IN THE COMMONWEALTH COURT OF PENNSYLVANIA

League of Women Voters of Pennsylvania, *et al.*, *Petitioners*, v. The Commonwealth of Pennsylvania, *et al.*, *Respondents*.	**No. 261 MD 2017**

PETITIONERS' POST-TRIAL PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

Mary M. McKenzie
Attorney ID No. 47434
Michael Churchill
Attorney ID No. 4661
Benjamin D. Geffen
Attorney ID No. 310134
PUBLIC INTEREST LAW CENTER
1709 Benjamin Franklin Parkway
2nd Floor
Philadelphia, PA 19103
Telephone: +1 215.627.7100
mmckenzie@pubintlaw.org

David P. Gersch*
John A. Freedman*
R. Stanton Jones*
Elisabeth S. Theodore*
Helen Mayer Clark*
Daniel F. Jacobson*
John Robinson*
John Cella (Atty. ID No. 312131)
Andrew D. Bergman*
ARNOLD & PORTER
KAYE SCHOLER LLP
601 Massachusetts Ave., NW
Washington, DC 20001-3743
Telephone: +1 202.942.5000
David.Gersch@apks.com
* Admitted pro hac vice.

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INTRODUCTION

Partisan gerrymandering is undemocratic and unconstitutional, and Pennsylvania's current congressional districting map is among the most extreme partisan gerrymanders in the nation's history. Following the 2010 census, the Republican-controlled General Assembly drew a map designed—with surgical precision—to maximize the political advantage of Republican voters and minimize the representational rights of Democratic voters. They deliberately manipulated district boundaries to discriminate against Democratic voters on the basis of their political views, their votes, and their association with the Democratic Party. They sought to predetermine the outcome of congressional elections for a decade.

The evidence at trial proved that Legislative Respondents' partisan gerrymander was intentional, obvious, and incredibly effective.

To accomplish the gerrymander, the 2011 map "packed" Democratic voters into five overwhelmingly Democratic districts. It "cracked" the remaining Democratic voters, spreading them across the other 13 districts while ensuring a reliable majority of Republican voters in each. And it worked: Without fail, the 2011 map has given Republicans 13 of 18 seats—the same 13 seats—in all three congressional elections in which the map has been used. Republicans won those 13 seats irrespective of swings in the vote—even when Democratic candidates won a majority of the votes statewide. The map is impervious to the will of voters.

Petitioners' experts established that, by a host of mathematical and statistical measures, the 2011 map is an extreme partisan gerrymander that could only be the product of partisan intent. Not one of Dr. Jowei Chen's simulated non-partisan maps produces the 13-5 Republican advantage that has persisted under the 2011 map. Dr. Wesley Pegden proved that, upon making tiny changes to the map's district boundaries, the extreme Republican bias dissipates, demonstrating that the map was carefully calibrated to maximize partisan advantage. And Dr. Christopher Warshaw demonstrated the extent to which the 2011 map wastes Democratic votes, yielding historically extreme pro-Republican Efficiency Gaps.

But it doesn't take an expert to see this map for what it really is. The districts are ridiculous. The 12th District resembles the Boot of Italy. The 6th District could be mistaken for the State of Florida with a longer and more jagged Panhandle. The 7th District—which has gained national notoriety as the epitome of naked gerrymandering—has been dubbed "Goofy kicking Donald Duck." As a result, many Pennsylvanians now live in areas of the Commonwealth known as "Goofy's finger" and "Goofy's armpit." It's a mockery of representative government in plain view for all the nation to see.

And it's worse than just the Rorschach inkblot district shapes. The map's packing and cracking of Democratic voters rips apart Pennsylvania's communities of interest to an unprecedented degree. As Petitioners' expert Dr. John Kennedy

explained, there is no legitimate reason to carve the Democratic stronghold of Reading out of Berks County, where it serves as the county seat, and append it via a narrow land bridge to the reliably Republican 16th District. Likewise, the map cracks Erie and Harrisburg by shoving their Democratic voters into overwhelmingly Republican areas with which they share no common interest. And the map packs Democratic voters into the 14th District by extending a tentacle up the Allegheny River to remove those voters from the 12th District.

Laying bare the mapmakers' utter disregard for traditional districting principles are the points at which several districts are barely even contiguous. At one point in King of Prussia, the 7th District holds itself together only by Creed's Seafood & Steaks. Its east and west sections are joined by a medical center. And the borough of Kennett Square is connected to the 16th District by a cemetery.

Legislative Respondents made no effort to defend the 2011 map at trial. They offered zero non-partisan explanation for the bizarre district shapes, the decisions to split particular communities, or the uniform 13-5 Republican victories in 2012, 2014, and 2016. Legislative Respondents' experts conducted no affirmative analysis and offered no positive conclusions about the map, instead merely criticizing the work of Petitioners' experts. Those criticisms were makeweight, unreliable, and not credible.

And though Legislative Respondents fought tooth and nail to conceal the reality of how the 2011 map was drawn, the truth came to light. As Dr. Chen's analysis of files produced by Speaker Turzai in the federal case showed, Republican mapmakers assigned detailed partisanship scores to each and every precinct, municipality, and county across Pennsylvania. It's no mystery why.

The 2011 map violates the Pennsylvania Constitution. Under the Free Expression and Free Association Clauses, the government cannot burden or retaliate against protected political expression and association. That is exactly what the map does. It targets Pennsylvania citizens likely to vote for Democratic congressional candidates in order to minimize their electoral and therefore political influence. And under the Pennsylvania Constitution's equal protection guarantees, the map intentionally and impermissibly discriminates against Democratic voters, materially disadvantaging them in electing candidates of their choice.

This partisan gerrymandering needs to stop. It's discriminatory and unfair, and it's undermining people's trust and confidence in the integrity of government. It matters so much that people have faith in the electoral process by which we select our representatives in Washington. It matters to young people like the students in petitioner Bill Marx's high school civics class, who grow disillusioned simply upon seeing the 2011 map's ridiculous district shapes. It matters to petitioner Beth Lawn, a chaplain, who worries about her disabled son's access to

healthcare. It matters to petitioner Tom Rentschler and his neighbors in Reading and Berks County, who lack a congressperson focused on their community's needs. It matters to every single Pennsylvanian.

The law does not tolerate discrimination, and there is no exception for discrimination on the basis of Pennsylvania citizens' political views. Quite the opposite. Even before the federal Bill of Rights, the framers of the Pennsylvania Constitution enshrined robust protections for the political expression and association of all Commonwealth residents. Those Pennsylvania protections must and do extend to voting, one of the highest acts of self-expression there can be in a representative democracy.

This Court should declare that the 2011 map violates the Pennsylvania Constitution and enjoin its further use. It's time Pennsylvania voters got to choose their elected officials—not the other way around.

PROPOSED FINDINGS OF FACT

A. Pennsylvania's 2011 Congressional Districting Map Was Created in Secret and Enacted in a Highly Unusual and Partisan Manner

1. As a result of the reapportionment process following the 2010 U.S. Census, Pennsylvania lost a congressional seat. *See* Joint Stipulation of Facts ("JSF") ¶¶ 1-3. In Pennsylvania, responsibility for redrawing congressional districts following each census lies with the Pennsylvania General Assembly, which is composed of the Pennsylvania Senate and House of Representatives. JSF

¶ 6. Both chambers of the General Assembly must pass a redistricting bill, and it must be signed into law by the Governor. JSF ¶ 6.

2. Heading into the November 2010 election, Democrats held the Pennsylvania House by a slim margin. The governor of Pennsylvania in 2010, Ed Rendell, was also a Democrat. But in the 2010 elections, Republicans picked up 11 seats in the Pennsylvania House, taking control of that chamber. Republicans also retained control of the Senate, and Republican Tom Corbett won the governorship. Thus, after the 2010 election, Republicans held exclusive control over Pennsylvania's congressional redistricting. JSF ¶¶ 7-9, 153-54.

3. Having gained control over the redistricting process, Republicans in the General Assembly set to work redrawing the congressional map in a way that would entrench Republican dominance in Pennsylvania's delegation to the U.S. House of Representatives for the next decade. On September 14, 2011, Republicans introduced their congressional redistricting bill, Senate Bill 1249. JSF ¶ 39. The bill's primary sponsors were all Republicans: Majority Floor Leader Dominic F. Pileggi, President Pro Tempore Joseph B. Scarnati III, and Senator Charles T. McIlhenney Jr. JSF ¶ 40.

4. The Republican leadership in the General Assembly went to extraordinary lengths to conceal their intent to draw district boundaries that would burden the representational rights of Democratic voters. SB 1249 started as an

empty shell—it contained no map showing the proposed congressional districts. *See* JSF ¶ 42; Joint Ex. 1; Petrs. Ex. 178 (Dinniman *Agre* Tr.) 19:6-8; Petrs. Ex. 179 (Vitali Dep.) 64:10-11. Instead, the bill described each congressional district as follows: "The [Number] District is composed of a portion of this Commonwealth." JSF ¶ 42; Joint Ex. 1. The same was true at the second reading of the bill, almost three months later, on December 12, 2011. JSF ¶¶ 43-44.

5. The Republicans' efforts to keep the contents of the bill secret were highly unusual, especially for a bill of such public importance. Petrs. Ex. 178 (Dinniman *Agre* Tr.) 20:4-12, 16-18. Democratic representatives were shut out of the process of drawing the map, which was done in secret. Petrs. Ex. 179 (Vitali Dep.) 59:11-15. Republican Senators suspended the ordinary rules of procedure to rush the bill through the Senate to avoid scrutiny from Democrats and the general public. Petrs. Ex. 178 (Dinniman *Agre* Tr.) 23:16-25; *id.* at 25:4-7, 27:3-8.

6. Then, on the morning of December 14, 2011, Republicans amended the bill to add—for the first time—the actual descriptions of the new congressional districts. JSF ¶¶ 45-47; Joint Exs. 2-3.

7. As soon as the plan was revealed, Democratic Senators decried its partisan bent and the Republicans' lack of transparency. Senator Anthony Williams stated: "[M]aybe if we had . . . transparency, openness, and most importantly, inclusion, we could have shared the responsibility of coming up with

[a] . . . much more representative map. That is not what happened . . . . [W]e have a map that not one Democrat had anything to do with on this side of the aisle." 2011 Senate Legislative Journal 1361, 1409-10 (Dec. 14, 2011).[1] Senator Jay Costa introduced an amendment that he believed would create eight districts favorable to Republicans, four districts favorable to Democrats, and six swing districts. *Id.* at 1404; JSF ¶ 49; Petrs. Ex. 178 (Dinniman *Agre* Tr.) 24: 10-13. It failed on a party-line vote. JSF ¶ 49; Petrs. Ex. 178 (Dinniman *Agre* Tr.) 24:15.

8. Later the same day, just hours after first revealing the proposed district boundaries, the Senate passed SB 1249 by a vote of 26-24. JSF ¶ 50. Not one Democratic Senator voted for it. JSF ¶ 51.

9. Just days later, on December 15 and December 19-20, 2011, the Pennsylvania House of Representatives considered SB 1249. JSF ¶¶ 53-56. As in the Senate, Democratic representatives denounced the plan's partisan substance and non-transparent process. For example, Representative Dan Frankel decried Republicans' "very cynical attempt to institutionalize a Republican majority of congressional seats in Pennsylvania." 2011 House Legislative Journal 2726, 2733

[1] The parties stipulated and agreed that the Court may consider and take judicial notice of the legislative history of Act 131, including the Legislative Journals available at http://www.legis.state.pa.us/cfdocs/billinfo/bill_history.cfm?syear=2011&sind=0&body=S&type=B&bn=1249 (select "Senate Journal Page 1398" under the heading "PN 1869"). JSF 48.

(Dec. 20, 2011). He urged the Senate to "reject this. This is not good government; this is a very cynical way to do government." *Id.*

10. Representative Frank Dermody added: "[T]he way our system is supposed to work is that the voters are supposed to pick the politicians. With this map, the politicians pick the voters. This map sets up districts that are gerrymandered beyond recognition." *Id.* at 2732. Representative Robert Freeman similarly stated: "SB 1249 contains the worst case of gerrymandering in Pennsylvania in living memory. . . . A look at the configuration of the congressional district map of 1249 reveals twisted and distorted districts that were drawn purely for political advantage, with no consideration for compactness of districts or communities of interest." *Id.* at 2730.

11. Representative Steve Samuelson protested the lack of transparency: "When this bill had first reading, the Senate had no plan [*i.e.*, the bill had no substantive content]. When this bill had second reading, the Senate had no plan. The map was not revealed until December 13. The details . . . were not available until 9 a.m. on December 14. . . . [T]he public had about 14 hours to see the details. Now, since the Senate came out with their plan on Wednesday, the public has had a grand total of 5 days." 2011 House Legislative Journal 2675, 2699-2700 (Dec. 19, 2011). Representative Babette Josephs similarly protested the extraordinary lack of transparency in what she called a "dreadful" plan, noting that

she had never before "seen a hearing in this legislature on a blank bill." *Id.* at 2731. "You could not tell looking at the bill or looking for a map, what . . . the Republicans had in mind." *Id.*

12. Representative Michael Hanna offered an amendment to "create a fair redistricting map . . . [that] will minimize district splits in counties and municipalities and ensure equality of representation across the 18 congressional districts." *Id.* at 2691. The amendment failed. *Id.*

13. On December 20, 2011—just six days after Republicans had first revealed the proposed districts—the House passed SB 1249 by a vote of 136-61. JSF ¶ 57. Of the 36 House Democrats who voted for SB 1249, at least 33 (approximately 92%) represented state legislative districts that were part of at least one of the following congressional districts under SB 1249: the 1st, 2nd, 13th, 14th, or 17th. JSF ¶ 59. Under SB 1249, all of these districts were "packed," JSF ¶ 73, meaning the Democrats who represented them would enjoy "safe" seats for the next decade. Petrs. Ex. 178 (Dinniman *Agre* Tr.) 62:12-14 (discussing how some Democrats voted for the plan to ensure that Congressmen Brady and Fattah would represent safe districts); Petrs. Ex. 179 (Vitali Dep.) 47:19-24 ("Congressman Brady wanted . . . his district . . . to be a safe Democratic district."); *id.* at 49:4-12.

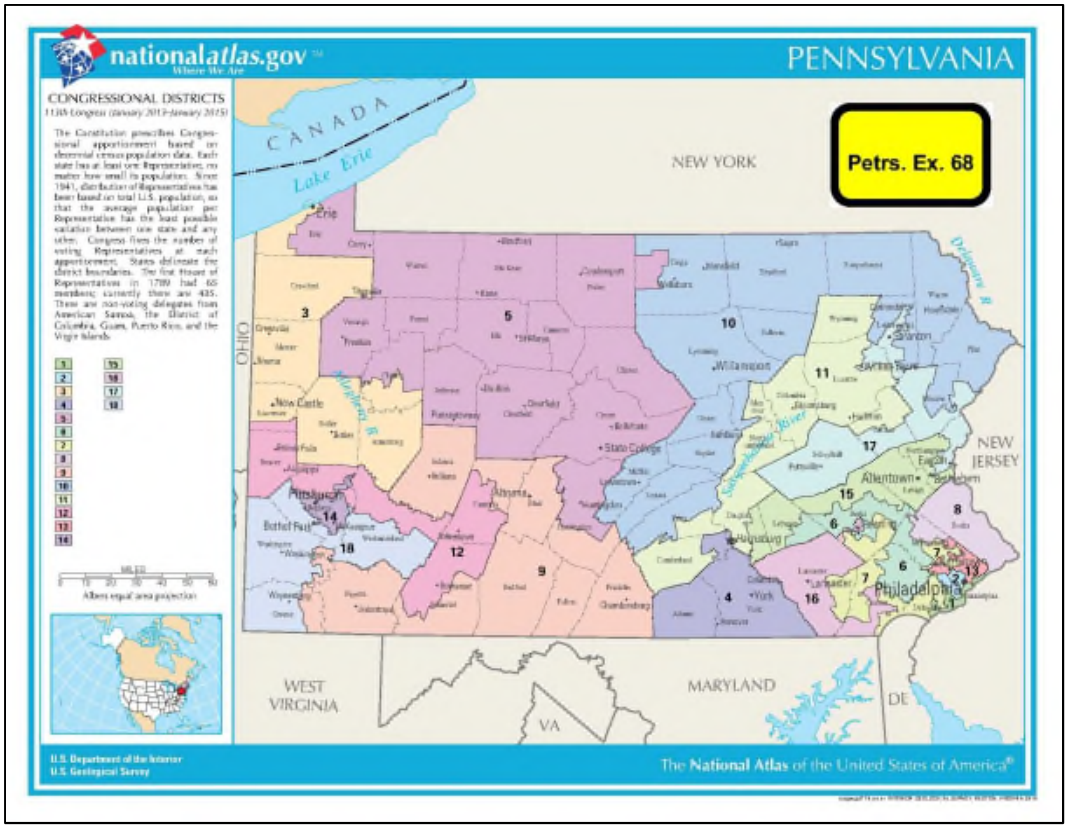
14. Republican Governor Tom Corbett signed the bill into law two days later, as Act 131 of 2011. The 2011 map remains in effect today. JSF ¶¶ 60-62.

B. The 2011 Map Packs and Cracks Democratic Voters, Creating Absurdly Contorted Districts and Dividing Communities

15. The 2011 map contains a series of non-compact, bizarrely shaped districts that slice and dice Pennsylvania's significant communities of interest. John J. Kennedy, Ph.D., a Pennsylvania native and Professor of Political Science at West Chester University, testified as an expert in political science, with a specialty in Pennsylvania political history and political geography. Dr. Kennedy analyzed the 2011 map's unprecedented division of Pennsylvania's communities of interest and concluded that these divisions "pack" and "crack" Democratic voters to dilute their electoral influence. Tr. 579:13-644:15; Petrs. Ex. 53 (Kennedy Report).

16. In a partisan gerrymander, "packing" involves concentrating one party's backers in a few districts so that the party wins by overwhelming margins in those districts, but the party's votes are minimized elsewhere. "Cracking" involves spreading a party's supporters across multiple districts so that they fall reliably short of a majority in each. Petrs. Ex. 53 at 2-3.

17. Petitioners' Exhibit 68 is an image of the 2011 enacted map:



18. Prior to the 2011 map, the margin between the number of congressional seats held by Democrats and Republicans was small, within one seat in over half of all election cycles from 1966-2010 (13 of 23 cycles). Petrs. Ex. 53 at 3-4. In 2012, however, even though Democratic candidates won a majority of the vote statewide (50.8%), Democrats won only 5 of 18 seats. JSF ¶¶ 71-72. In 2014 and 2016, Democratic candidates won 44.5% and 45.9% of the two-party vote share respectively, and Republicans continued to win 13 of 18 seats. JSF ¶¶ 74-75, 80-81. Thus, not a single congressional seat has changed party hands in three elections under the 2011 map:

Table A: Partisan Distribution of Seats in Pennsylvania's Congressional Delegation, 2012-2016

Year	Districts	Democratic Seats	Republican Seats	Democratic Vote Percentage[1]	Republican Vote Percentage
2012	18	5	13	50.8%	49.2%
2014	18	5	13	44.5%	55.5%
2016	18	5	13	45.9%	54.1%

Source: The Pennsylvania Manual

Petrs. Ex. 53 at 3-4.

19. To engineer this outcome, the 2011 map flagrantly disregarded the traditional districting principle of protecting communities of interest, instead ripping apart counties, municipalities, and other local communities. Tr. 579:18-580:1, 583:13-17, 586:18-587:17.

20. First, the number of split local jurisdictions is the highest of any map in Pennsylvania's history.[2] Petrs. Ex. 56. Pennsylvania's 67 counties play a "central and historical role . . . as building blocks" of the Commonwealth. *Holt v. 2011 Legislative Reapportionment Comm'n*, 614 38 A.3d 711, 745 (Pa. 2012). Yet the 2011 plan splits 28 of these counties between one or more congressional

[2] The sole exception is the map in use from 2004 to 2010, which the General Assembly cobbled together in ten days operating under a court order in *Vieth v. Pennsylvania*, 195 F. Supp. 2d 672 (M.D. Pa. 2002), to equalize population by tweaking certain precincts. Petrs. Ex. 53 at 4 n.3.

districts. *Id*. It also splits 68 municipalities between separate districts. *Id*. The number of split counties and municipalities in the 2011 enacted map is a marked increase from Pennsylvania's recent history. The map in effect during the 1992-2000 election cycles split 19 counties and 14 municipalities. *Id*. The 2011 map almost doubles the number of split counties from that 1990s map and more than quadruples the number of split municipalities. *Id.*

21. The 2011 map splits some counties across so many different congressional districts that the prospect of effective representation evaporates. Petrs. Ex. 53 at 5-6, 16-19. For instance, Pennsylvania's third largest county, Montgomery County, is sliced between five different districts (the 2nd, 6th, 7th, 8th, and 13th)—and none of those five congressmen resides in Montgomery County. Tr. 643:20-25; Petrs. Ex. 53 at 17. Berks County and Westmoreland County are each split across four different districts, despite having populations of just 411,442 and 365,169, respectively. Petrs. Ex. 53 at 17.

22. Petitioners' Exhibit 56 summarizes the number of counties and municipalities split in Pennsylvania congressional districting maps since 1966:

Table B: Split Counties and Municipalities by Decade[2]

Year	Split Counties	Split Municipalities
1966-1972	7	2
1970s	9	4
1980s	16	3
1990s	19	14
2000s	25	67
2010s	28	68

Source: The Pennsylvania Manual

[2] Details of these figures are provided in the Appendix

Petrs. Ex. 56.

23. The 2011 map also significantly increased the number of municipalities that are divided at the census-block level. Tr. 642:8-19. Splitting municipalities by census blocks, which range from only 600 to 3,000 residents, is "highly granular." Tr. 642:21. Until the 1992 map, there were no congressional districts that divided municipalities at the census-block level. Petrs. Ex. 53 at 5. In the 1990s and 2000s, there were only three and six census-block divisions, respectively. *Id.* But in the 2011 map, there are an unprecedented 19 such splits, more than triple the amount of the 2002 map:

Table C: Number of Municipalities Split at the Block Level by Decade

1970s	1980s	1990s	2000s	2010s
0	0	3	6	19

Source: The Pennsylvania Manual

Petrs. Ex. 57.

24. Pennsylvania's local communities share historical attachments, affiliations, and common interests. Petrs. Ex. 53 at 19. As Dr. Kennedy testified, Pennsylvanians identify strongly with their local communities at the municipal, county, and regional levels:

> [F]or Pennsylvanians, community is very important. Noted Pennsylvania historian Philip [Klein] once remarked that if you ask a Texan where they're from, they'll undoubtedly say they are a Texan. If you ask a Pennsylvanian where they're from, they're much more likely to respond as their hometown. Pennsylvanians identify with their own hometown, with their community. I often ask my students, particularly in my Pennsylvania class . . . when you're traveling out of state, if you're on vacation, and someone asks you, "Where are you from?", almost always someone will say relating to their hometown; rarely will they say they're from Pennsylvania. Pennsylvanians identify with their community, with their hometown, whether it's the Lehigh Valley; whether it's the Mon Valley; whether it's Easton, or Harrisburg, Erie, Reading; or they might be from Delco or Montco. . . . So the point is, communities are important to our identity as Pennsylvanians. Residents of Delco have a different identity than residents of Amish Country. Those who reside in . . . Johnstown have a

> different identity than those who live in Aliquippa. Those that live in Allentown have a different identity than those who live in Hershey.

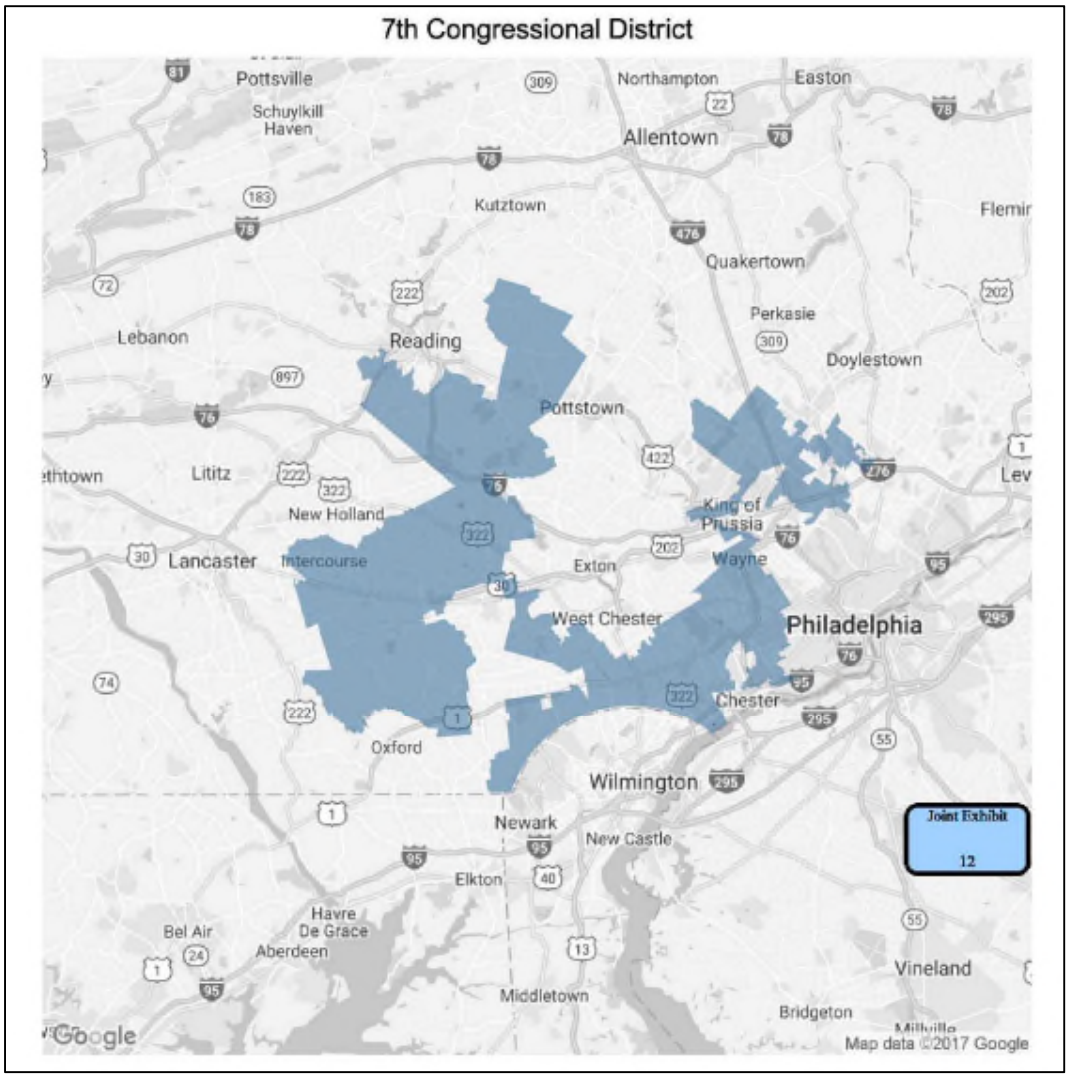
Tr. 583:21-585:5.

25. The 2011 map disregards these communities. Pennsylvanians in Delaware County have been pushed into the same congressional district with Amish County. Joint Ex. 12. Pennsylvanians from Johnstown have been pushed into the same district as Aliquippa. Joint Ex. 17. The Lehigh Valley has been substantially divided for the first time in recent memory; what was once the Lehigh Valley district no longer exists. Tr. 623:13-626:11; Petrs. Ex. 53 at 48. As Dr. Kennedy noted, "the minor legal baseball team is called the Lehigh Valley Iron Pigs," not "the Allentown/Hershey Iron Pigs." Tr. 626:9-11. The 2011 map disregarded these common bonds. And, as Dr. Kennedy explained in his unrebutted testimony, the map did so solely for partisan reasons. Tr. 624:23-625:9, 625:16-626:7; Petrs. Ex. 53 at 6, 47-48.

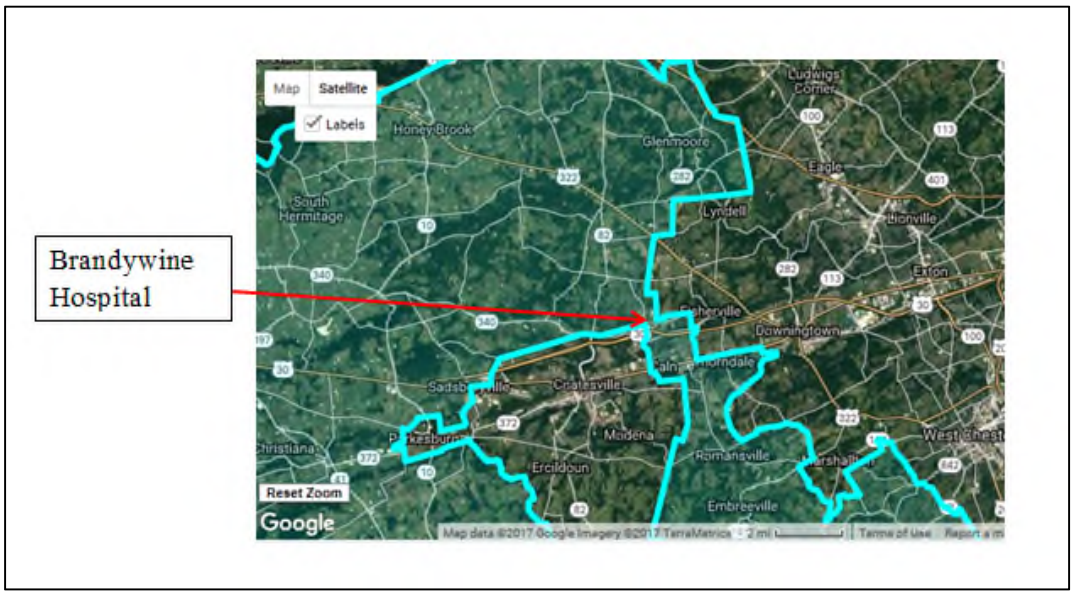
26. A district-by-district analysis of the 2011 map shows how Democratic voters have been cracked and packed to the detriment of Pennsylvania's communities of interest. Tr. 588:24-636:14; Petrs. Ex. 53 at 19-57.

27. Pennsylvania's 7th District is widely known as "one of the most gerrymandered districts in the country." Tr. 598:25-599:3. Historically based in Delaware County in southeastern Pennsylvania, the 7th District now extends in

two divided branches, snaking through Montgomery County to the northeast and through Berks County and Lancaster County to the northwest. Tr. 599:11-25; Joint Ex. 12. Ultimately, this sprawling district splits five counties and 26 municipalities. Petrs. Ex. 53 at 30; Tr. 615:12-15. Its notoriously non-compact boundaries have earned it the moniker "Goofy Kicking Donald Duck," Tr. 599:19-22, with Goofy to the east, kicking Donald Duck to the West:



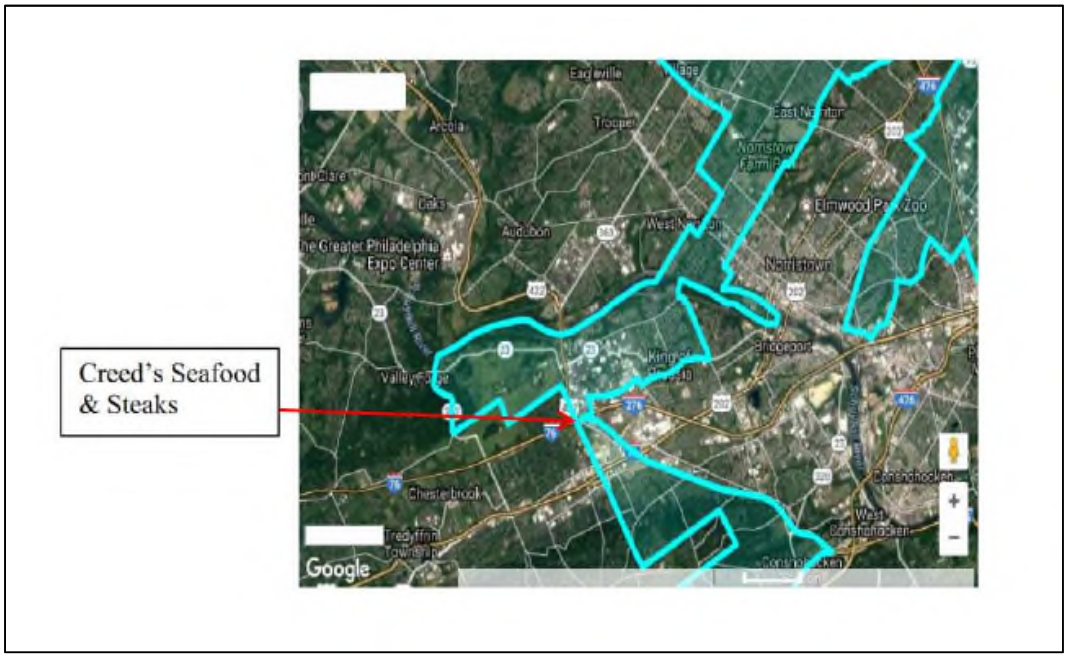
28. The 7th District is barely contiguous. At the point where its eastern and western halves are joined—referred to at trial as "Goofy's toe," Tr. 601:14-16—the 7th District is only the width of a single medical facility:



Petrs. Ex. 53 at 32. This narrow land-bridge manages to avoid the Democratic-leaning municipalities of Downingtown and Exton to the north and Coatesville to the south, splitting the Democratic voters there from their larger communities and moving them into the 16th and 6th Districts, where they are heavily outnumbered by Republican voters. Petrs. Ex. 53 at 32; Petrs. Ex. 78; Petrs. Ex. 97.

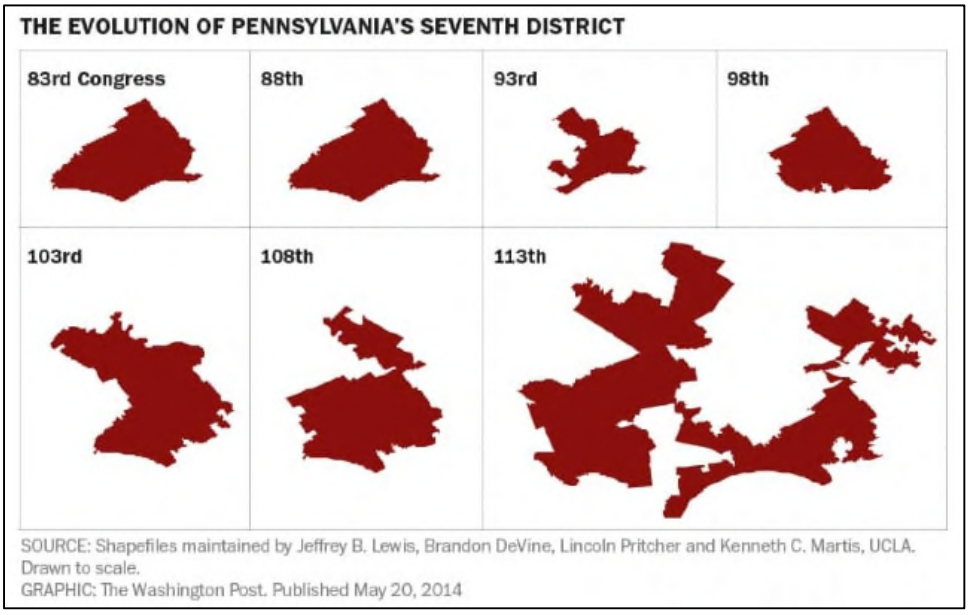
29. In the northeast half of the 7th District—"Goofy's Adam's apple," Tr. 602:6-8—the only point of contiguity is a piece of land that houses the restaurant Creed's Seafood & Steaks. Petrs. Ex. 81; Tr. 602:16-20. The Democratic-leaning

areas of Upper Merion to the northeast of this point have been split away from the 7th District and placed in the 13th District:



Petrs. Ex. 81.

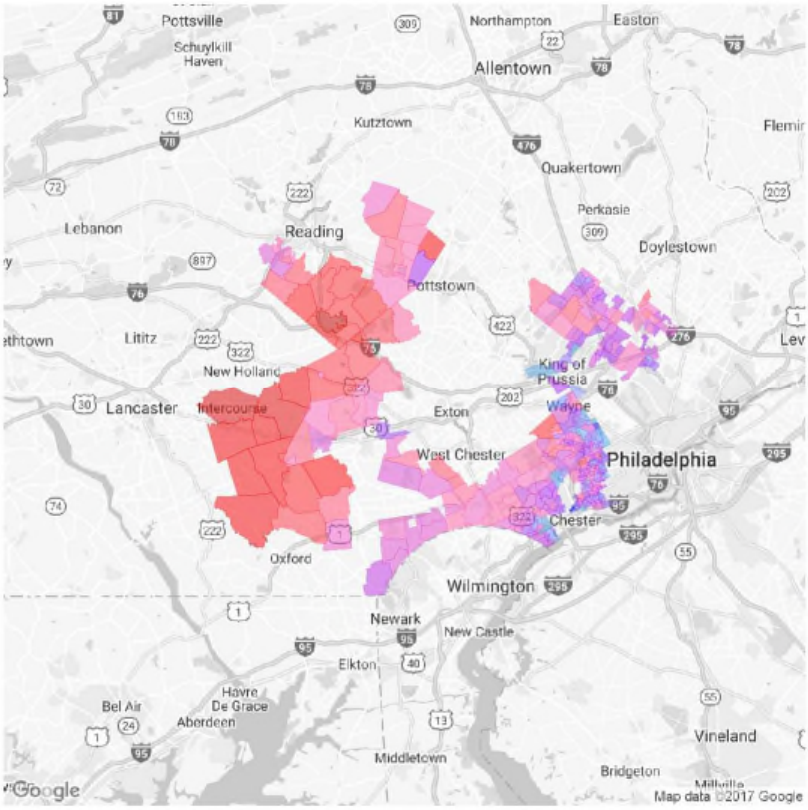
30. The evolution of the 7th District over time tells the tale:



Joint Ex. 24; *see* Tr. 614:13-615:9.

31. The 7th District cracks Democratic voters into neighboring districts, reducing their electoral influence in both districts. For example, the gap in the 7th District's southeastern portion splits the City of Chester in Delaware County and cuts out the Democrat-heavy pocket of Swarthmore to the north ("Goofy's armpit"), packing those strongly Democratic municipalities into the already overwhelmingly Democratic 1st District. Tr. 605:19-606:3; Petrs. Exs. 83-84. This cracking and packing is illustrated by overlaying the results of Pennsylvania's 2010 U.S. Senate election on the 7th and 1st Districts, with Republican precincts shaded red and Democratic precincts shaded blue:

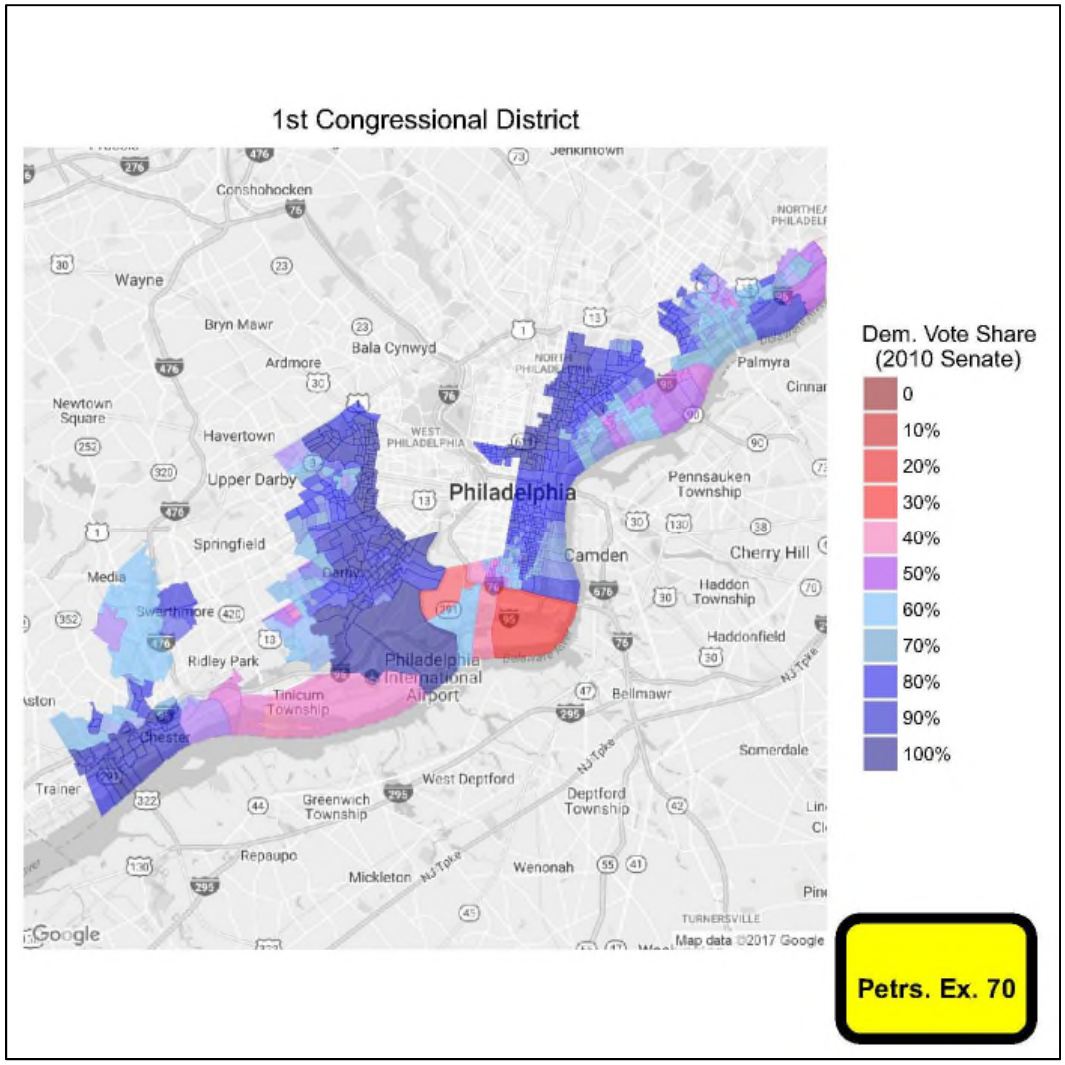
7th Congressional District



Dem. Vote Share (2010 Senate)

- 0
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%

Petrs. Ex. 83



32. As illustrated above, the appendage encapsulating Swarthmore in the southwestern portion of the 1st District is like a puzzle piece that would otherwise fit into the southeastern gap of the 7th District. Tr. 607:23-608:15; Petrs. Ex. 53 at 20-21. The 2011 map thus divides Delaware County north of the City of Chester to remove Democratic voters from the 7th District. Tr. 605:19-606:3; Petrs. Ex. 53 at 19-20. The consequence of all these changes was to turn a district that was

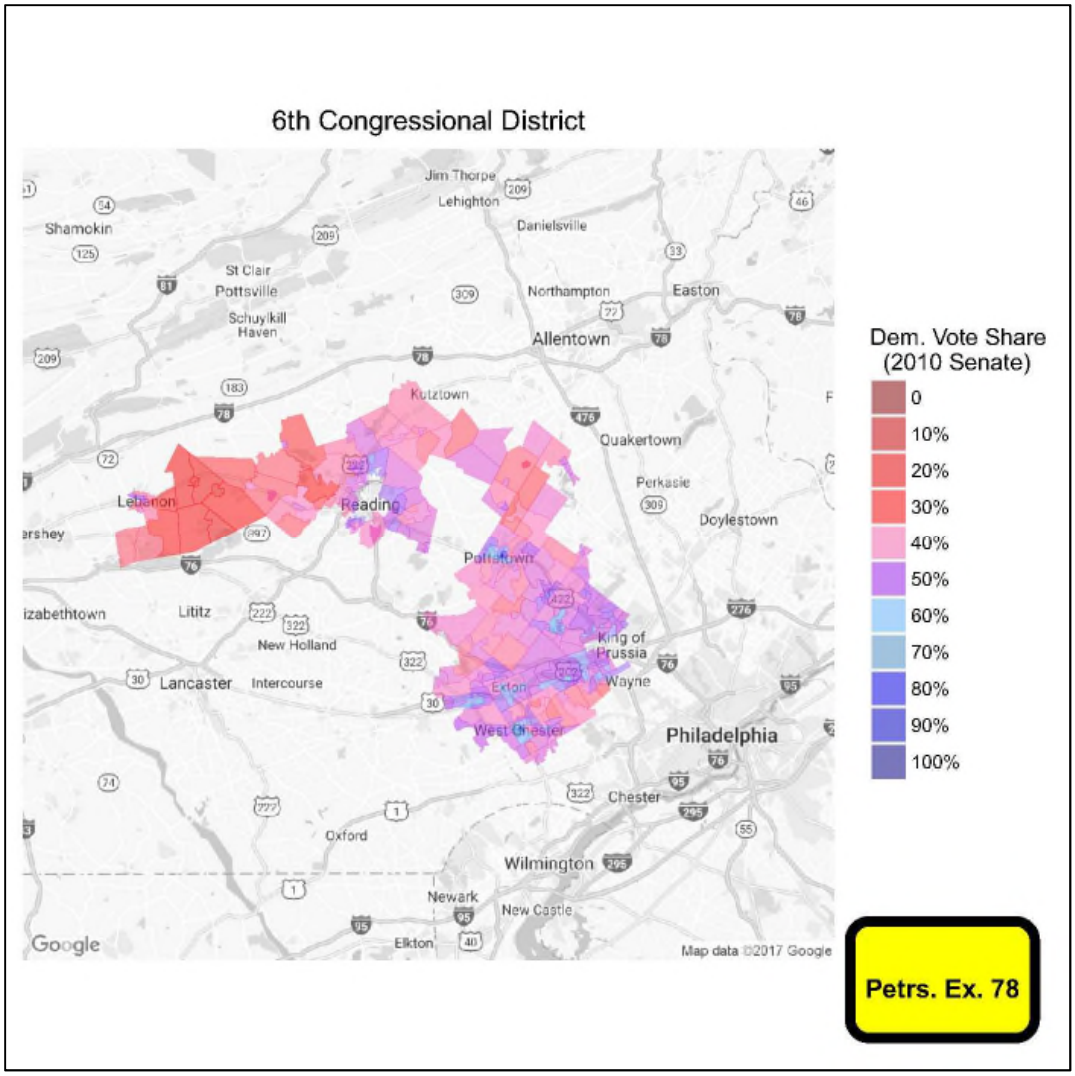
competitive under the prior map into an uncompetitive district where Democratic candidates were dissuaded from running. Petrs. Ex. 179 (Vitali Dep.) 34:23-35:9.

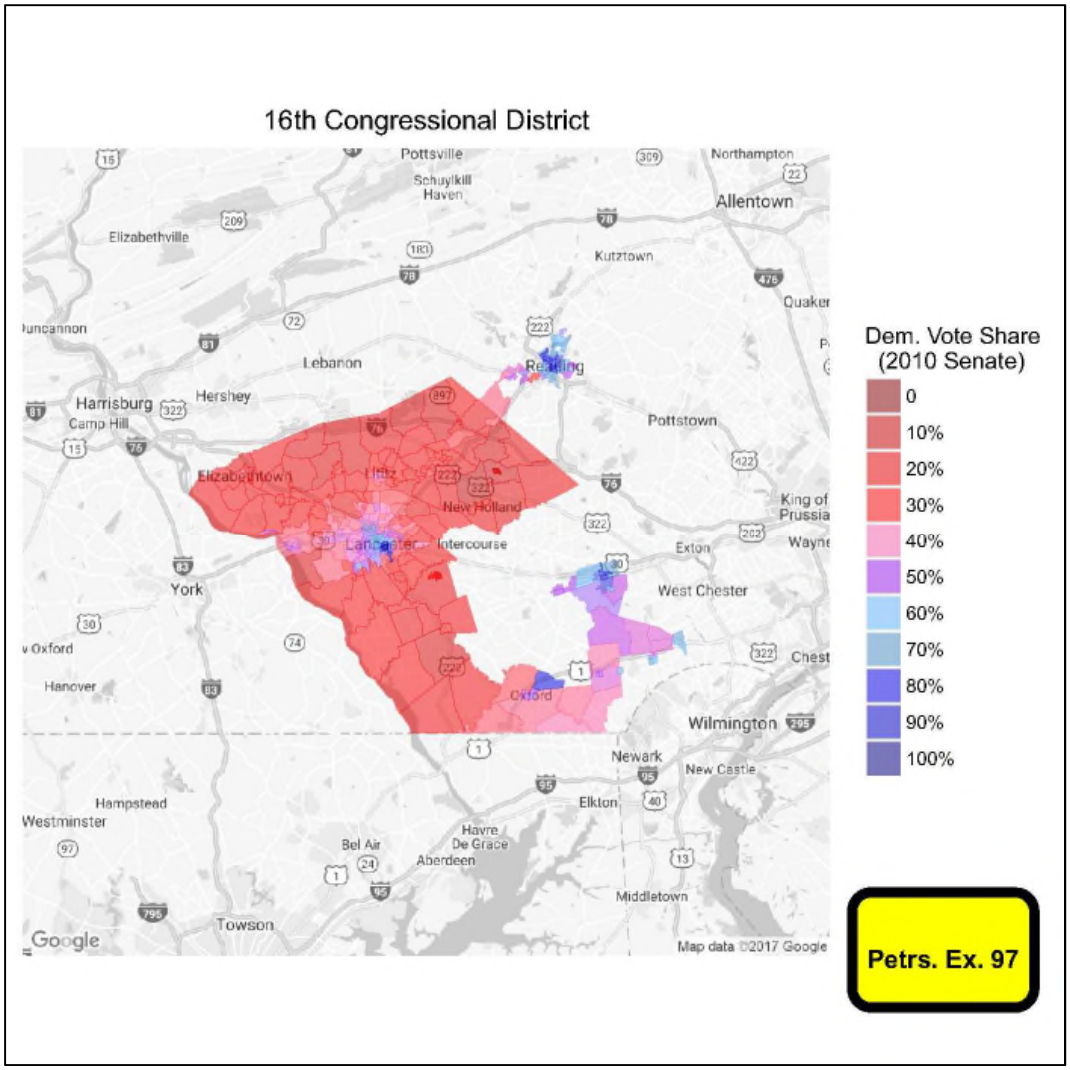
33. Legislative Respondents have offered no non-partisan explanation for the 7th District's bizarre shape, narrow stretches of land, or passing over of Democratic areas such as the City of Chester, Swarthmore, Downington, and Coatesville.

34. Intertwined with the 7th District's meandering boundaries lies the 6th District, which begins in Chester County but extends northward into Montgomery County, before jetting west to include parts of Berks and Lebanon Counties. Joint Ex. 11; Tr. 616:2-8; Petrs. Ex. 53 at 28. It spans multiple communities of interest, containing only pieces of each, Tr. 617:9-17, and results in a shape that resembles the state of Florida "with a more jagged and elongated panhandle." Tr. 616:9-12.

35. Legislative Respondents have offered no non-partisan explanation for the 6th District's bizarre shape.

36. A small incision into the 6th District's northwestern portion carves out the City of Reading, thereby splitting Reading from the rest of Berks County, even though Reading is the county seat. Tr. 616:13-17; Petrs. Ex. 53 at 29. The partisan makeup of Reading makes plain the motivation for this decision—it is blue:


6th Congressional District
Jim Thorpe
Lehighton
Danielsville
Shamokin
St Clair
Pottsville
Schuylkill Haven
Northampton
Easton
Allentown
Kutztown
Quakertown
Perkasie
Doylestown
Reading
Lebanon
Pottstown
Lititz
New Holland
Lancaster
Intercourse
King of Prussia
Wayne
Exton
West Chester
Philadelphia
Chester
Oxford
Wilmington
Newark
New Castle
Elkton
Google
Map data ©2017 Google
Dem. Vote Share (2010 Senate)
0
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Petrs. Ex. 78



37. The 16th District, which has historically been a district based in Lancaster County in Amish country, serves as the repository for Reading's cracked Democratic voters. Petrs. Ex. 53 at 50; Tr. 618:12-17. The 16th District is a Republican-dominated district but has corralled in Democrat-heavy areas on two of its borders, cracking those Democratic voters away from the 6th and 7th Districts. The 16th District now includes the City of Reading, which is joined by a narrow isthmus that at one point is only the width of a mulch store and a service center:

Petrs. Ex. 53 at 52; *see* Tr. 618:18-619:15, 620:2-6.

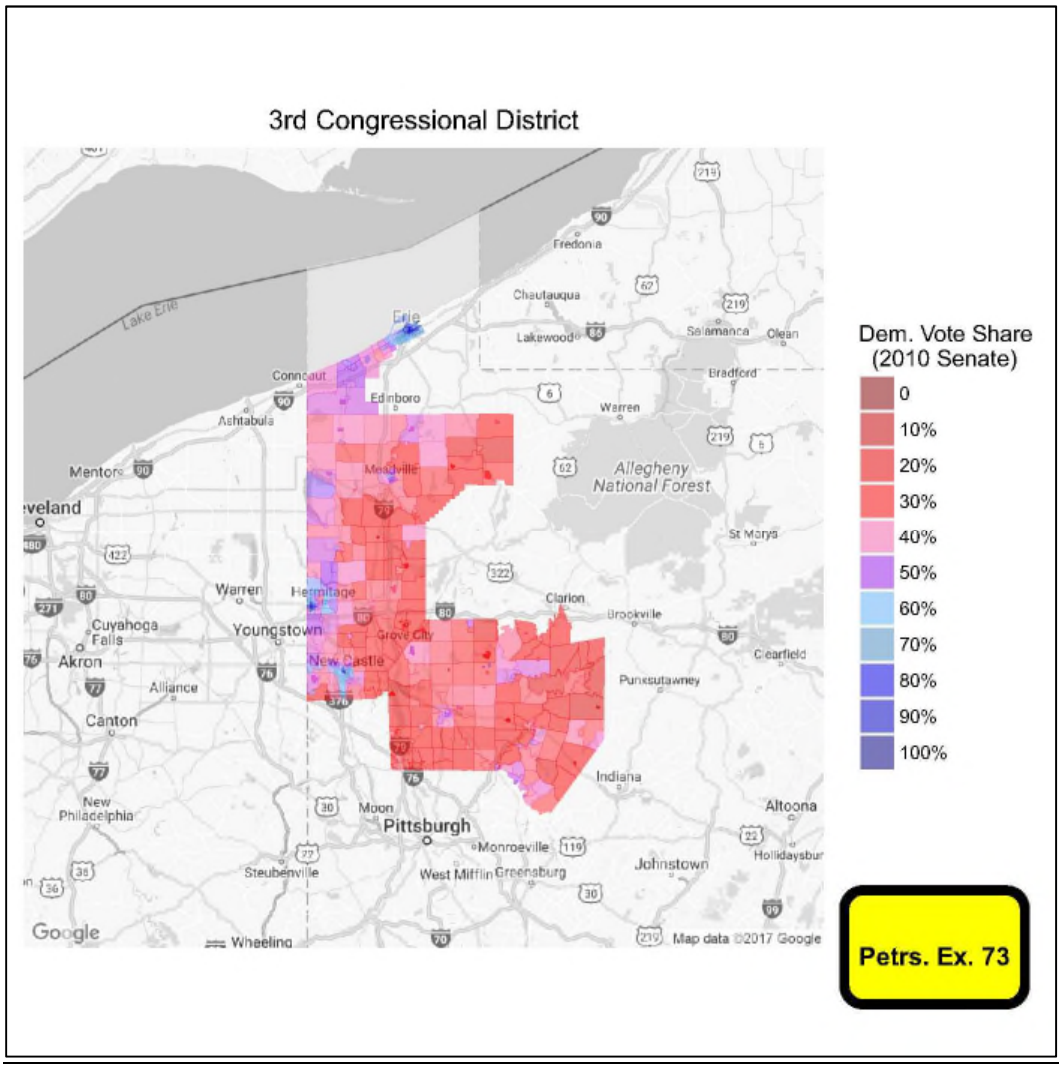
38. The 16th District also cracks the predominantly Democratic voters in the Coatesville area out of the 7th District (the blue "boot" on the 16th District's southeastern appendage).

39. Legislative Respondents have offered no non-partisan explanation for the decisions to place Reading and Coatesville into the 16th District. The intent and effect of this cracking is to place Democratic voters into a ruby red district that they have little chance of influencing. Tr. 621:15-622:10; Petrs. Ex. 97.

40. The 3rd District is another example of how the 2011 map divides counties and communities of interest to disadvantage Democratic voters. Although Erie County had remained undivided and within a single congressional district throughout Pennsylvania's history, the 2011 map bisects it, with the border between the 3rd and 5th Districts running through the Democratic voters residing in the Erie metropolitan area. Tr. 591:12-20.

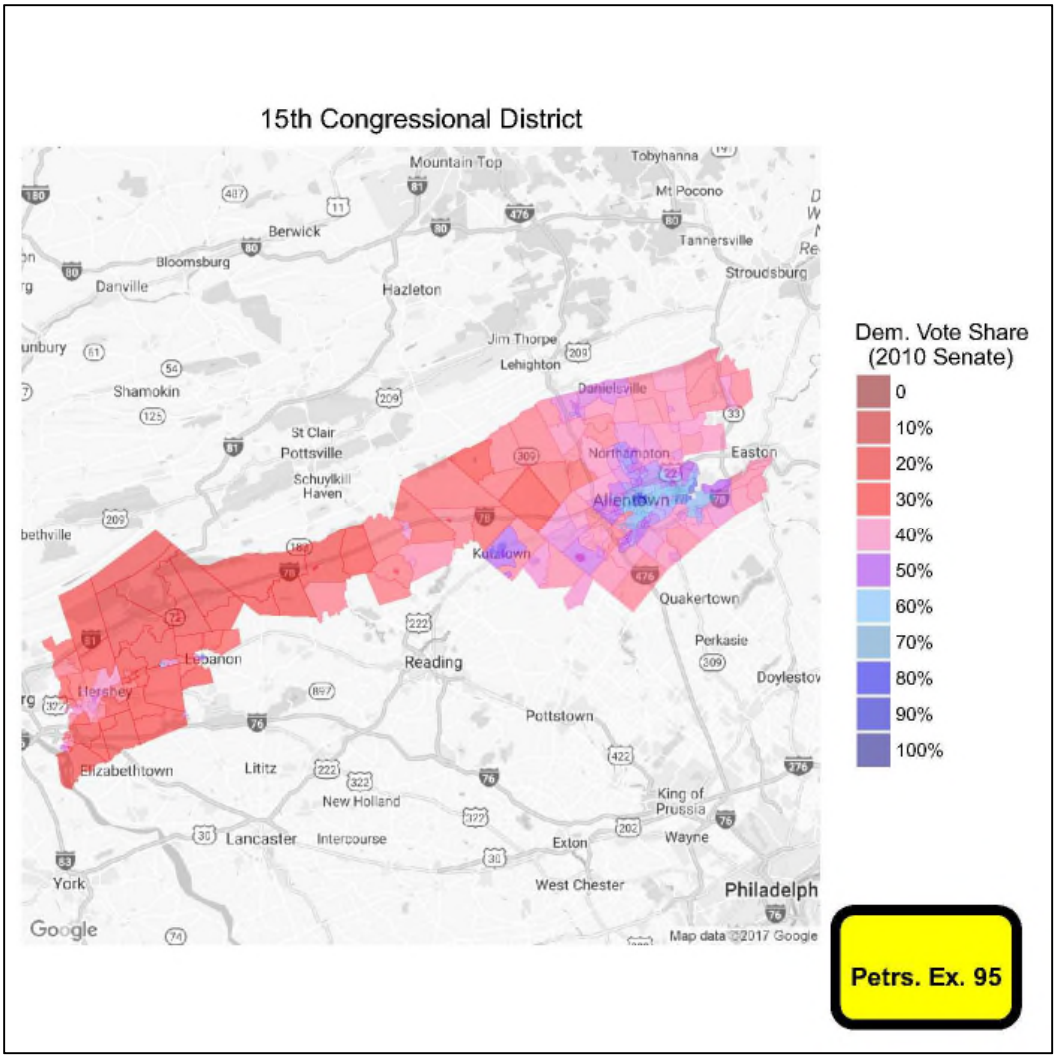
41. Leaving Erie County intact historically not only preserved it as a distinct community of interest, but also made sense given Erie County's location in the northwestern corner of the state, bordering Ohio to its west, New York to its east, and Lake Erie to its north. Tr. 597:10-23; Petrs. Ex. 68. With Erie County split in half, Erie County's strongly Democratic voters are cracked and diluted across two different districts. Petrs. Ex. 53 at 24, 27. The 3rd District extends from Erie southward to encompass Republican-leaning areas in Butler County,

shifting the partisan make-up of this district in favor of Republicans. Petrs. Ex. 53 at 24. Likewise, the 5th District to the east, where Republican voters have always held a significant advantage, remains a safe Republican seat despite the addition of the cracked off Democratic voters from the eastern portion of the Erie metropolitan area. Tr. 597:17-598:5; Petrs. Ex. 53 at 27.



42. Legislative Respondents have offered no non-partisan explanation for the decision to split Erie County.

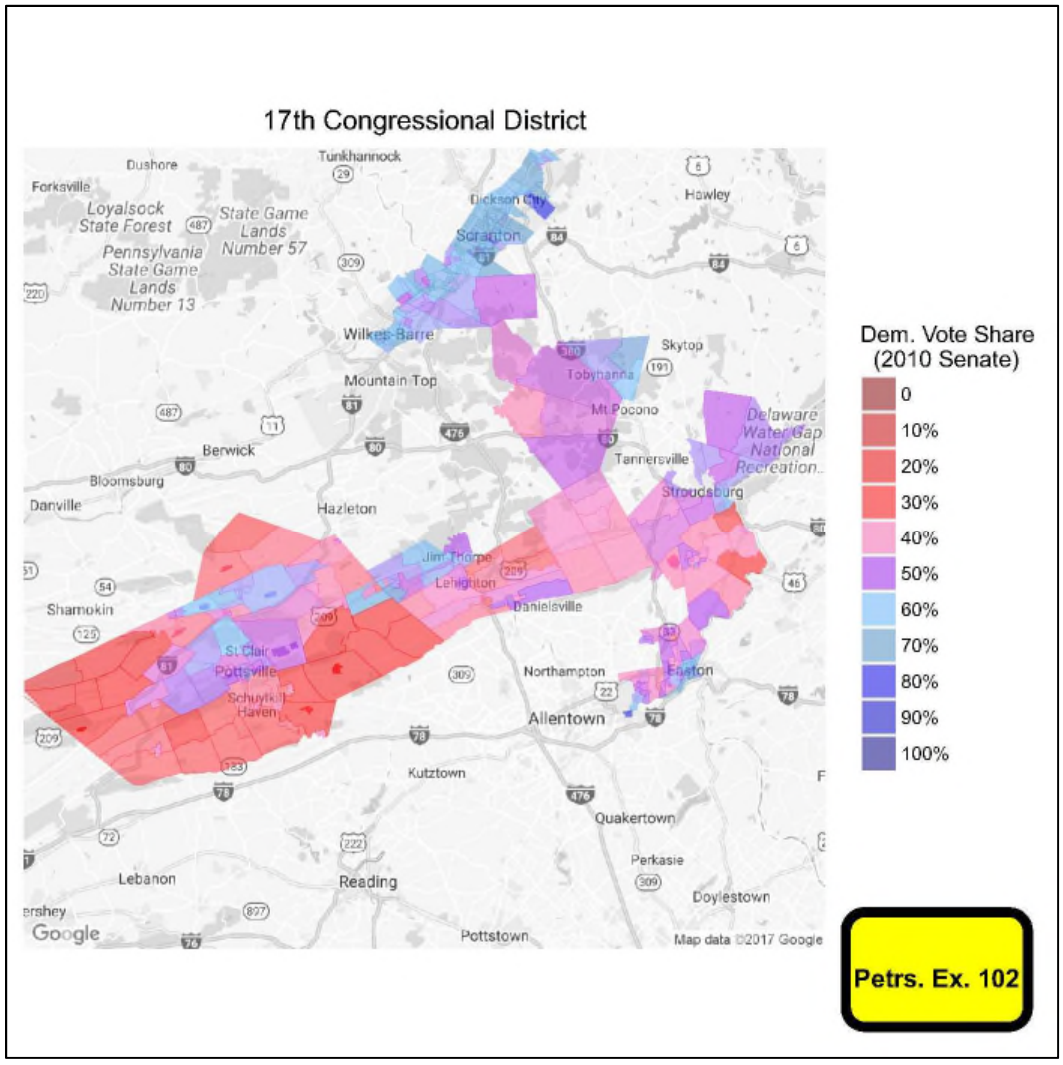
43. The 15th District had historically been a Lehigh Valley-based district, with the maps from 1971 until 2011 always containing Northampton and Lehigh Counties together and undivided (with the exception of one division of one township split from the remainder of Lehigh County in the court-ordered 2002 map). Tr. 623:15-22; Petrs. Ex. 53 at 48. But the 2011 map moves the mostly Democratic voters residing in the seat of Northampton County (Easton) and its largest city (Bethlehem) from the remainder of the 15th District. Tr. 624:25-625:9. These Democratic voters from the Lehigh Valley are now packed into the 17th District. The distinctive community of the Lehigh Valley—home of the "Lehigh Valley Chamber of Commerce," the "Lehigh Valley International Airport," and the "Lehigh Valley Iron Pigs" minor league baseball team—has been carved up for the map's partisan purpose of diluting Democratic voters. Tr. 624:9-18, 626:8-11.



44. Legislative Respondents have offered no non-partisan explanation for the decision to divide the Lehigh Valley.

45. The packing of Democratic voters from Easton and Bethlehem into the 17th District results in a district shape that resembles a "Transformer." Tr. 628:3-17. The Democratic voters from Easton and Bethlehem are lumped together with other Democratic voters in Wilkes-Barre, Scranton, and East Stroudsburg, even though they are an entirely separate communities of interest. Tr. 628:11-17;

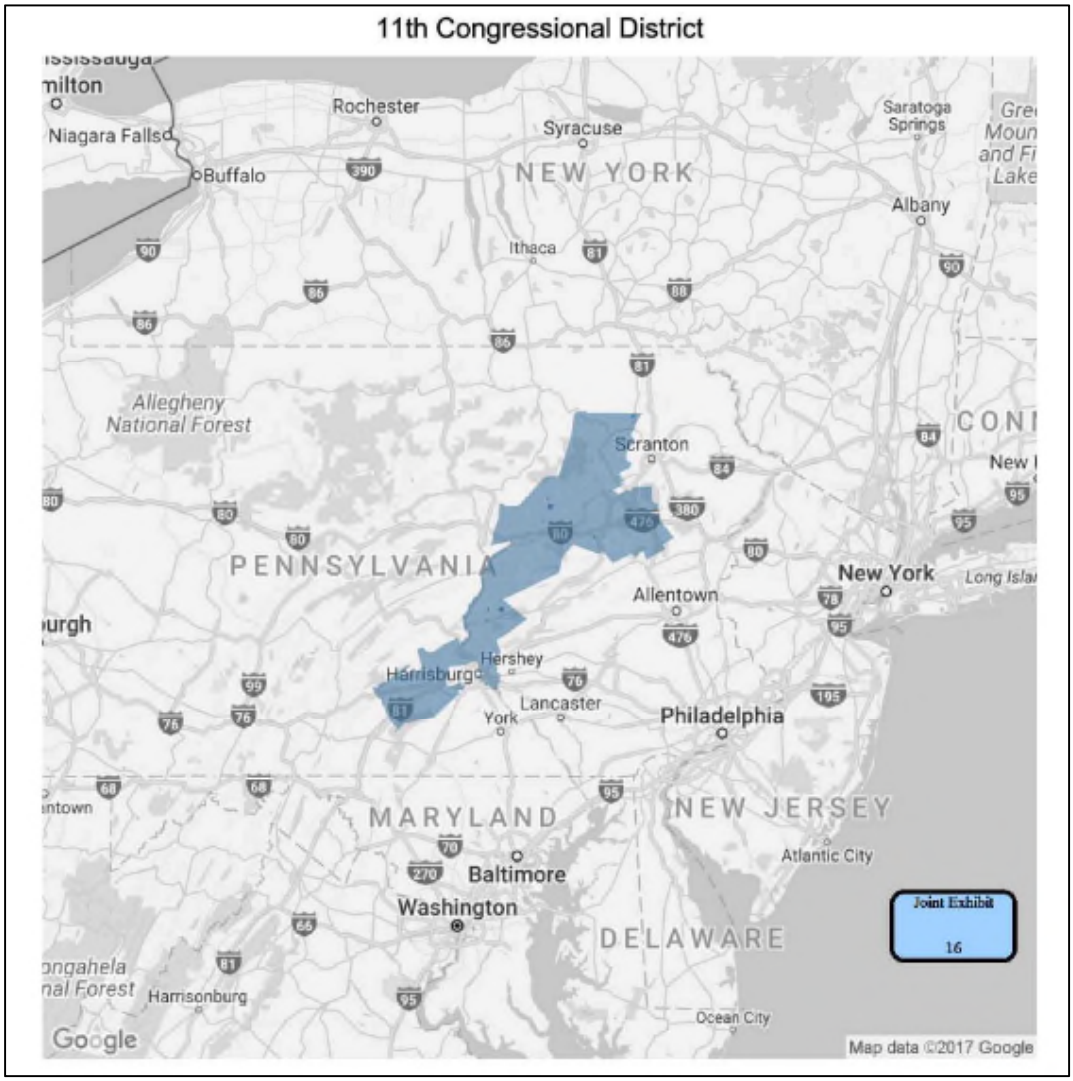
Petrs. Ex. 102. The combined effect is to pack and waste Democratic votes in one of Pennsylvania's few Democratic districts. Petrs. Ex. 53 at 54.



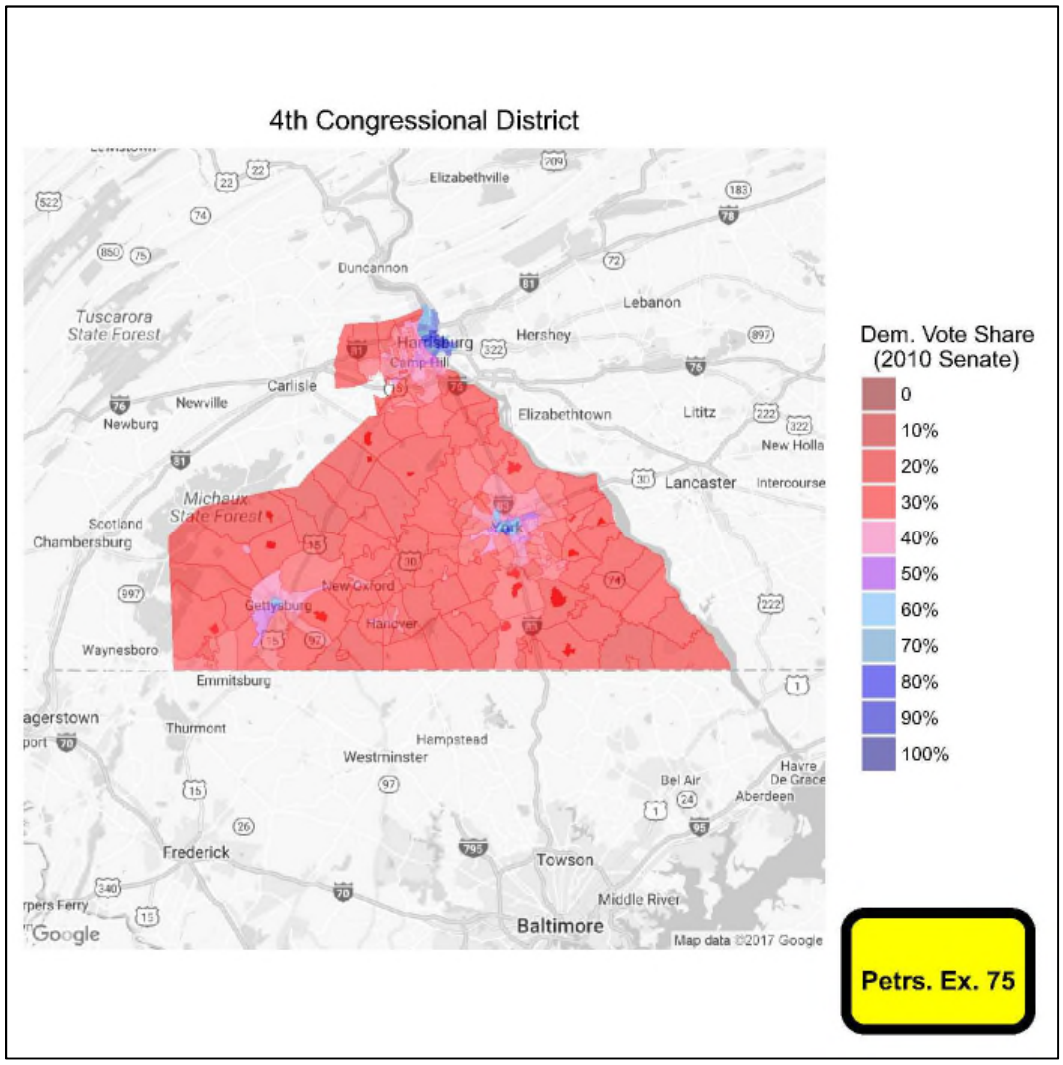
46. Legislative Respondents have offered no non-partisan explanation for grouping these far-flung Democratic communities into the 17th District.

47. The packing of the Scranton/Wilkes-Barre area into the 17th District splits off these two Democratic-leaning seats of Lackawanna and Luzerne Counties from the remainder of those Counties. Tr. 630:1-17. As a result, the southern

portion of Luzerne County is now in the 11th District, which constitutes a 200-mile long district that runs vertically from northeast Pennsylvania all the way to the south central portion of the Commonwealth, splitting Dauphin County and ending in Cumberland County. Tr. 630:1-17; Petrs. Ex. 53 at 40-41. A resident of the 11th District in Nicholson, Wyoming County, would need to travel 80 miles just to get to the nearest district office in Hazelton. Tr. 630:18-23; Petrs. Ex. 53 at 40-41.



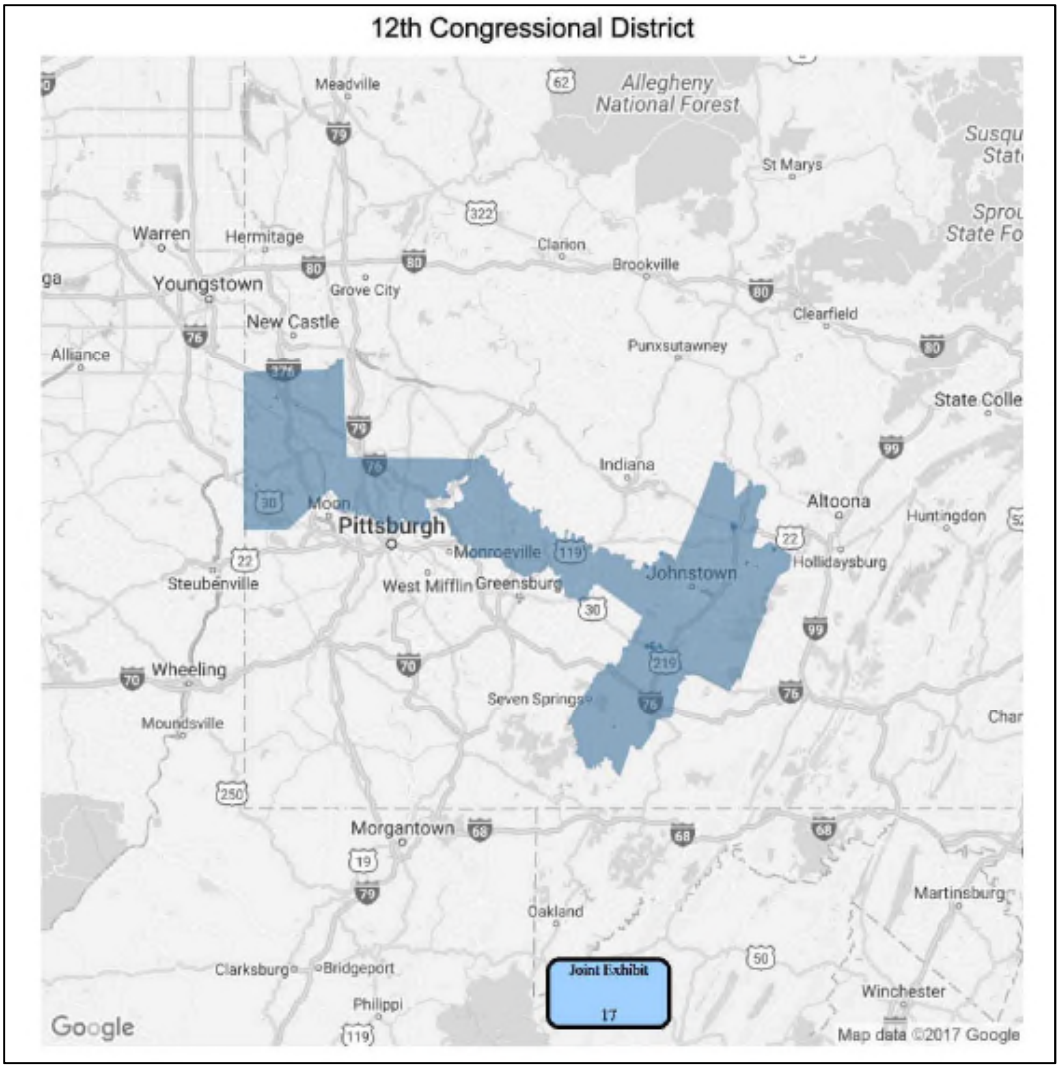
48. The 2011 map splits Harrisburg, a Democratic stronghold, between the 4th and 11th Districts. Petrs. Ex. 53 at 25. The southern tip of the 11th District grabs a piece of Harrisburg, while the remainder of Harrisburg is placed into the 4th District. Tr. 631:1-8. Harrisburg's Democratic voters thus are cracked into two different overwhelmingly Republican districts. Petrs. Ex. 53 at 25.



49. Legislative Respondents have offered no non-partisan explanation for the splitting of Harrisburg between the 4th and 11th Districts.

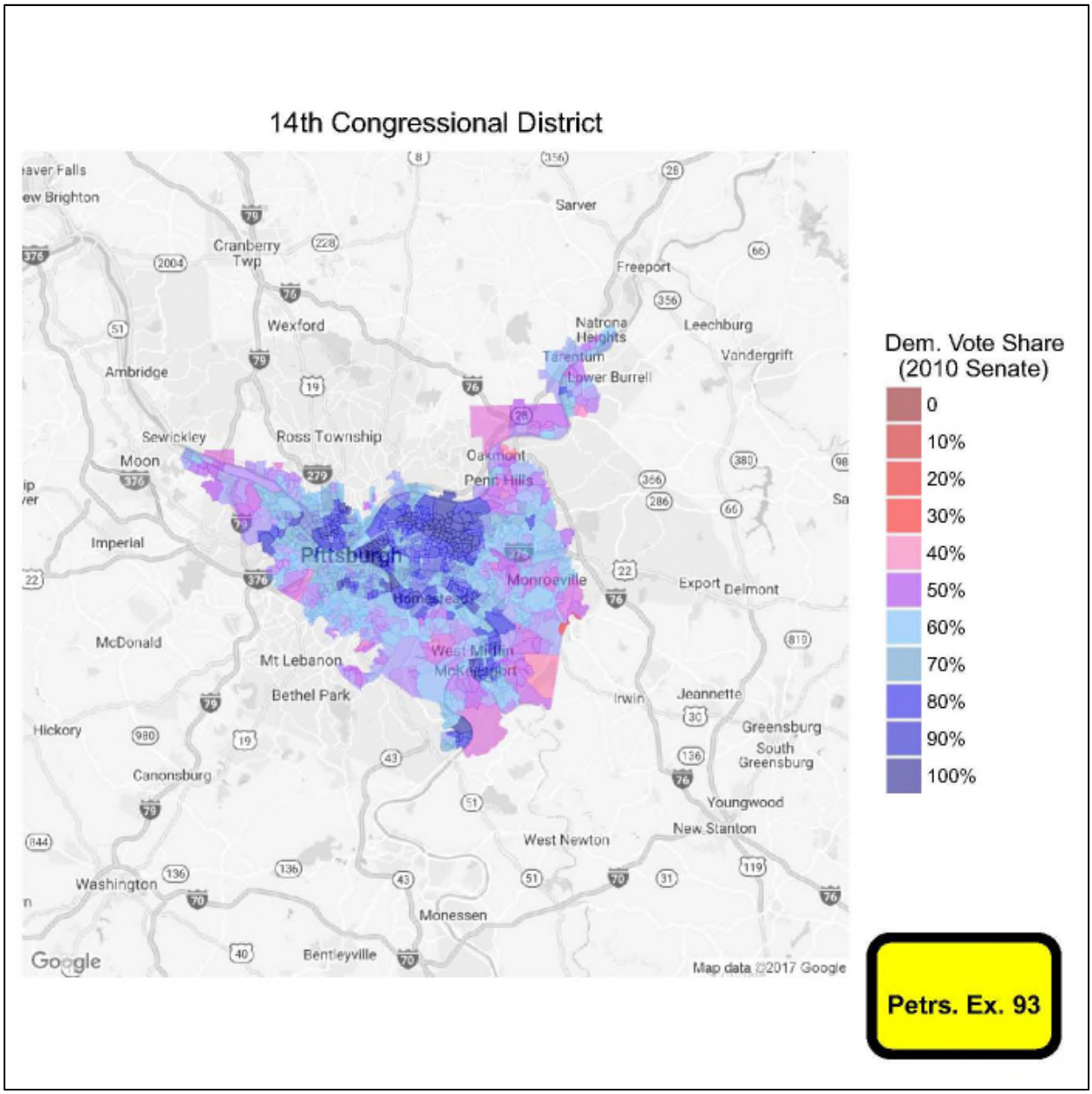
50. The 2011 map also engages in another form of partisan gerrymander known as "hijacking." Tr. 634:9-12. It merged the previous 4th and 12th districts to create the current 12th District, which stretches from the Ohio and West Virginia border across Lawrence, Beaver, Allegheny, and Westmoreland counties before jetting outward in Cambria and Somerset Counties on its eastern side. Tr. 633:15-25, 634:6-8. The 12th District bypasses four other districts along the way from the Ohio border to Johnstown. Its clear purpose was to pit two incumbent Democratic congressmen, Jason Altmire and Mark Critz, against each other. Tr. 634:8-25, 634:13-24. As a result, Critz defeated Altmire in the Democratic primary, before losing to the Republican candidate in the general election—a two-seat swing of Pennsylvania's congressional delegation in favor of Republicans. Tr. 634:13-635:5; Petr. Ex. 53 at 42.

51. Legislative Respondents have offered no non-partisan explanation for why Altmire and Critz were paired together rather than two incumbents who lived closer to one another.



52. Critz's loss was made more probable by the anomalous gap in the 12th District that runs northeast of Pittsburgh along the Allegheny River. Tr. 633:18-22, 636:5-14. That "tentacle" stretching to the north of the 14th District ensnares the Democratic river communities, cracking those voters out of the 12th District. Joint Ex. 17; Petrs. Ex. 93. This feature packs the Democratic voters in the tentacle into the Democratic-dominated 14th District that contains Pittsburgh,

eliminating any influence these voters would otherwise have on the redrawn 12th District and diluting their overall impact. Tr. 636:5-14.



53. Legislative Respondents have offered no non-partisan explanation for the decision to place the Democratic voters in these river communities in the 14th District rather than the 12th District.

54. As Dr. Kennedy testified, "This is a gerrymandered map." Tr. 644:15.

C. The 2011 Map Deliberately Discriminates Against Democratic Voters Based on Their Prior Votes and Projected Future Votes

1. Legislative Respondents Analyzed and Considered Partisan Voting Preferences in Drawing the 2011 Map

55. On November 9, 2017, the federal court in *Agre v. Wolf* ordered Speaker Turzai to produce the "facts and data considered in creating the 2011 Plan." Order, *Agre*, No. 2:17-cv-4392, ECF No. 76 ¶ 2 (E.D. Pa. Nov. 9, 2017). Petitioners' counsel in the instant case provided their expert, Dr. Jowei Chen, with 13 GIS shapefiles that Petitioners' counsel told Dr. Chen had been produced by Speaker Turzai in response to the federal court's order. Tr. 294:16-295:6; Petrs. Ex. 1 at 38 (Chen Report). Dr. Chen—an Associate Professor in the Department of Political Science at the University of Michigan, Ann Arbor, with extensive experience in redistricting matters—was able to readily determine what these files represented and the purposes for which they were used. Petrs. Ex. 1 at 38.

56. Dr. Chen explained that one of the files, titled "Turzai - 01674," contained election results for every precinct in Pennsylvania for every statewide election, legislative election, and congressional election between 2004 and 2010. Petrs. Ex. 1 at 38; Tr. 299:10-301:1. Dr. Chen determined that, within the file, these elections results were used to calculate ten different partisan indices that

measured the partisan performance of each precinct. Petrs. Ex. 1 at 38-39; Tr. 301:10-302:19.

57. Dr. Chen explained that one of the partisan indices, titled "INDEX08," appeared to be very strongly correlated with the precinct-level Republican vote margin across a range of recent elections at the time of the 2011 redistricting. Petrs. Ex. 1 at 38-39; Tr. 304:3-21. According to Dr. Chen, the index contained values ranging from -1376 to +2957 for each precinct, assigning positive, higher values to precincts with heavier support for Republican candidates. *Id.* Based on his experience and expertise in redistricting matters, Dr. Chen concluded that this was a partisan index that measured the support within each precinct for Republican or Democratic candidates in Pennsylvania elections preceding the 2011 redistricting. *Id.*

58. Dr. Chen testified that another of the indices, titled "INDEX04," contained values ranging from -930 to +1050, again with precincts voting more heavily in favor of Republican candidates having positive, higher values. Petrs. Ex. 1 at 39; Tr. 303:4-304:2. Dr. Chen found that INDEX04 exhibited a near-perfect correlation with the partisan results of the 2004 Presidential and US Senate elections in Pennsylvania, suggesting that INDEX04 was a partisan index crafted using the results of various 2004 statewide elections. *Id.*

59. Dr. Chen determined that seven of the eight remaining partisan indices assigned partisan scores to each precinct based on the results of individual elections. Petrs. Ex. 1 at 39-40. Namely, there were separate partisan indices based on the results in each precinct in the 2008 Presidential election, the 2010 U.S. Senate election, the 2010 U.S. House elections, the 2010 state house elections, the 2010 gubernatorial election, the 2008 Attorney General election, and the 2004 Presidential election. Again, each of these indices assigned a score for each precinct, with higher, positive values representing a precinct with better Republican performance and lower, negative value representing a precinct with better Democratic performance. Petrs. Ex. 1 at 39-40; Tr. 305:5-307:5. Dr. Chen explained that the final of the 10 indices assigned partisanship scores based on voter registration statistics. Petrs. Ex. 1 at 40; Tr. 307:12-19.

60. Dr. Chen testified that two of the other files, named "Turzai - 01653.DBF" and "Turzai - 01644.DBF," contained the same ten partisan indices, but calculated at the county- and municipality-level rather than the precinct-level. Petrs. Ex. 1 at 41; Tr. 308:22-309:5. Dr. Chen thus testified that the files assigned partisanship scores to each county and municipality in Pennsylvania. Tr. 308:22-309:5. Dr. Chen testified that a fourth file, titled "Turzai - 01641," contained elections results at the census-block level. Petrs. Ex. 1 at 41; Tr. 309:6-15.

61. Dr. Chen explained that the partisan indices contained in these files are not publicly available. Petrs. Ex. 1 at 41. He concluded that these indices represented a significant effort at measuring and comparing the partisan performance of Pennsylvania voters in elections preceding the 2011 plan. *Id.*

62. There was no genuine dispute at trial as to the files' authenticity. Indeed, the Court invited Legislative Respondents' counsel to cross-examine Dr. Chen regarding any authenticity questions, but they never did. Tr. 297:14-20.

63. Based on Dr. Chen's analysis of these files, the Court finds that the creators of the 2011 map assigned partisanship scores to every precinct, municipality, and county across Pennsylvania in order to draw congressional district boundaries that would maximize Republican advantage.

2. Dr. Chen's Expert Testimony Established That Partisan Intent Was the Predominant Factor in Drawing the Map

64. Independently of the Turzai files, Dr. Chen analyzed the question of whether partisan intent was the predominant factor in the drawing of the 2011 plan. Tr. 165:7-10; Petrs. Ex. 1 at 2. Dr. Chen concluded that partisan intent predominated over traditional districting criteria, and that the Republican advantage under the 2011 plan cannot be explained by Pennsylvania's geography, by a hypothetical non-partisan effort to protect incumbents, or by a hypothetical effort to create a district with a particular African-American voting age population.

Tr. 166:10-17; Petrs. Ex. 1 at 3-4, 21, 29, 35. The Court adopts Dr. Chen's conclusion that partisan intent predominated in the creation of the 2011 plan.

65. To reach his conclusions, Dr. Chen used a computer algorithm to create a large number of random, simulated congressional districting plans for Pennsylvania that adhere to traditional districting criteria. Tr. 166:81-8. Dr. Chen has employed a similar simulation approach in his academic work and in expert testimony in other cases. Tr. 158:2-164:1. The Court finds that Dr. Chen's simulated plans provide a reliable and statistically accurate baseline against which to compare the 2011 enacted plan. Petrs. Ex. 1 at 5. By comparing Dr. Chen's simulated plans to the enacted plan, the Court can reliably assess whether the characteristics and partisan outcomes under the enacted plan could plausibly have resulted from a non-partisan process or be explained by Pennsylvania's political geography. *Id.* at 5-6. Such "alternative plan[s]" are "powerful evidence." *Holt v. 2011 Legislative Reapportionment Comm'n*, 38 A.3d 711, 756-57 (Pa. 2012).

66. Dr. Chen created a total of 1,000 simulated plans, comprised of two different sets of 500 plans. In the first set, which Dr. Chen describes as "Simulation Set 1," Dr. Chen's algorithm generated 500 simulated plans that follow the traditional districting principles of equal population, contiguity, minimizing county splits, minimizing municipality splits, and compactness. Tr. 166:25-167:20. Dr. Chen explained that these are the traditional districting

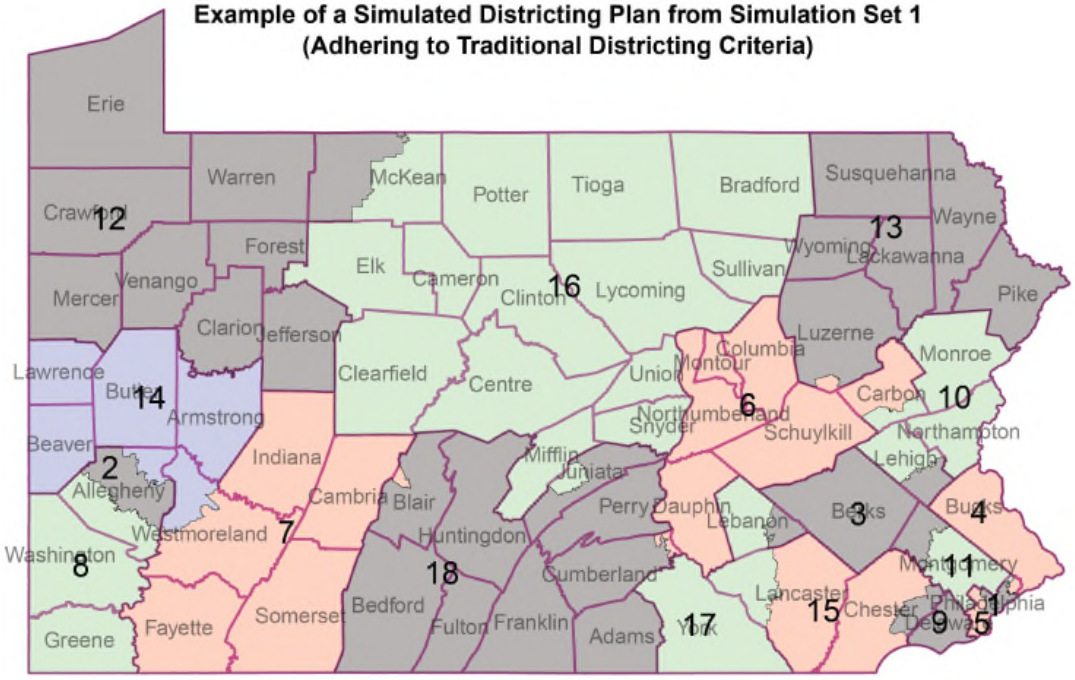
principles applied to congressional districting plans across the country, and that the Pennsylvania Constitution enshrines for state legislative districts. Tr. 167:23-168:23; Petrs. Ex. 1 at 7-8. These traditional principles "have deep roots in Pennsylvania constitutional law" and "represent important principles of representative government." *Holt*, 38 A.3d at 745.

67. Dr. Chen could have incorporated into his simulations any additional non-partisan criteria that the General Assembly used in creating the 2011 plan, but he could not do so because Legislative Respondents refused to provide any information about the criteria they used. Tr. 169:8-170:5.

68. Petitioners' Exhibit 3 provides an example of one of Dr. Chen's 500 simulated maps in Simulation Set 1:

Chen Figure 1:

Example of a Simulated Districting Plan from Simulation Set 1
(Adhering to Traditional Districting Criteria)



	Simulated Map:	Enacted Map:
Expected Republican Seats:	9	13
Counties Split:	14	28
Average Reock Compactness Score:	0.442	0.278
Average Popper-Polsby Compactness Score:	0.310	0.164

Petrs. Ex. 3

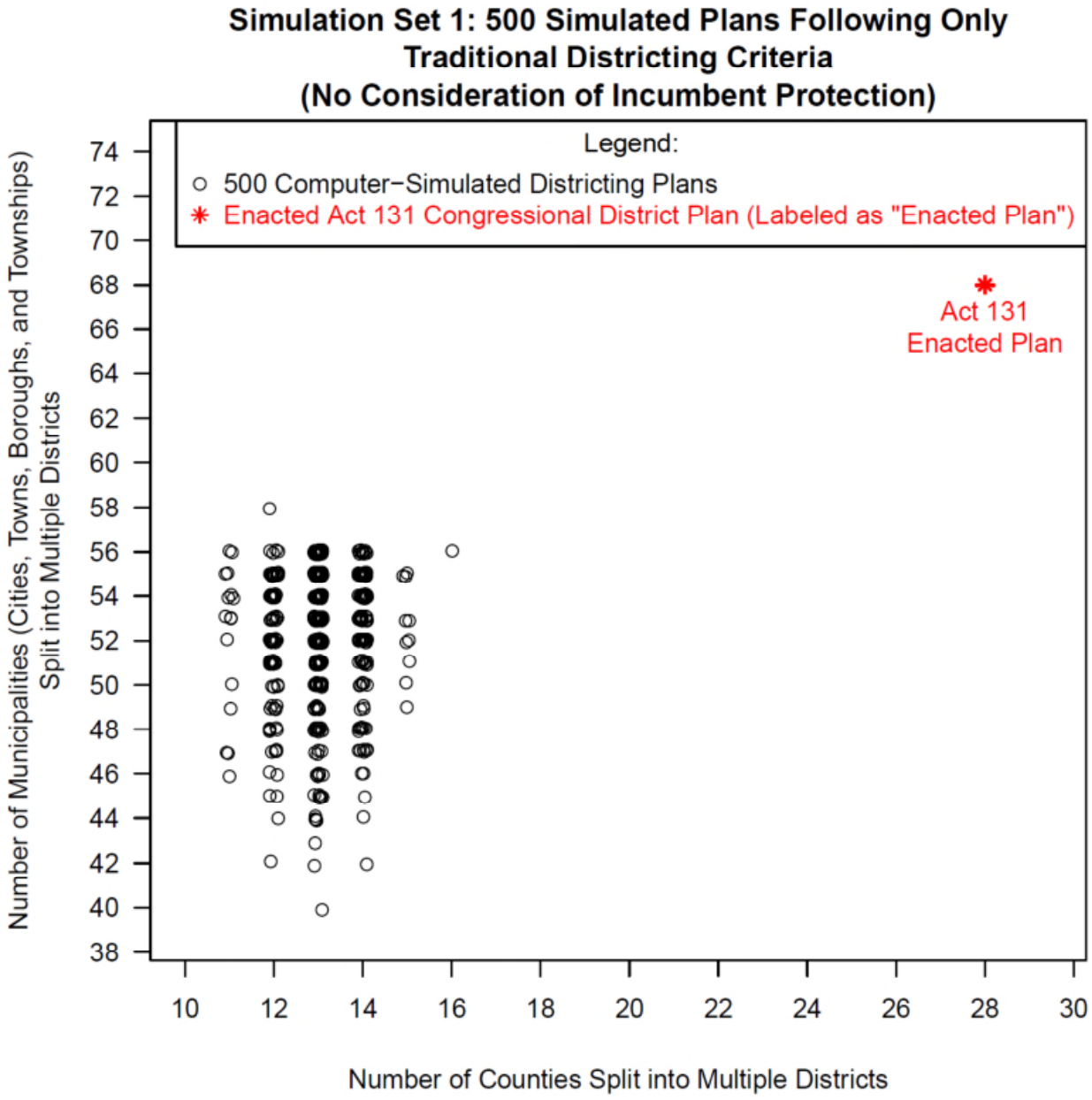
See also Tr. 172:3-177:18.

69. Dr. Chen compared the 500 simulated plans in Simulation Set 1 to the 2011 enacted plan along a number of measures. First, Dr. Chen compared the number of counties that the simulated and enacted plans split. The enacted plan splits 28 of Pennsylvania's 67 counties. Petrs. Ex. 4; Tr. 179:20-25. The 500 plans in Simulation Set 1 split a range of only 11 to 16 counties, with most splitting just 12 to 14 counties. From this, Dr. Chen concluded with over 99.9% statistical certainty that the enacted plan's splitting of 28 counties was not an outcome that

plausibly could have emerged from a districting process that prioritized traditional districting criteria rather than partisan intent. Petrs. Ex. 1 at 17.

70. The enacted plan also splits significantly more municipalities than do Dr. Chen's simulated plans. Tr. 180:18-23. While the enacted plan splits 68 municipalities, the simulated plans in Simulation Set 1 split a range of only 40 to 58 municipalities. Petrs. Ex. 4; Tr. 180:3-23.

71. Petitioners' Exhibit 4 depicts the number of counties and municipalities split under the enacted plan and the 500 simulated plans in Simulation Set 1:



Petrs. Ex. 4; *see* Tr. 179:9-19.

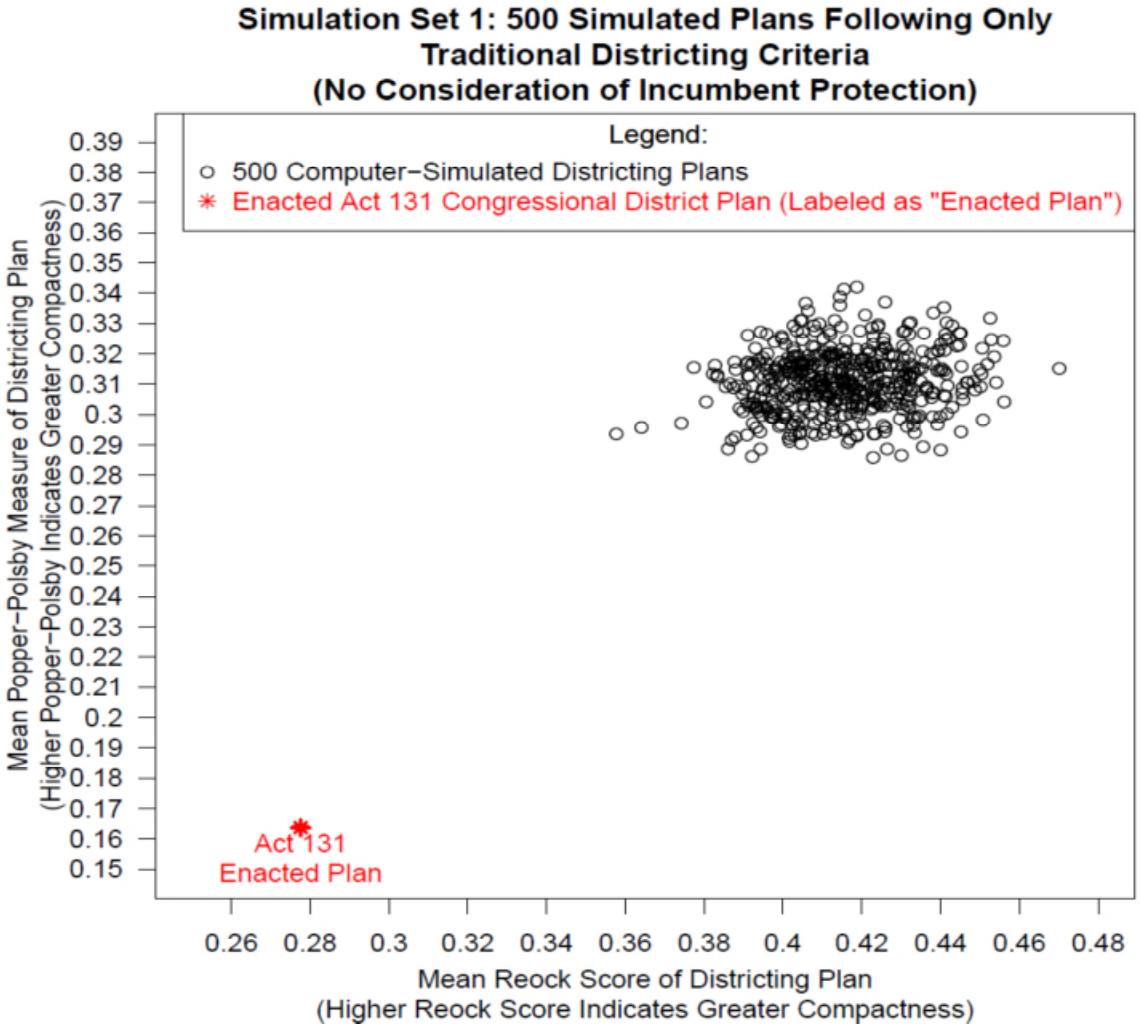
72. The Court finds that the enacted plan failed to follow the traditional districting criterion of avoiding the unnecessary splitting of counties. *Id.*

73. The Court finds that the enacted plan splits more municipalities than necessary. Petrs. Ex. 1 at 18; *see Holt*, 38 A.3d at 756-57 (alternative plans that

split fewer political subdivisions render it "inconceivable . . . that the magnitude of the subdivision splits [in the enacted plan] was unavoidable").

74. Dr. Chen also compared the compactness of the simulated plans to the 2011 enacted plan. Dr. Chen employed two widely used measures of compactness known as Reock and Popper-Polsby scores. Tr. 174:7-175:4, 176:1-8. For both, a higher score indicates that a plan's districts are more compact. *Id.* Dr. Chen found that the districts in all 500 simulated plans in Simulation Set 1 are more compact than the 2011 plan. Petrs. Ex. 1 at 19. As measured by both the Reock score and the Popper-Polsby score, the compactness of the 2011 plan is far outside the range of scores produced by the 500 simulated plans. Petrs. Ex. 5; Tr. 182:2-184:9.

75. Petitioners' Exhibit 5 depicts the compactness of the enacted plan and the 500 simulated plans in Simulation Set 1:



Petrs. Ex. 5.

76. The Court finds that the 2011 plan did not attempt to draw districts that were compact while adhering to other traditional districting criteria. Petrs. Ex. 1 at 19; Tr. 184:4-9.

77. To measure the partisanship of each hypothetical district in his simulated plans, Dr. Chen used precinct-level voting data from recent elections in Pennsylvania. Tr. 184:22-189:15. Dr. Chen overlaid this precinct-level voting data onto the boundaries of the hypothetical districts in his simulated plans to

determine whether those districts lean Democratic or Republican. Petrs. Ex. 1 at 6, 12. In other words, Dr. Chen looked at the set of precincts that would comprise a particular district in a simulation, and calculated whether that simulated district would be won by a Republican or Democrat based on prior elections results in that set of precincts. *Id.*

78. In his primary analysis, Dr. Chen measured the partisanship of each precinct using results from the six statewide elections in Pennsylvania in 2008 and 2010. Tr. 186:19-21; Petrs. Ex. 1. Those elections were the Presidential, Attorney General, Auditor General, and State Treasurer elections in 2008 and the U.S. Senate and gubernatorial elections in 2010. Tr. 187:1-9. Dr. Chen used the precinct-level votes from these elections to measure the partisanship of each precinct because they were the most recent statewide elections available to the General Assembly at the time of the 2011 redistricting and because all six elections were reasonably closely contested. Petrs. Ex. 1 at 13-14.

79. Dr. Chen estimated the partisan outcome in a simulated district as follows: He determined the set of precincts that would comprise that simulated district, and then he aggregated the total votes for Republican candidates in those precincts in the six statewide elections in 2008 and 2010, and the total votes for Democratic candidates in those same precincts in the same elections. Tr. 194:23-197:4-198:22; Petrs. Ex. 1 at 14. If there were more aggregate Republican votes

than Democratic voters, Dr. Chen classified the simulated district as Republican, and vice versa. *Id.*

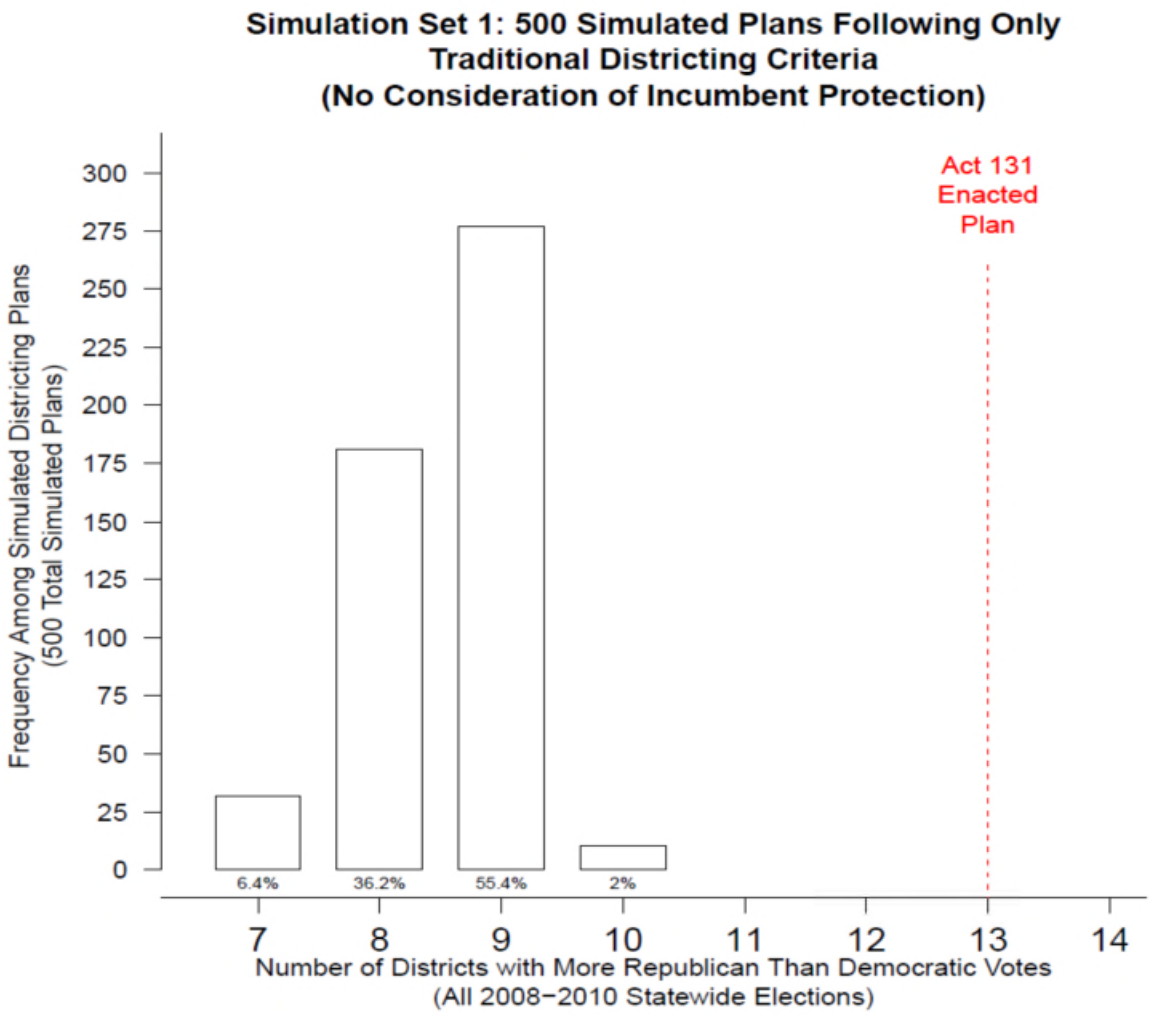
80. The Court finds that Dr. Chen's use of 2008 and 2010 statewide elections to measure the partisanship of the simulated plans is a reliable methodology. Most notably, this methodology perfectly predicts the partisan outcome of the actual congressional elections that have occurred under the 2011 enacted plan. When overlaying the precinct-level votes from these six statewide elections onto the district boundaries of the 2011 enacted plan, there are more Republican votes in 13 of 18 districts—the same 13 districts that Republicans have won in each of the three congressional elections under the 2011 plan. Tr. 201:4-202:5. That indicates that the 2008 and 2010 statewide elections are an accurate predictor of congressional elections in Pennsylvania, and that using these statewide elections allows for a direct, apples-to-apples comparison of the partisanship of the 2011 plan and of the simulated plans. Tr. 202:6-203:6.

81. Indeed, partisan legislators drawing congressional districts commonly use recent statewide elections to predict expected partisanship. Tr. 190:9-191:9; Petrs. Ex. 1 at 12-13. As is commonly accepted among political scientists, competitive statewide elections are the most reliable method of predicting and comparing the partisanship of different legislative districts within a state. Tr.

190:3-6; Petrs. Ex. 1 at 12. The Court finds that Dr. Chen's predictions of partisan outcomes—under both the enacted plan and the simulated plans—are reliable.

82. With this measure of partisanship, Dr. Chen analyzed the partisan outcomes under his 500 simulated plans in Simulation Set 1. A majority of the simulated plans (277 of 500) produce nine Republican districts—*i.e.*, a 9-9 split between the parties among the 18 total districts. Petrs. Ex. 1 at 15-16; *see* Tr. 199:2-200:24. Most of the remaining plans produce eight Republican districts—a 10-8 Democratic advantage. *Id.* None of the 500 simulations produce the 13 Republican districts that exist under the 2011 plan; in fact, none of the simulated plans lead to even 11 or 12 Republican districts. *Id.*

83. Petitioners' Exhibit 6 depicts the distribution of seats that Republican are expected to win under the enacted plan and under the simulated plans in Simulation Set 1:



Petrs. Ex. 6.

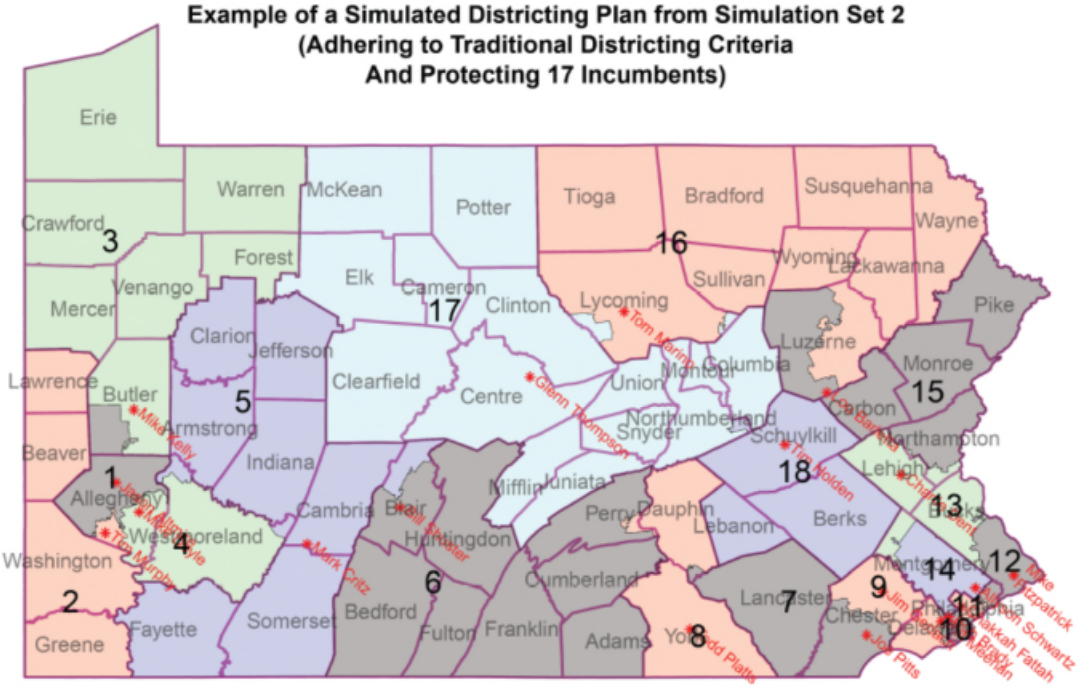
84. Dr. Chen concluded with over 99.9% statistical certainty that the 2011 plan's creation of a 13-5 Republican advantage would never have emerged from a districting process adhering to traditional districting principles. Tr. 203:14-204:2. Based on the collective results of Simulation Set 1, Dr. Chen concluded that extreme partisan intent predominated over traditional districting principles in the creation of the 2011 plan. Tr. 204:8-15. The Court agrees with that conclusion.

85. In his second set of simulations, which Dr. Chen describes as Simulation Set 2, Dr. Chen added to his simulations the additional criterion of avoiding the pairing of incumbents. Tr. 205:20-207:8; Petrs. Ex. 1 at 23-24. Dr. Chen does not consider incumbency protection to be a traditional districting principle, but he ran these simulations to evaluate whether a hypothetical goal of protecting incumbents in a non-partisan manner could explain the partisan bias of the 2011 plan. *Id.* Dr. Chen programmed his algorithm to avoid pairing 17 of 19 incumbents in place at the time of the 2011 redistricting. Tr. 207:9-309:14. (The 2011 plan had to pair at least two incumbents because Pennsylvania lost a seat after the 2010 Census. *Id.*) Simulation Set 2 use the same traditional districting criteria as Simulation Set 1, plus this incumbency protection measure. *Id.*

86. Petitioners' Exhibit 7 depicts one of the 500 simulated plans in Simulated Set 2. The red stars in the map represent the home addresses of the 19 incumbents in office at the time of the 2011 redistricting:

Chen Figure 1A:

Example of a Simulated Districting Plan from Simulation Set 2 (Adhering to Traditional Districting Criteria And Protecting 17 Incumbents)

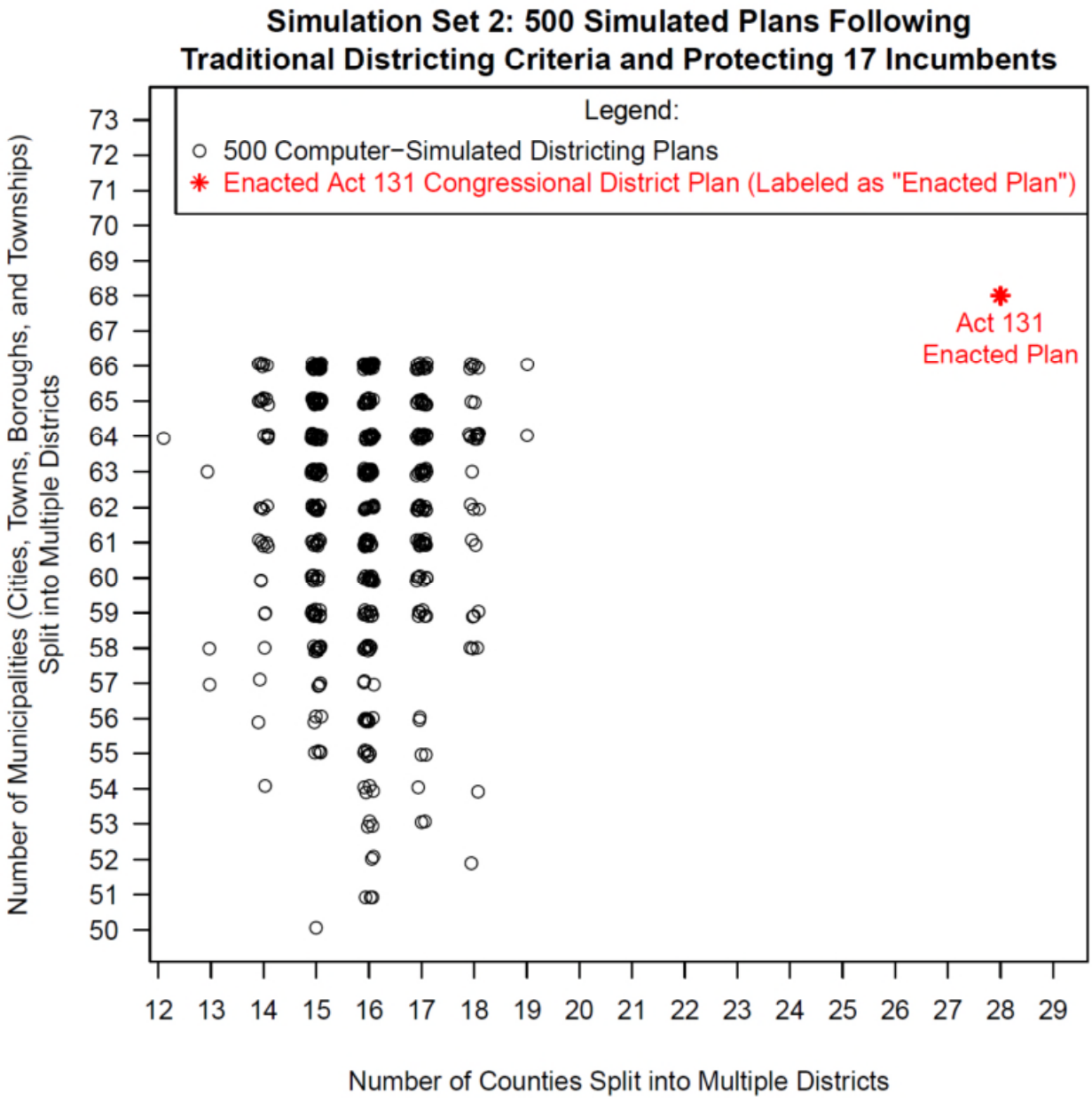


	Simulated Map:	Enacted Map:
Expected Republican Seats:	9	13
Counties Split:	15	28
Average Reock Compactness Score:	0.396	0.278
Average Popper-Polsby Compactness Score:	0.273	0.164
Incumbents Paired:	Jim Gerlach & Pat Meehan	Jason Altmire & Mark Critz

Petrs. Ex. 7

87. As with Simulation Set 1, the differences between the 2011 plan and the 500 simulated plans in Simulation Set 2 are stark. The simulated plans split from 12 to 19 counties, compared to the 28 counties split in the 2011 plan. Tr. 215:7-216:18; Petrs. Ex. 1 at 24-25. All 500 simulated plans split fewer municipalities than the enacted plan. Tr. 216:19-217:7; Petrs. Ex. 1 at 24-25.

88. Petitioners' Exhibit 8 depicts the number of counties and municipalities split under the enacted plan and the 500 simulated plans in Simulation Set 2:

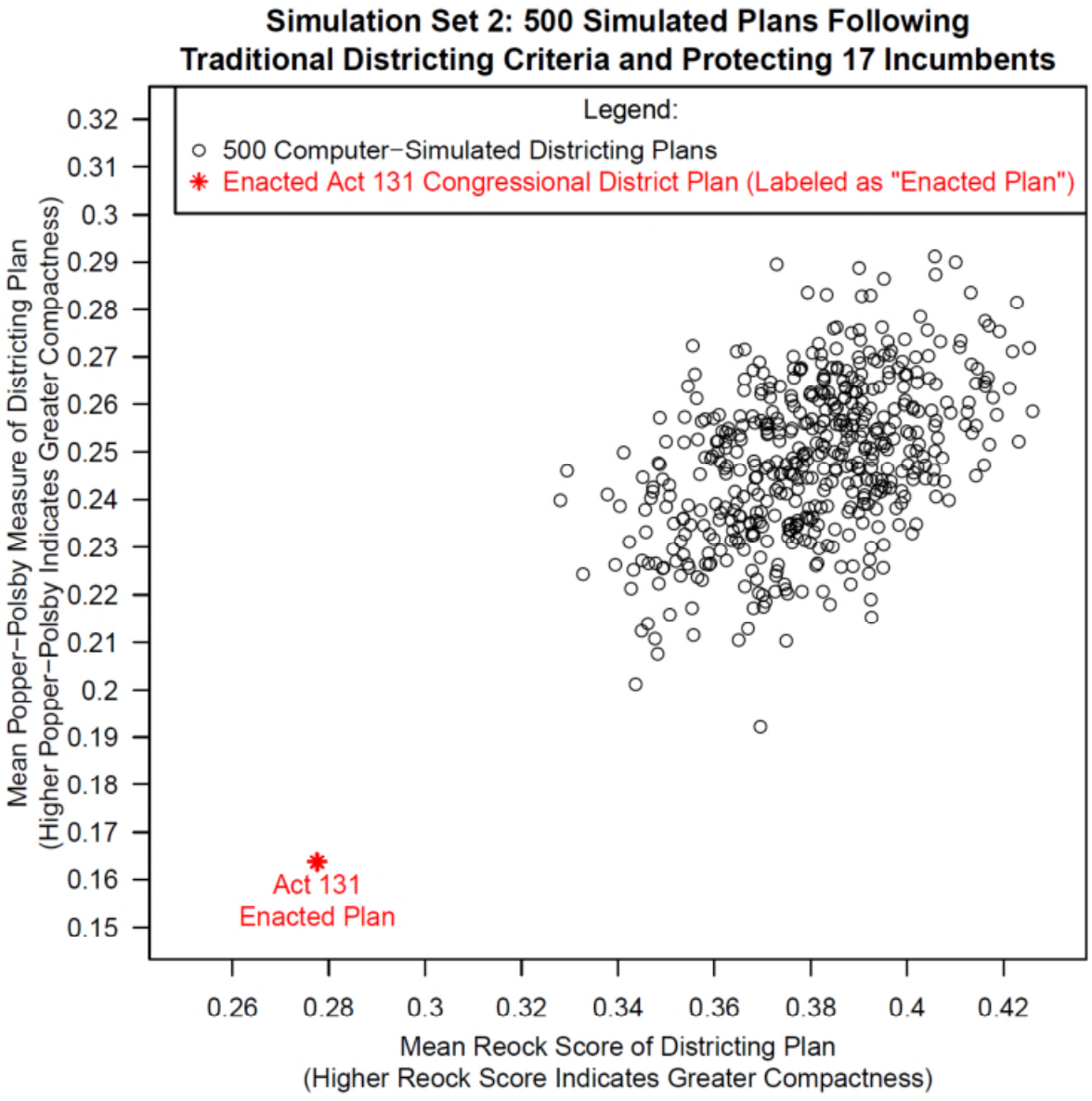


Petrs. Ex. 8.

89. The Court finds that a hypothetical non-partisan goal of protecting incumbents cannot justify or explain the number of counties and municipalities that the enacted plan splits. Tr. 217:10-21; *see Holt*, 38 A.3d at 756-57.

90. Likewise, Dr. Chen's Simulation Set 2 establishes that a hypothetical goal of not pairing incumbents cannot explain the lack of compactness of the 2011 plan. All 500 plans in Simulation Set 2 have much more compact districts than the 2011 plan. Tr. 218:9-220:5; Petrs. Ex. 1 at 24, 26.

91. Petitioners' Exhibit 9 depicts the compactness of the enacted plan and the 500 simulated plans in Simulation Set 2:

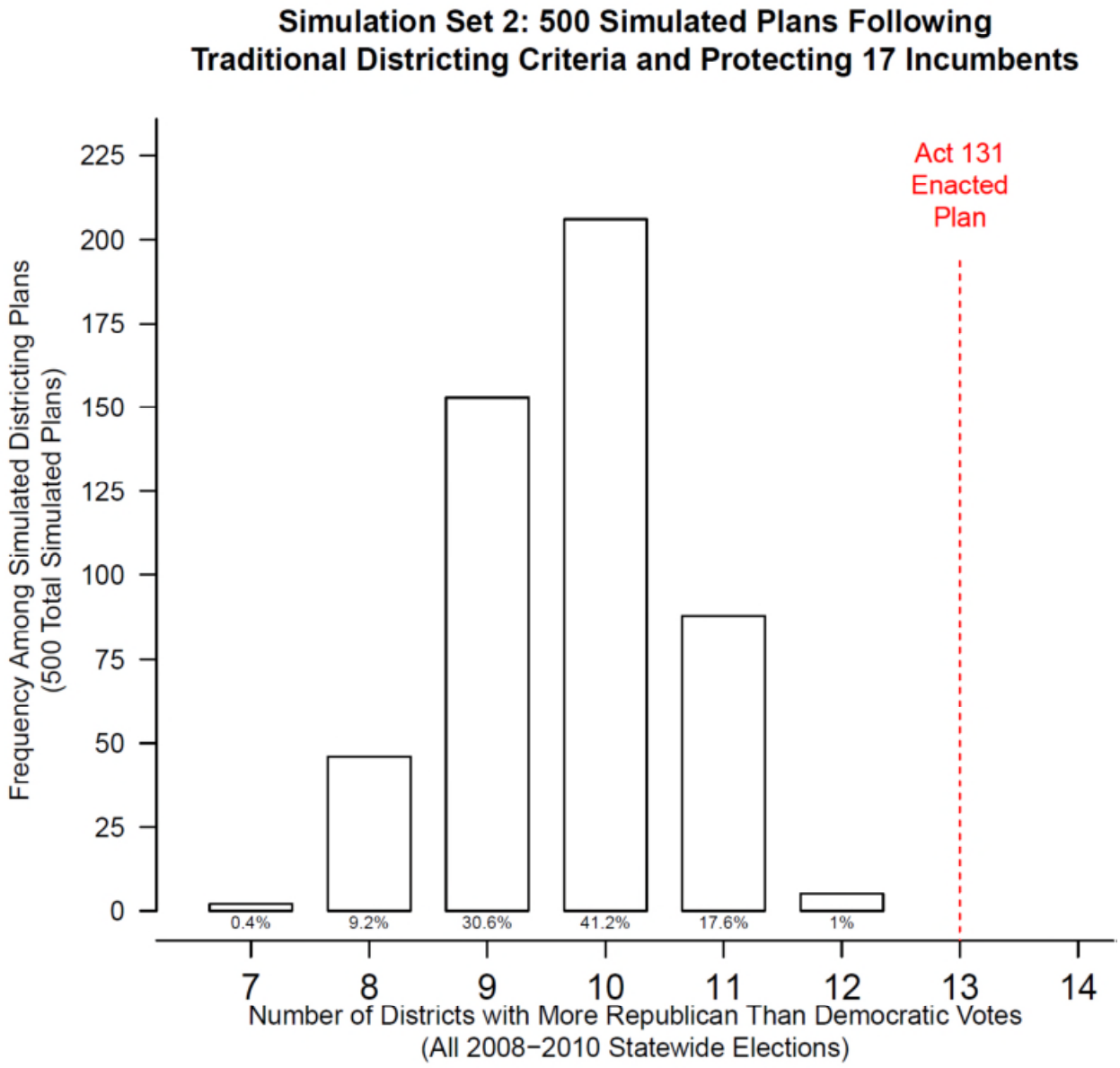


Petrs. Ex. 9.

92. Dr. Chen analyzed the partisan breakdown of the simulated plans in Simulation Set 2 using the same process he did for Simulation Set 1—by overlaying the precinct-level results of the six statewide elections in 2008 and 2010 onto the boundaries of the simulated districts. Tr. 221:14-20. The number of expected Republican districts increased slightly from Simulation Set 1 to Simulation Set 2. Tr. 233:22-234:21. That occurred because any effort to protect incumbents inherently favors the party previously holding more seats, and 12 of 19 incumbents were Republican at the time of the 2011 redistricting. *Id.* Dr. Chen explained that this inherent bias would be particularly pronounced if the prior plan were gerrymandered to favor Republicans. Tr. 234:22-235:20. The Pennsylvania Supreme Court has concluded that the prior plan was deliberately drawn to favor Republicans. *Erfer v. Commonwealth*, 794 A.2d 325, 332 (Pa. 2002).

93. Dr. Chen found that even with this baked-in bias, a hypothetical non-partisan effort to avoid pairing incumbents still could not explain the Republican advantage under the 2011 plan. Tr. 235:21-237:1. The most common outcome in Simulation Set 2 was the creation of plans with 10 Republican districts, with a 9-9 split being the second most common outcome. Tr. 221:21-222:15; Petrs. Ex. 1 at 27-28. Again, not a single one of the 500 simulated plans produced the 13-5 Republican advantage that exists under the 2011plan. *Id.*

94. Petitioners' Exhibit 10 depicts the distribution of seats that Republican are expected to win under the enacted plan and under the simulated plans in Simulation Set 2:



Petrs. Ex. 10.

95. This allowed Dr. Chen to conclude with overwhelmingly high statistical certainly that a non-partisan effort to protect incumbents cannot explain the partisan bias of the 2011 plan. Tr. 222:19-223:2; Petrs. Ex. 1 at 27. The Court finds this conclusion to be reliable and finds that Simulation Set 2 confirms that partisan intent was the predominant factor behind the 2011 plan. Tr. 223:3-6.

96. Petitioners' Exhibit 12 summarizes Dr. Chen's comparisons:

Chen Table 1: Summary of Two Sets of Simulated Districting Plans and Enacted Act 131 Plan

	Act 131 Plan (Senate Bill 1249):	Simulation Set 1:	Simulation Set 2:
Description:	General Assembly's Enacted Plan	Simulated maps only follow traditional districting criteria	Simulated maps protect 17 incumbents and otherwise follow traditional districting criteria
Total Number of Simulated Plans:		500 simulated maps	500 simulated maps
Number of Split Counties:	28	11 to 16	12 to 19
Number of Split Municipalities:	68	40 to 58	50 to 66
Incumbents Protected:	17	3 to 13	17
Average Reock Score (Compactness):	0.278	0.358 to 0.470	0.328 to 0.426
Average Popper-Polsby Score (Compactness):	0.164	0.286 to 0.342	0.192 to 0.291
Republican Districts (using 2008-2010 statewide elections):	13	7 (32 simulations) 8 (181 simulations) 9 (277 simulations) 10 (10 simulations)	7 (2 simulation) 8 (46 simulations) 9 (153 simulations) 10 (206 simulations) 11 (88 simulations) 12 (5 simulations)

Petrs. Ex. 12

97. Dr. Chen also found that the specific pairing of incumbents that occurred under the 2011 plan is one that could not have occurred under a non-

partisan process that adhered to traditional districting criteria. Tr. 225:19-226:5. Under the 2011 plan, the two incumbents paired together were Jason Altmire and Mark Critz, both Democrats. Tr. 224:19-21. Yet Altmire and Critz are never paired together in any of the 500 plans in Simulation Set 2. Tr. 225:25-226:5; Petrs. Ex. 1 at 30-31. Dr. Chen found ten different pairings of incumbents that could have occurred if there had been a non-partisan effort to pair only 2 of 19 incumbents, and Altmire and Critz are not among the possible pairings. Petrs. Ex. 11. Dr. Chen explained that Altmire and Critz are never paired in his simulated plans because they did not live remotely close to one another; they did not live in the same county or even in adjacent counties. Tr. 226:25-227:14.

98. Petitioners' Exhibit 11 summarizes the incumbent pairings that occurred, and the frequency of those pairings, in Simulation Set 2:

Chen Table 3: Paired Incumbents under Simulation Set 2
(Simulations Protecting 17 of 19 Incumbents
While Following Traditional Districting Criteria)

Incumbent Pair:	Percent of simulated plans in which incumbent pair is placed into the same district:
Jim Gerlach & Pat Meehan	**40.2%**
Bob Brady & Pat Meehan	**34.4%**
Bob Brady & Chakkah Fattah	**18.2%**
Jim Gerlach & Joe Pitts	**0.6%**
Pat Meehan & Joe Pitts	**4.8%**
Bill Shuster & Mark Critz	**0.6%**
Glenn Thompson & Tom Marino	**0.4%**
Tim Murphy & Mike Doyle	**0.4%**
Bill Shuster & Glenn Thompson	**0.2%**
Bob Brady & Allyson Schwartz	**0.2%**

Petrs. Ex. 11

99. The Court finds that any effort to protect incumbents under the 2011 plan was done in a partisan manner to advantage Republican incumbents and disadvantage likely Democratic voters. Tr. 227:15-22.

100. Dr. Chen also established that the partisan bias of the 2011 plan cannot be explained by Pennsylvania's political geography, meaning the geographic locations of Republican and Democratic voters. Tr. 251:21-25. Political geography can create a natural advantage for Republicans in winning congressional seats where, for example, Democratic voters are clustered in urban

areas. Tr. 252:6-253:3. But Dr. Chen designed his simulations with the express purpose of accounting for Pennsylvania's political geography. Tr. 253:7-19. The simulations build districts using the same Census geographies and population data that existed in 2011; thus, the simulated plans capture any natural advantage that one party may have had based on population patterns when General Assembly passed the 2011 plan. Petrs. Ex. 1 at 5-6. That none of the 1,000 simulated plans produces a 13-5 Republican advantage demonstrates that voter geography cannot explain the 2011 plan's extreme Republican bias. Tr. 255:16-256:24.

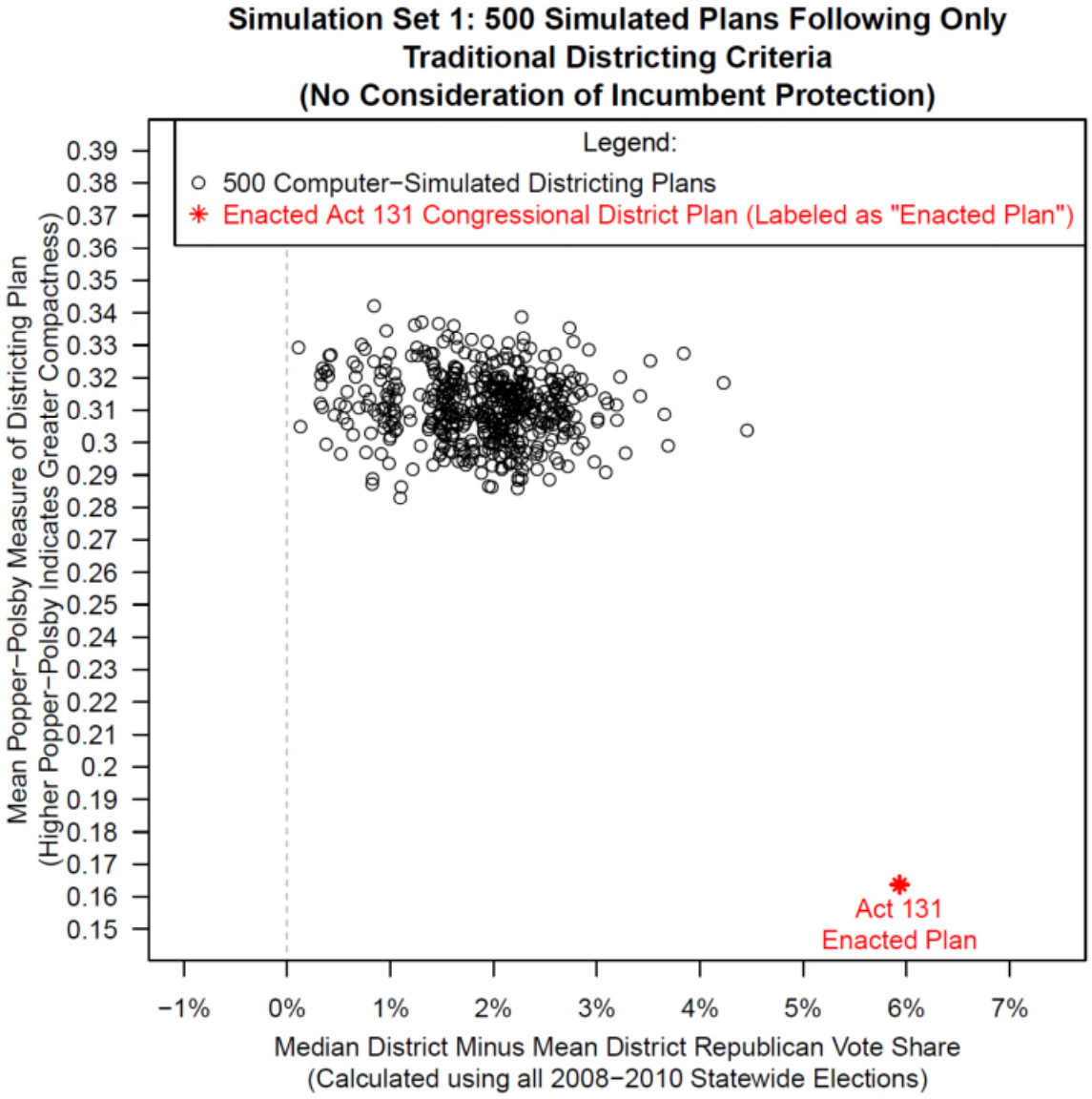
101. Dr. Chen's analysis of the "mean-median gap" further demonstrated that Pennsylvania's political geography cannot explain the 2011 plan's partisan bias. Tr. 256:25-264:16. For purposes of this measure, the Republican "mean" vote share is the average Republican vote share in each of the 18 congressional districts. Tr. 257:10-21. The Republican "median" vote share is the Republican vote share in the district where Republicans performed the middle-best out of the 18 districts; hence, it is the Republican vote share in the district that either party needs to win to earn a majority of seats. Tr. 257:22-258:10-19. The mean-median gap is simply the difference between the mean and median. Tr. 258:20-259:6.

102. If the Republican mean vote share is lower than the Republican median vote share, that is favorable for Republicans because it indicates that Republicans can win the median district even when their mean vote share across

the state is less than 50%. Tr. 259:7-21. On the flip side, if the Democratic mean vote share is higher than the Democratic median vote share, that means it is harder for Democrats to win a majority of seats. Tr. 259:22-260:13. This can result from the clustering of Democratic voters in urban centers, since lopsided Democratic victories will be reflected in the Democratic mean vote share (making it higher), but not in the Democratic vote share in the median district. Tr. 261:9-17.

103. Dr. Chen found that under the 2011 plan, the mean-median gap is equal to 5.9% in Republicans' favor. Tr. 260:18-261:8. Dr. Chen concluded that this mean-median gap cannot be explained by Pennsylvania's political geography. Tr. 261:18-266:15; Petrs. Ex. 1 at 20-21. The 500 simulated plans in Simulation Set 1 produce mean-median gaps generally ranging from 1%-3%. Tr. 262:5-263:25. That range reflects a small natural Republican advantage due to political geography, but not an advantage nearly as large as that under the 2011 plan. *Id.* None of the 500 simulated plans produced a mean-median gap as large as that under the 2011 plan. *Id.*

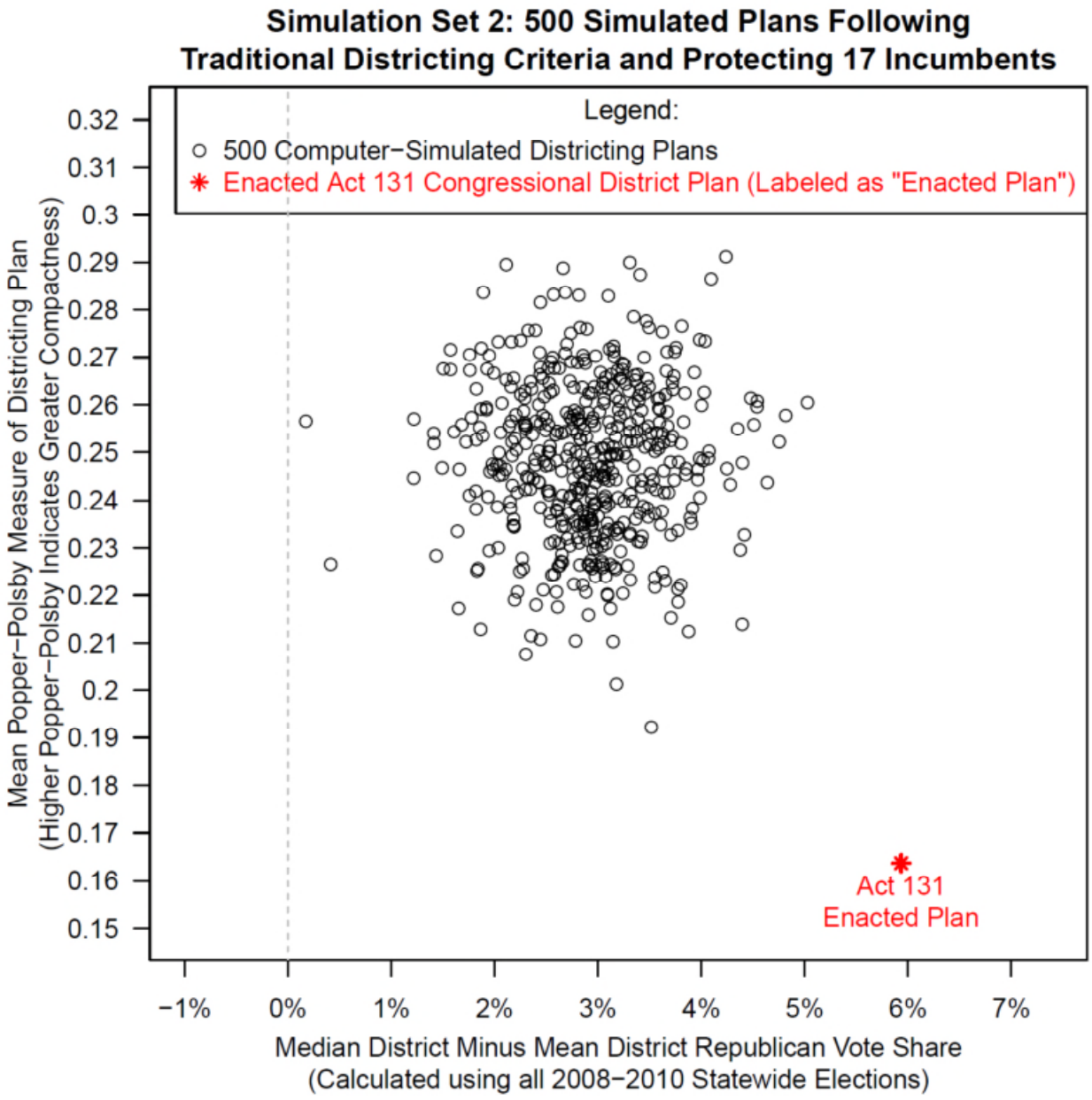
104. Petitioners' Exhibit 16 depicts the mean-median gap of the 2011 plan and the 500 simulated plans in Simulation Set 1:



Petrs. Ex. 16.

105. Dr. Chen found similar results under Simulation Set 2. Even when protecting 17 of 19 incumbents, none of the 500 simulated plans produced a mean-median gap as large as the 5.9% gap under the 2011 Plan. Tr. 265:9-266:15.

106. Petitioners' Exhibit 17 depicts the mean-median gap of the 2011 plan and the 500 simulated plans in Simulation Set 2:



Petrs. Ex. 17.

107. The Court finds that Dr. Chen's mean-median gap analysis confirms that political geography does not explain the Republican bias of the 2011 plan.

108. Dr. Chen conducted a robustness analysis to support his conclusions regarding the partisan intent and effects of the 2011 plan. Tr. 282:6-24; Petrs. Ex.

1 at 44-45. As a robustness check, Dr. Chen measured the partisanship of the enacted plan and of the simulated plans using a different set of statewide elections than the 2008 and 2010 elections he previously used; he now used all 11 statewide elections in Pennsylvania from 2012 to 2016. Tr. 283:2-20.

109. As with the 2008-2010 statewide elections, Dr. Chen found that Republican candidates in these 2012-2016 statewide elections received more votes than Democratic candidates in 13 of 18 districts under the 2011 plan. Tr. 284:20-285:5. Again, those 13 districts are the same districts that Republican congressional candidates have won in every election under the 2011 plan. Tr. 285:6-16. This indicates that the 2012-2016 statewide elections are also an accurate predictor of congressional elections under the 2011 plan, and that the precinct-level results from these elections allow for direct comparisons between the enacted plan and simulated plans. Tr. 285:16-286:2. What's more, when combined with the prior analysis using the 2008-2010 elections, this result shows that across all statewide elections in Pennsylvania over the last 10 years, Republican candidates have received more votes than Democratic candidates in 13 of 18 districts under the 2011 plan. Tr. 286:3-18. In other words, the 2011 plan is simply a 13-5 Republican plan in the underlying partisanship of its districts. *Id.*

110. Dr. Chen thus applied the precinct-level results from the 2012-2016 statewide elections to the same 1,000 simulated plans analyzed previously. In

Simulation Set 1, the vast majority of the simulated plans produce 9 Republican districts using the 2012-2016 data, and almost all of the remaining simulated plans result in 8 or 10 Republican districts. Tr. 287:11-288:5; Petrs. Ex. 19. In Simulation Set 2, Republicans win 9 or 10 districts in over 75% of the simulated plans. Petrs. Ex. 20; Tr. 289:15-290:10. As with the 2008-2010 data, Republicans do not win 13 districts in any of the 1,000 simulated plans using the 2012-2016 elections data. Tr. 292:3-19; Petrs. Exs. 19, 20.

111. The Court finds that this robustness analysis bolsters Dr. Chen's conclusions regarding the partisan intent of the 2011 plan. Using two different sets of statewide elections—which combined reflect all statewide elections in Pennsylvania over the last ten years—the partisan bias of the 2011 plan cannot be explained by the traditional districting criteria, by Pennsylvania's political geography, or by a hypothetical non-partisan effort to protect 17 of 19 incumbents. Petrs. Ex. 1 at 49. Dr. Chen's analysis leads to the inescapable conclusion that partisan intent predominated in the creation of the 2011 enacted plan.

112. Legislative Respondents' expert, Dr. Wendy Tam Cho, offered no opinion as to whether Pennsylvania's map was gerrymandered, instead seeking only to rebut Dr. Chen's analysis. The Court finds that Dr. Cho was not a reliable witness.

113. In her expert report, in a section entitled "What is the Simulation Algorithm?," Dr. Cho stated that Dr. Chen "does not describe his algorithm in any detail in his report," that "the algorithmic details determine the output produced," and that "omitting the details is not acceptable." Leg. Resps. Ex. 11 at 18. Dr. Cho stated that Dr. Chen presented a "black box" and that a "learned reader [lacked] sufficient information to independently evaluate and implement said algorithm." Leg. Resps. Ex. 11 at 19. She said that based on Dr. Chen's purported failure to disclose the algorithm, "[i]t is not clear that his algorithm produces a set of maps that is not biased in some systematic way." Leg. Resps. Ex. 11 at 19.

114. In her testimony, Dr. Cho changed stories. Dr. Cho acknowledged that she was offered the opportunity to examine Dr. Chen's source code, but declined to do so because she was unwilling to sign the parties' confidentiality agreement limiting her use of the code to this case. Tr. 1224:8-1225:20.

115. Dr. Cho then took the position that she "did not" "have to review Dr. Chen's source code in order to reach [her] conclusion[s]" about how it operated. Tr. 1141:5-8. Directly contradicting her report, Dr. Cho explained that she didn't need the code: "I understand what Dr. Chen is trying to do regardless of whether I see his exact code . . . because he's described it well enough." Tr. 1294:8-13.

116. Dr. Cho proceeded to evaluate Dr. Chen's simulations based on her understanding of his algorithm. Specifically, Dr. Cho predicated her analysis on

the assumption that, in this case, Dr. Chen employed an algorithm that he had used in a 2013 academic paper. Tr. 1136-4:1143:6. That algorithm would first pick a random geographic unit to begin building a simulated district. Tr. 1137:23-1138:9. Dr. Cho testified that she understood the second step of the 2013 algorithm to add the adjacent unit that was geographically closest to the first unit. *Id.* Dr. Cho believed that the second step of the 2013 algorithm, and all subsequent steps, were "completely determined" by the first point chosen because the algorithm always added the adjoining unit that met a fixed criterion (being the one geographically closest). Tr. 1140:6-1142:18. According to Dr. Cho, this meant that if the 2013 algorithm picked the same starting point twice, it would "create[] the exact same map." *Id.* Dr. Cho therefore opined that Dr. Chen's simulated plans were not "random maps," Tr. 1142:3-7, and that this lack of randomness rendered Dr. Chen's simulations a unreliable method of evaluating the 2011 plan's partisan bias. Tr. 1166:12-1167:20.

117. Dr. Cho had it wrong. Had Dr. Cho reviewed the source code that Dr. Chen turned over to Legislative Respondents, she would have quickly learned that Dr. Chen did not use his 2013 algorithm in this case. Tr. 1656:22-24. In the algorithm that Dr. Chen did use here, a starting building block on the map is selected at random, and at the critical second step, a neighboring building block is *also added at random.* Tr. 1157:12-1158:2. The algorithm then continues to add

adjoining building blocks at random. Tr. 1158:3-9. Dr. Chen displayed and explained his code in open court to prove this was the case. Tr. 1658:9-1661:3.

118. Dr. Cho thus predicated her entire analysis of Dr. Chen's simulations on an incorrect understanding of his algorithm. Tr. 1656:15-21. Indeed, Dr. Cho said elsewhere in her testimony that one *could* make meaningful comparisons between simulated plans and the enacted plan if the simulated plans were random and independent. Tr. 1133:18-22. Dr. Chen's simulations were exactly that.

119. Dr. Cho made several verifiably inaccurate statements about Dr. Chen's analysis. Dr. Cho said three different times in her testimony that, in a 2016 academic paper, Dr. Chen described the algorithm he used to simulate maps for that paper only in a footnote. Tr. 1135:7-10, 1171:15-20, 1172:19-21. Dr. Cho declared that, because the algorithm was merely "described in a footnote," there had not been proper "validation" of it. Tr. 1171:15-20; *see also* Tr. 1172:19-21 (Dr. Cho testifying that "if you publish in Political Science and put the algorithm in a footnote, that's not a validation of the algorithm"). This was incorrect. Dr. Chen's 2016 paper includes an entire section titled "The Automated Districting Algorithm," which provides extensive details on the algorithm used over several lengthy paragraphs in the main body of the article. Leg. Resps. Ex. 39 at 331-32. That 2016 algorithm also assigned the second building block at random. Tr. 1663:25-1664:6.

120. Dr. Cho also inaccurately claimed that Dr. Chen did not release his source code for the algorithm used in the 2016 paper. Tr. 1246:16-1247:12. Dr. Cho claimed that Dr. Chen disclosed only a "binary executable" for the 2016 paper, *id.*, but Dr. Chen showed on rebuttal that he had in fact disclosed the source code behind the 2016 algorithm, Tr. 1664:20-1665:9. The Court finds that Dr. Cho's inaccurate statements on these matters undermine her reliability.

121. Based on these totality of the circumstances, the Court ascribes no weight to Dr. Cho's testimony as it relates to Dr. Chen.

122. Legislative Respondents' other expert, Dr. Nolan McCarty, likewise offered no opinion as to whether Pennsylvania's map was gerrymandered. Tr. 1417:1-3. Instead, he opined that Dr. Chen's analysis was flawed because Dr. Chen supposedly did not use a good indicator of how Pennsylvanians would vote for Congress. Tr. 1500:21-1501:3.

123. Even though both of Dr. Chen's measures of partisanship—the 2008-2010 statewide elections and the 2012-2016 statewide elections—perfectly predicted the outcomes in all 54 U.S. House elections held under the 2011 map, Dr. McCarty claimed that Dr. Chen's measures "overstate[] how favorable the 2011 enacted plan was to Republicans." Leg. Resps. Ex. 17 at 11. According to Dr. McCarty's measure, notwithstanding the fact that Republicans have won 13

seats in all three elections since 2011, the enacted map "should have produced from 9 to 11 Republican seats." Leg. Resps. Ex. 17 at 11; Tr. 1472:11-14.

124. Dr. McCarty's measure also suggested that "all" of Dr. Chen's simulated maps—which ignored partisan considerations—were *more favorable to Republicans* than the enacted map, which was drawn by a Republican-controlled General Assembly and signed by a Republican Governor. Tr. 1529:23-1530:18; *see* Leg. Resps. Ex. 17 at 12. Dr. McCarty says that this shows Dr. Chen's analysis failed to support a finding that the enacted map is an outlier with respect to its pro-Republican advantage. Leg. Resps. Ex. 17 at 13; *see* Tr. 1489:19-1490:1.

125. Dr. McCarty employed a novel and convoluted method of estimating the partisanship of the enacted map. Dr. McCarty first calculated a Partisan Vote Index ("PVI") for each district based on the 2004 and 2008 Presidential elections. Tr. 1421:6-1423:2. He then generated a probability that a given PVI would produce a Republican or Democratic result by looking at the results of congressional races from across the United States that had the exact same PVI at the time of the congressional election. Tr. 1428:1-1431:3. According to Dr. McCarty, he did this to create an uncertainty factor—the notion that even if a district was Republican leaning, in some percentage of cases of cases, it would vote Democratic. Leg. Resps. Ex. 17 at 7-9. Finally, Dr. McCarty simulated 1,000 elections using his calculated probabilities. Leg. Resps. Ex. 17.

126. The most obvious flaw in Dr. McCarty's approach is that it repeatedly yielded the wrong result. In his 1,000 simulated elections, Dr. McCarty's measure predicted the actual 13 Republican-seat outcome only 3% of the time. Tr. 1451:21-1452:1. In the other 97% of the simulations, his measure produced something else, typically closer to just 10 Republican seats. Tr. 1453, 1517:3-11; Leg. Resps. Ex. 18, Figure 3. In fact, according to Dr. McCarty, it was twice as likely that Republicans would win just *7 of 18 seats* under the 2011 plan than it was that they would win the 13 seats they have won in real life in three straight elections. Tr. 1523:17-21; Leg. Resps. Ex. 18, Figure 3. Dr. McCarty estimated that it was four times as likely that Republicans would win 8 of 18 seats than the 13 seats they have won in the real world, and seven times as likely that they would win 9 seats as compared to the 13 seats they have won in the real world. Tr. 1615:2-14; Leg. Resps. Ex. 18, Figure 3. Dr. McCarty offered no substantive explanation for why his predictions were so inaccurate; he merely asserted without explanation that Republicans have "over performed." Leg. Resps. Ex. 18 at 10.

127. Based on his PVI measure, Dr. McCarty also opined that there were 10 supposedly competitive districts. Tr. 1443:4-16. There have been three congressional elections conducted under the enacted map, meaning that there have been a total of 30 elections in Dr. McCarty's so-called competitive districts. In the real world, the Republican candidates have won all 30 of these elections. Tr.

1590:16-1591:1. Dr. McCarty's classification of these districts as "competitive" makes clear that something is very askew in his partisanship measure.

128. Other flaws in Dr. McCarty's PVI measure include that he relied entirely on the 2004 and 2008 Presidential elections. Dr. McCarty stated in his direct testimony that "using presidential votes as a measure of partisanship in Congressional districts . . . is commonly accepted." Tr. 1422:10-13. Yet Dr. McCarty said the exact opposite in an expert report in a prior Florida case, where he had said "the use of presidential vote outcomes to predict Congressional elections is problematic" because "presidential election vote is only a crude measure of partisanship and may not predict Congressional voting patterns." Tr. 1501:25-1502:4.

129. Dr. McCarty's turnabouts did not stop there. In this case, Dr. McCarty said in his direct testimony that using all "statewide elections" to measure partisanship was inferior to using just Presidential elections. Tr. 1423: 2-14. But in the Florida case, Dr. McCarty wrote that the "best" way to measure partisanship and predict the outcomes of congressional elections was to "use precinct-level vote returns from other Florida statewide elections." Tr. 1502:7-10. Using statewide elections, including but not limited to Presidential elections, is exactly what Dr. Chen did in this case. Tr. 1504:13-15

130. Dr. McCarty later testified that he used only Presidential elections in this case as a convenience because he wanted to make comparisons with the rest of the country. Tr. 1423:15-19.

131. Dr. McCarty conceded that the 2004 election was a relatively dated election to use in evaluating elections under the 2011 enacted plan, Tr. 1566:6-9, and that ideally he would have used more elections than just two, Tr. 1565:15-17. The fragility of relying on just two presidential elections, one dated, was demonstrated by Dr. McCarty's own work in this case. Although not presented in his report, Dr. McCarty also calculated the PVI for the enacted plan using the 2008 and 2012 elections. Petrs. Ex. 34. Switching the 2012 election for the 2004 election increases the Republican lean. Tr. 1559:15-156:9, Petrs. Ex. 34.

132. While Dr. McCarty testified that he did not use the 2012 election results because they were not available when the 2011 plan was created, Tr. 1475:21-1476:7, this finding should have suggested to him that using other elections, such as more recent elections or all statewide elections as he had advocated in the Florida case, would have produced a more accurate result. Dr. Chen's measure demonstrates this fact; Dr. Chen's use of all 2008 and 2010 statewide elections perfectly estimates the correct results in all districts under the enacted map. Tr. 152:11-18. Dr. McCarty's upside-down view that the enacted map is not the 13-5 Republican map that it is in real life was in part a product of

his choice to use just two Presidential elections, one of which was dated, and to avoid all other statewide elections.

133. Dr. McCarty's translation of his PVI numbers into a Democratic probability of winning was also extremely problematic. Dr. McCarty converted his PVI estimates into a Democratic probability of winning by looking at all congressional elections nationwide from 2004 to 2014, identifying those elections that had the same exact PVI, and calculating the percentage of that subset of elections in which the Democratic candidate won. Leg. Resps. Ex. 18 at 5-6 & app'x A. Dr. McCarty used nationwide elections "not because it's necessarily the best generator of [his] uncertainty principle . . . [but] because it had enough elections that [he] could produce a probability for every PVI imaginable." Tr. 1568:22-1569:1; *see* Tr. 1431:2-11.

134. Dr. McCarty did not point to a single peer-reviewed article that has ever estimated a party's probability of winning congressional districts in a state using such a method. Tr. 1677:15-25 (Dr. Chen). Nor did Dr. McCarty point to any real-life example where a state's partisan mapmakers have used such a method for predicting the partisanship of the districts they are creating. Tr. 1680:2-1681:4 (Dr. Chen). Dr. Chen confirmed that, to his knowledge, no such peer-reviewed article or real-life example exists. Tr. 16177:15-1681:4.

135. The Court concludes that Dr. McCarty's conversion methodology is flawed. It makes no sense to evaluate Pennsylvania elections by looking at elections from other states. Tr. 1680-1681 (Dr. Chen). As Dr. Chen explained, no partisan mapmaker would ever look to congressional election results in other states to predict the partisanship of the districts within their home state. Tr. 1681:5-1683:2 (Dr. Chen). In North Carolina, for example, where mapmakers disclosed the information they relied upon to predict partisan voting, the mapmakers did not look to votes in states other than North Carolina. *Id.*

136. Dr. McCarty's conversion methodology also leads to serious anomalies. For example, Dr. McCarty estimates that when moving from a district with a PVI of 0 to a *more* Democratic-leaning district with a PVI of -1, the Democratic chances of winning somehow goes *down*. Tr. 1684:8-1685:22 (Chen); Leg. Resps. Ex. 18 app'x A. The same anomaly occurs when moving from a PVI of 6 to 5 and from a PVI of -4 to -5. Tr. 1686:20-1687:22 (Chen); Leg. Resps. Ex. 18 app'x A. These anomalies directly impacted Dr. McCarty's analysis of Pennsylvania: Dr. McCarty estimated that Democrats have a better chance of winning District 7 than District 8, even though District 8 has a more Democratic-leaning PVI. Tr. 1688:19-1689:7; Leg. Resps. Ex. 18 at 9.

137. Notwithstanding the dismal prediction record produced by his conversion methodology, Dr. McCarty defended his approach, saying "the

methodology I use is better at predicting Congressional elections in general," Tr. 1525:7-9, only to concede that he had never applied his methodology to any state other than Pennsylvania, an admission wrung out of him only after repeated questions and intervention by the Court. Tr. 1525:12-1529:3.

138. Dr. McCarty's evaluation of Dr. Chen's simulated maps had all these flaws, plus one more. Dr. McCarty could have computed the PVI scores of Dr. Chen's simulated districts directly, but he chose not to do so, purportedly because of the "tight deadline" and the number of "calculations" he would have needed to do. Tr. 1464:20-1465:8-12. Dr. Chen clarified on rebuttal that it would have taken Dr. McCarty no more than an hour to do the calculations. Tr. 1692:17-1693:8.

139. Yet instead of doing so, Dr. McCarty estimated PVI scores for the simulated districts using a makeshift regression analysis. Tr. 1550:8-12, 1464:20-1465:16. According to Dr. McCarty, the regression produced "essentially the same" information as calculating the actual PVI. Tr. 1466:9-12. But the regression had the effect of inflating the expected Republican performance under Dr. Chen's simulated maps. Petrs. Ex. 162. When Dr. McCarty was pointed to a specific simulated map showing that his regression had increased the Republican lean, he assured the Court that it was an outlier. Tr. 1474:3-12; Petrs. Ex. 162. On cross-examination, when confronted with the first ten maps from Dr. Chen's simulation set, Dr. McCarty conceded that every single one showed that his

regression increased Republican lean, Tr. 1554:18-1558:21, and the initial map he had been shown was no outlier, Tr. 1558:24-1559:9. In fact, Dr. McCarty's changed methodology increased the Republican lean on each and every one of Dr. Chen's 1,000 simulated maps, explaining why Dr. McCarty somehow found that Dr. Chen's non-partisan maps are more pro-Republican than the enacted map. Tr. 1697:18-1698:11 (Dr. Chen).

140. Dr. McCarty's testimony was marked by bias and a refusal to consider real-world results and common sense. For example, although his PVI measure failed to estimate the 13 Republican seats that Republicans have won in all three congressional elections under the 2011 plan, Dr. McCarty steadfastly refused to say his method was generating the "wrong" result. Tr. 1517:3-11. Instead, he testified that the mismatch between reality and his measure showed that Republicans winning 13 seats was merely an "outlier." Tr. 1517:8. To Dr. McCarty's way of thinking, the fact that the Republicans in reality won more seats than his measure estimated showed only that Republicans had "overperformed," or that Democrats had "underperformed." Leg. Resps. Ex. 17 at 10; *see* Tr. 1517:7-9 ("[I]t just means the 2012 election was an outlier relative to the fundamentals of the districting plan."), 1518:18-21 ("13 is -- is an outlier, outcome, with respect to what one would expect . . . . I'm showing that the plan was not designed to create 13."). He "disagree[d]" that he should even "consider the possibility that [his]

measure . . . is just not a good predictor of how the real world works." Tr. 1594:10-15. Asked whether he would suggest to one of his Princeton students whose results were off 97% of the time that the student should "at least consider the possibility" that his model "may not be a good model," Dr. McCarty filibustered to avoid answering. Tr. 1594:25-1596:22.

141. With respect to his opinion that Dr. Chen's maps, which were simulated without any partisan information, were more favorable to Republicans under his measure than the enacted map, Dr. McCarty testified that he did not want to consider whether this made any sense given that Republicans controlled both chambers of the General Assembly and the Governor's office at the time, and given the enacted plan's bizarre district shapes. Tr. 1530:18-1537:22, 1541:6-1542:2. And although he testified as an expert in the federal case, Dr. McCarty avoided learning what discovery had been produced there about what information the mapmakers had consulted. Tr. 1535-36:14.

142. Dr. McCarty's head-in-the-sand methodology defies any appreciation of the real world. If Legislative Respondents really believed that all of Dr. Chen's simulated maps made with no partisanship input were better for Republican candidates than the 2011 enacted map, then this case should have settled.

143. In sum, Dr. McCarty's choices had the combined effect of making the enacted plan look *less* Republican that it is in real life and making Dr. Chen's

simulated plans look *more* Republican. Tr. 340:4-341:25. Under the circumstances, it is reasonable to believe that Dr. McCarty adjusted his method because it produced a result more favorable to Legislative Respondents.

144. The Court assigns no weight to Dr. McCarty's testimony as it related to Dr. Chen.

3. Dr. Pegden's Expert Testimony Established That the Map Was Carefully Crafted to Ensure a Republican Advantage

145. Wesley Pegden, Ph.D., an Associate Professor in the Department of Mathematical Sciences at Carnegie Mellon University in Pittsburgh, testified as an expert in mathematical probability. Tr. 707:19-24, 715:25-716:2; Petrs. Ex. 118 (Dr. Pegden's CV). Dr. Pegden, a Pennsylvania native, has published numerous papers on discrete mathematics and probability in high-impact, peer-reviewed journals, and has been awarded multiple prestigious grants, fellowships, and awards. Tr. 709:4-710:20; Petrs. Ex. 118.

146. In early 2017, before this case was even filed, Dr. Pegden published a paper in the Proceedings of the National Academy of Sciences, a top-ranked, peer-reviewed journal. Tr. 710:7-15, 712:4-6, 1368:18-1369:13; Petrs. Ex. 119 (Dr. Pegden's PNAS paper). This paper provides an innovative and rigorous method to identify whether a particular configuration (here, the 2011 enacted plan) is an outlier with respect to a set of candidate configurations (here, the universe of all possible congressional districting maps for Pennsylvania meeting specified

constraints). Tr. 711:4-7. Dr. Pegden's method has a wide range of applications, and his paper used the method specifically to examine the partisanship of Pennsylvania's 2011 congressional districting plan. Tr. 711:10-21, 712:7-713:10, 1368:9-18.

147. For this case, Dr. Pegden evaluated whether the 2011 plan is an outlier with respect to partisan bias and, if so, whether that could be explained by the interaction of political geography and traditional districting criteria. Tr. 716:20-717:1; Petrs. Ex. 117 at 1-2 (Pegden Report). Dr. Pegden concluded that the 2011 plan is indeed an extreme outlier with respect to partisan bias. He found—with a probability of over 99.99%—that the Republican bias of the 2011 plan cannot be explained by political geography or the districting criteria he considered. Tr. 717:2-8; Petrs. Ex. 117 at 1-2, 8.

148. Dr. Pegden's academic paper includes the proof of a mathematical theorem that creates a new way to determine whether a particular configuration is an outlier with respect to a "bag" of all possible configurations. Tr. 719:5-19; Petrs Exs. 117, 119. His theorem makes it possible to do so without analyzing every configuration in the bag, and without randomly selecting configurations from the bag as in conventional statistical sampling approaches. Tr. 719:20-722:6; Petrs. Ex. 117 at 4 & nn.4-5; Petrs. Ex. 119.

149. Dr. Pegden's approach involves Markov chains. A Markov chain is a sequence of random observations for which each observation can depend on the previous observation but not on things that came before it. A Markov chain is therefore often described as a "memoryless random process." Tr. 787:4-8.

150. To analyze the 2011 plan using this technique, Dr. Pegden began with the 2011 plan, made a sequence of small random changes to it, and then observed whether the partisan bias in the districting evaporated or decreased. Tr. 722:9-23. His method calls a districting an "outlier" if its partisan bias decreases when he makes these small random changes. Tr. 723:13-21; Petrs. Ex. 117.

151. Dr. Pegden's method involves four steps. *See generally* Petrs. Ex. 117 at 4. The first step is to start from the configuration that is to be evaluated—here, Pennsylvania's 2011 congressional districting plan. Tr. 725:2-9.

152. In the second step, the software randomly chooses a precinct (also known as a "Voter Tabulation District" or "VTD") on the boundary of two congressional districts, and attempts to move or "swap" this precinct from the district it's in to the district it borders. Tr. 725:10-726:4, 762:1-762:23.

153. At step 2, the swap is allowed only if it would generate a new potential districting that satisfies all the constraints that define the bag of districtings in the particular version of the test being run. These constraints vary from run to run. Three constraints always apply: there must be 18 contiguous

districts, the districts must have approximately equal population, and the districts must be at least as compact as the enacted plan. Tr. 726:5-16, 727:23-728:14; Petrs. Ex. 117 at 3. Different runs use different thresholds for population deviation and different compactness measures. Tr. 729:2-12; Petrs. Ex. 117 at 3, 8-9.

154. At step 3, the test uses precinct-level voting data to evaluate whether the new districting is more or less biased in favor of Republicans than the 2011 plan. Tr. 729:16-730:21; Petrs. Ex. 117 at 4.

155. At step 4, the test loops back to step 2 and makes another small random swap of precincts at a district boundary. The test can be run for a large number of steps. For each run reported in his expert report, Dr. Pegden ran the test for 2^{40} or 2^{39} steps. 2^{40} equals 1,099,511,627,776—about 1 trillion. 2^{39} is half as large—just over a half trillion. Tr. 730:23-731:20, 738:3-18; Petrs. Ex. 117 at 4.

156. Although not every one of the trillion iterations of step 2 generates a valid districting (by which Dr. Pegden means a districting that meets that run's constraints), each run generates several hundred billion districtings that meet the constraints imposed. Tr. 768:11-769:14, 1371:13-1372:18.

157. The new districtings generated by this test are not meant to be proposed legal districtings for Pennsylvania. Rather, they are districtings similar to the 2011 plan that are used for comparison purposes. Tr. 733:1-734:24. As Dr. Pegden explained, his "method accepts as given that the mapmakers' taste in

squiggly districts is the correct taste and shows that even against that backdrop, where we have weird-looking districts . . . still, Pennsylvania's districting is an outlier." Tr. 734:2-8.

158. Petitioners' Exhibit 121 is a set of sample maps generated during a run of Dr. Pegden's test:

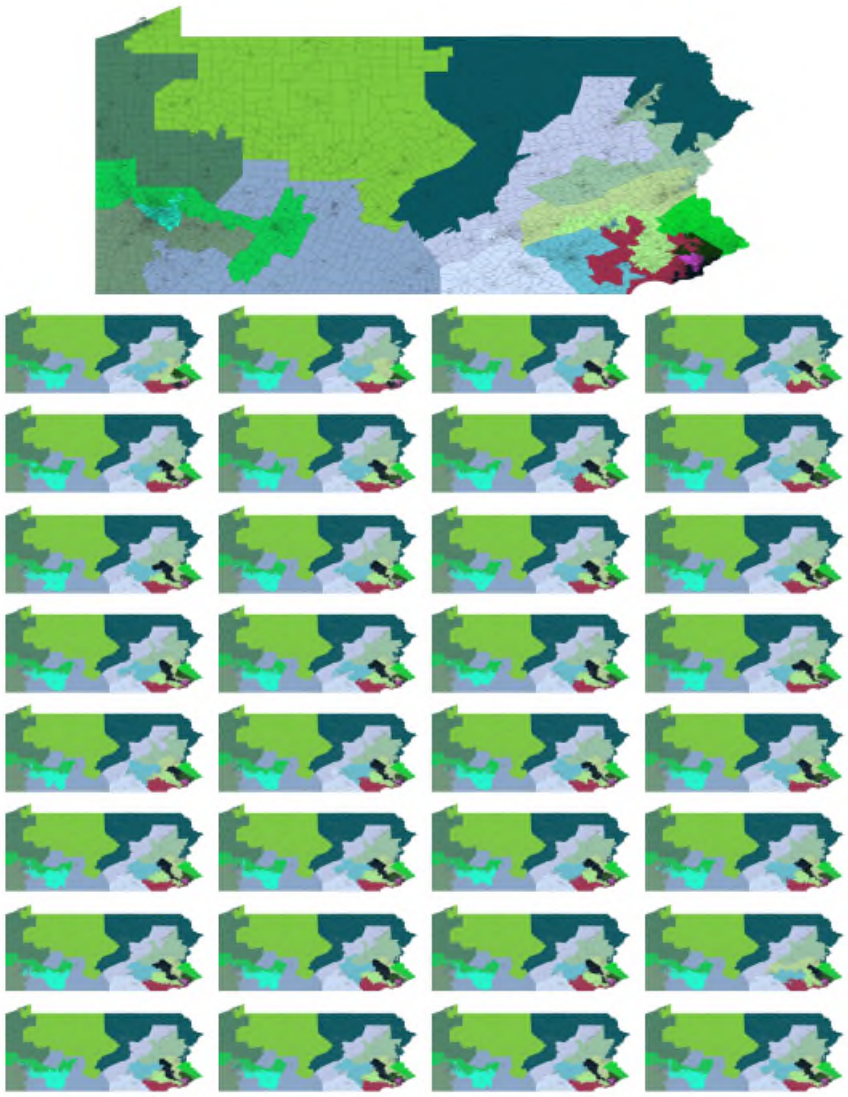


Figure 2: These examples are from the 6th row of our results table. In particular, careful inspection shows that precincts in District 2 remain assigned to District 2 in these maps, and that several rural districts experience few changes since large portions of their boundaries are county boundaries which this run is required to preserve. Again, examples were taken every $10 \cdot 2^{31}$ steps.

Petrs. Ex. 121.

159. Dr. Pegden's method evaluates the partisan bias of districtings using one of the same tests employed by Dr. Chen: the mean-median gap. As explained above, this test compares the mean level of Republican support in each of the 18

districts to the level of Republican support in the median of the 18 districts. Tr. 735:10-737:5, 782:11-783:12; Petrs. Ex. 117 at 10; Petrs. Ex. 119 at 7.

160. Dr. Pegden measured each precinct's level of Republican support by reference to the precinct-level election returns in Pennsylvania's 2010 U.S. Senate general election. Tr. 737:6-738:2, 783:13-785:3; Petrs. Ex. 117 at 9. Dr. Pegden checked whether this method would have accurately predicted the results of Pennsylvania's 2012, 2014, and 2016 U.S. House general elections, and found that it returned the correct result for all 54 such elections. Tr. 813:23-814:7.

161. Dr. Pegden ran his test eight times. Each of these eight runs used a different set of constraints. Dr. Pegden refers to the "bag of districtings" as *all possible districting plans* that meet the constraints imposed in that run. Petrs. Ex. 117 at 3; Tr. 738:20-739:15. While Dr. Pegden took up to a trillion steps in each run, the runs did not generate the entire bag of districtings; as Dr. Pegden explains, that would be impossible since the number of possible configurations in the bag of districtings is astronomically large, possibly larger than the number of elementary particles in the universe. Petrs. Ex. 117 at 4 n.5. Nevertheless, Dr. Pegden's newly developed theorem enabled him to calculate, based on the number of steps in a particular run, how unusual the partisan bias of the enacted plan is across the entire bag of possible districtings. Petrs. Ex. 117 at 4 n.5.

162. Dr. Pegden reported his results in a table. Petrs. Ex. 122. Dr. Wendy K. Tam Cho, an expert witness for Legislative Respondents, did not challenge Dr. Pegden's calculations in this table. Tr. 1302:22-25, 1306:10-1307:3.

163. Some of the eight runs allowed districtings to deviate from absolute population equality by up to 2%; others allowed a deviation of up to 1%. Tr. 739:23-742:13, 763:21-764:15, 779:6-780:19; Petrs.' Ex. 117 at 3-4.

164. Dr. Pegden's test uses two different measures of compactness: the average perimeter of all 18 districts, and the average Polsby-Popper score of all 18 districts. Tr. 742:15-744:21; Petrs.' Ex. 117 at 9. He permits candidate districtings to be of comparable compactness to the 2011 plan. Tr. 743:11-25.

165. In some runs, Dr. Pegden imposes the constraint that any county preserved by the 2011 plan would have to be preserved in all the maps encountered by his algorithm. Other runs do not include this requirement. Tr. 744:22-745:8; Petrs. Ex. 117 at 3.

166. In some runs, Dr. Pegden does not allow any changes to District 2 of the 2011 plan, in case it might be argued that the enacted shape of District 2 is mandated by the Voting Rights Act. Tr. 745:9-19; Petrs. Ex. 117 at 3.

167. Dr. Pegden's results table reports epsilon values for each run's partisan bias. The epsilon value represents the fraction of districtings encountered

in the trillion (or half trillion) steps that had as much partisan bias as the 2011 plan, as measured by the mean-median gap. Tr. 746:14-747:20; Petrs. Ex. 122.

168. The epsilon values that Dr. Pegden found are minuscule. For example, in his sixth run, he found that $\varepsilon = 0.00000000097$. Petrs. Ex. 122. This means that, after taking roughly a trillion steps of swapping one precinct at a time, only 97 out of the 100,000,000,000 (100 billion) valid districtings encountered in that run exhibited as much partisan bias as the 2011 plan. Tr. 747:6-20. In the fourth run of his test, *every districting encountered in the trillion steps* of the algorithm exhibited less partisan bias than the 2011 plan. Tr. 752:14-753:23.

169. Dr. Pegden calculates a "p value" for each run. The p value is where Dr. Pegden employs his theorem to translate the results of the run (*i.e.*, epsilon value described above) to a probability of finding the 2011 plan's partisan bias across the entire bag of possible districtings in Pennsylvania meeting the constraints imposed on that run. Petrs. Ex. 117 at 8. The p value thus identifies, with mathematical rigor, the probability that a random districting of Pennsylvania would have such a small epsilon value. *Id.* In other words, the p value is the probability that a randomly chosen districting from the bag of districtings will perform as poorly as the enacted plan in terms of partisan bias. Tr. 1306:19-25.

170. For example, in the sixth run, the epsilon value is significant at $p = 0.000045$. Petrs. Ex. 122. This means that the probability that a typical (*i.e.*,

randomly selected) districting of Pennsylvania could have such a low epsilon value is 0.0045%. This is true regardless of the political geography of Pennsylvania, and can be calculated even without individually comparing the 2011 plan to every member of the "bag of districtings" for that row of the results table. Tr. 747:21-752:12; *see also* Petrs. Ex. 117 at 8; Petrs. Ex. 123 (Dr. Pegden's theorem). Nothing in the theorem depends on how many districtings are in the bag of districtings being analyzed, or on how many steps the algorithm completes. Tr. 816:8-11, 817:20-818:3.

171. Dr. Pegden's table further reports epsilon and p values with respect to anti-competitiveness. Petrs. Ex. 122. For these columns, instead of measuring the mean-median difference, the test measures the anti-competitiveness of each districting encountered by the algorithm. A new districting is considered more anti-competitive than the enacted plan if there is a greater variance in the Republican vote share among the districts of the new districting than among the districts of the enacted plan. Tr. 754:2-755:2; *see also* Petrs. Ex. 117 at 10. In other words, a districting is considered more anti-competitive when it has fewer close districts and instead has more solidly Democratic and solidly Republican districts. Tr. 753:24-755:2; Petrs. Ex. 117 at 10.

					partisan bias		anti-competitiveness	
	population threshold	compactness measure	preserve counties?	freeze dist. 2?	ε-outlier at $\varepsilon =$	significant at $p =$	ε-outlier at $\varepsilon =$	significant at $p =$
1	2%	perimeter	No	No	.00000000058	.000034	.000000031	.00025
2	2%	Avg. P.P	No	No	.00000000057	.000034	.000000000051	.000011
3	2%	perimeter	Yes	No	.0000000013	.000051	.000000032	.00025
4	2%	avg. P.P.	Yes	No	.00000000000017	.00000058	.00000000042	.000029
5	2%	perimeter	Yes	Yes	.00000000050	.000032	.0000000000049	.0000032
6	2%	avg. P.P.	Yes	Yes	.00000000097	.000045	.0000000000048	.0000031
7	1%	perimeter	Yes	Yes	.00000000038	.000028	.0000000000099	.0000045
8	1%	avg. P.P.	Yes	Yes	.00000000053	.000033	.0000000000096	.0000044

172. On the basis of his analysis, Dr. Pegden concluded that the 2011 plan is a gross outlier with respect to partisan bias in a way that is mathematically impossible to be caused by political geography or traditional districting criteria, and that is insensitive to precisely how the bag of districtings is defined. Tr. 755:19-756:10, 757:24-758:25, 763:2-8; Petrs. Ex. 117 at 2, 8. As he testified, the intentional drawing of the 2011 plan to maximize partisan advantage is the only conceivable explanation "for having a districting which appears so carefully crafted in the sense of being such an extreme local outlier in the set of its districtings." Tr. 1384:22-1385:4. Dr. Pegden established a greater than 99.99% confidence level for this claim. Tr. 1385:21-1386:12.

173. Dr. Pegden's mathematical analysis removes any conceivable doubt that the 2011 plan was drawn with an intent to benefit Republicans. It also eliminates the possibility that the high level of partisan bias observed in the 2011 plan could be a natural consequence of Pennsylvania's political geography.

174. Legislative Respondents offered their expert Dr. Cho to criticize Dr. Pegden's analysis and conclusions. But Dr. Cho did not take issue with Dr. Pegden's theorem, and she acknowledged that his theorem makes it possible to "take the results of the local districtings and then make a statement about how the actual map, the enacted map, relates to the bag of all possible districtings that satisfy his constraints." Tr. 1301:12-19; *see also* Tr. 1211:17-18 (Dr. Cho stating that "I'm not challenging the theorem").

175. None of Dr. Cho's critiques of Dr. Pegden's analysis withstand scrutiny. Dr. Cho claimed that Dr. Pegden's conclusions are "overbroad" because he has not "examined all possible redistrictings" or produced a "large representative sample" of all possible districtings. Leg. Resps. Ex. 11 at 5-6. This critique simply ignores or fails to understand Dr. Pegden's theorem. The theorem allows Dr. Pegden to draw mathematical conclusions about the entire bag of districtings based on the results of his reversible Markov chain, which makes small random changes to the district boundaries. Petrs. Ex. 117 at 5. The theorem does not require him to examine all possible districtings or to draw a representative

sample. Tr. 1363:21-1368:2; *see also* Petrs. Ex. 117 at 5. Again, Dr. Cho challenges neither the theorem nor the p values for each run that the theorem produces, and that p value represents a probability of finding the partisan bias of the enacted plan in the entire bag of districtings. Petrs. Ex. 117 at 5. If the theorem and p values are right, Dr. Pegden's conclusions are right.

176. Dr. Cho unpersuasively testified that swapping one precinct at a time is too little of a change to make the new map sufficiently different from the immediately preceding map or from the beginning map (*i.e.*, the 2011 plan). Tr. 1213:23-1216:13, 1234:18-1235:3. However, Dr. Pegden's analysis found that making even such small changes to the 2011 plan reduced its partisan bias, and he calculated a precise mathematical probability of that result occurring in the entire bag of possible districtings. Tr. 1369:14-1370:16. Again, the math cannot be—and was not—disputed. Indeed, the whole *point* of Dr. Pegden's analysis was that even when he made these tiny changes, the partisan bias dissipated instantly, showing how carefully the enacted plan was crafted. Dr. Pegden testified that this "is so dramatically the case that after the first second, we never again encou[nter] maps with as much partisan bias as the current districting in Pennsylvania." Tr. 1378:7-12; *see generally* Tr. 765:12-766:2, 1376:20-1378:18. That is a feature, not a bug, of his approach.

177. Dr. Cho criticized Dr. Pegden's approach because he did not require the preservation of municipalities, the protection of incumbents, or absolute population equality, Tr. 1218:24-1220:12, but those criticisms were unpersuasive.

178. As for the preservation of municipalities, Dr. Cho stated that the 2011 plan preserved 97.3% of the municipalities. She denied having any knowledge as to whether the preservation of municipalities was a goal of the drafters of the 2011 plan, but stated that "that doesn't happen by chance." Tr. 1226:5-17. On cross-examination, however, Dr. Cho admitted that it was "pure conjecture that if you preserve 97 percent, it's -- it's probably not by chance." Tr. 1317:24-1318:3. Dr. Cho further acknowledged that Dr. Pegden's maps may have preserved as many municipalities as the 2011 plan, but that she had not checked. Tr. 1318:4-1321:5.

179. Dr. Pegden testified that he ran his test with quantifiable constraints such as limiting county splits, whereas limiting municipality splits would require the injection into his algorithm of subjective considerations such as whether splitting larger cities should be weighted the same or differently as splitting smaller cities or townships. Tr. 772:22-777:24. Dr. Pegden did not know whether the mapmakers behind the 2011 plan had actually adhered to any criteria related to the preservation of municipalities, but had he been informed of any such criteria, he could have conducted additional runs taking account of those criteria. Tr. 822:13-823:4.

180. Dr. Cho's criticism of Dr. Pegden relating to incumbency protection was also unpersuasive. Tr. 1227:25-1228:10. On cross-examination, Dr. Cho admitted that in an August 2017 presentation, she had stated that "philosophically, incumbency protection does not make sense if the current map is arguably gerrymandered" and that "if the current map is arguably a gerrymander, it really doesn't make sense to preserve it." Tr. 1260:22-1266:1. Likewise, she acknowledged having criticized incumbency-protection in her academic work: "one might argue that jurisdictions that use political data in redistricting are conditioning state action (*i.e.*, district design) on the content of past speech (*e.g.*, previous vote history or voter registration) in order to create safe incumbent seats or safe Democratic- or Republican-held seats." Tr. 1268:6-20.

181. Dr. Pegden persuasively testified that it would be easy for him (or for other potential users of his code such as Dr. Cho) to freeze the incumbents' home precincts in the simulations, and that doing so would make little difference in the final results, because 19 precincts are a tiny fraction of Pennsylvania's many thousands of precincts. Tr. 812:7-813:22.

182. Insofar as Dr. Cho criticized Dr. Pegden for not preserving the cores of incumbents' districts, her criticism was put to rest by Dr. Pegden's explanation that a side effect of his technique—making small, random changes to the districts of the 2011 Plan—was to preserve the cores of districts. Tr. 780:24-782:6.

183. Dr. Cho failed to rebut Dr. Pegden's explanation for why allowing 1 or 2 percent population deviation did not affect his analysis. Dr. Pegden correctly concluded that the small variance from absolute population equality does not impact his conclusions. Tr. 739:23-742:13, 763:21-764:15, 779:6-780:19; Petrs.' Ex. 117 at 3-4. First, he saw no degradation of his results when he changed the population constraint from 2 percent to 1 percent, establishing that changing the population threshold would not affect his results. Tr. 870:3-19. Second, the different in the magnitude of partisan bias encountered in his trillions of maps and the actual map was too large as a numerical matter to have been accounted for by the slight variation in population equality. Tr. 740:23-741:23.

184. Dr. Cho did not explain why she would expect a change from 1 percent to zero percent to affect Dr. Pegden's results when the shift from 2 percent to 1 percent did not. Tr. 870:3-19. And she did not dispute Dr. Pegden's testimony that difference in the magnitude of partisan bias encountered in his trillions of maps and the actual map was too large as a numerical matter to have been accounted for by the small departures from absolute population equality. Tr. 740:23-741:23; Tr. 1373:2-1374:21. Dr. Cho acknowledged that she had no basis other than conjecture to testify that the slight deviation in population made a difference, and she testified that "I don't know what happens when you go to zero." Tr. 1316:23-1317:11.

185. Dr. Pegden conducted his analysis with software that he wrote, and he has made this software package—including all source code, data sets, and instructions—publicly available at no cost on his website since the publication of the PNAS paper. Numerous researchers have downloaded his code and quickly modified it or used it to run their own analyses. Tr. 718:1-719:4, 764:23-765:8, 1375:1-1376:14, 1391:14-1392:14; Petrs. Ex. 117 at 8-9. Dr. Cho acknowledged on cross-examination that although she was aware that Dr. Pegden's code had been posted on the internet for "the whole time," Tr. 1294:4-5, she had not taken the time to look at his code, Tr. 1295:18-1296:19.

186. Finally, Dr. Cho testified that she has a "supercomputer"—which is the "fastest research supercomputer in the world"—on which she has developed an algorithm to test to detect whether a map is gerrymandered. Tr. 1325:4-21. Yet, Dr. Cho admitted that she chose not to run her supercomputer to test whether Pennsylvania's congressional map is gerrymandered here. Tr. 1324:7-1326:25. She explained that she is a "very busy person" and has "a lot of things to do, and this was not one of them." Tr. 1327:20-25. "When I rank the number of things I have to do today," Dr. Cho said, "this is not on top." Tr. 1328:2-3.

187. The Court ascribes no weight to Dr. Cho's testimony as it relates to Dr. Pegden.

4. Voters Likely to Vote for Democratic Congressional Candidates Are an Identifiable Political Group

188. The Court concludes that Pennsylvania voters likely to vote for Democratic congressional candidates are an identifiable political group. Dr. Chen conducted an independent statistical analysis that provides empirical proof for this proposition. Tr. 310:3-315:14; Petrs. Ex. 1 at 12 (Chen Report). Dr. Chen analyzed Pennsylvania election results over the last ten years and found that, for each precinct, municipality, and county in the Commonwealth, there was an extremely strong correlation in the level of support for Democratic candidates across elections. Tr. 310:10-311:12. That correlation was as high as 0.90 to 0.95. *Id.* Dr. Chen explained that, given this correlation, it is "very easy" to identify particular geographic units, all the way down to the precinct level, that are likely to vote for Democratic candidates in future elections. Tr. 315:6-14, 317:1-15. He testified that when we see lots of Democrats, meaning likely Democratic voters as opposed to registered Democrats, in one precinct or district, "we can be sure that . . . they are Democrats in the next election as well." Tr. 311:5-12.

189. Dr. Chen's analysis merely provides statistical proof for what is common sense. As Dr. Chen explained in his report, the entire reason why partisan mapmakers are able to gerrymander districts so effectively is because they are able to use past voting history to identify a class of voters likely to vote for Democratic

(or Republican) candidates for Congress. Petrs. Ex. 1 at 12. There would be no such thing as partisan gerrymandering if such identifiable classes did not exist.

190. Dr. Warshaw confirmed the point. He testified without rebuttal or contradiction that today, "[m]embers of the mass public are extremely sorted by party" and "Congressional elections are extremely predictable." Tr. 998:3-6; *see also* Tr. 950:7-10; 894:24-895:14; 956:12-957:2 (political scientists measure partisan preference by party identification or voting history, not party registration).

191. None of Respondents' experts suggested that people likely to vote for Democratic (or Republican) congressional candidates are not identifiable.

192. Indeed, the Court concludes from Dr. Chen's analysis of the files Speaker Turzai produced in the federal case that the General Assembly in fact did identify likely Democratic voters in creating the 2011 map. The General Assembly assigned partisanship scores to every single precinct in Pennsylvania specifically to identify those precincts more or less likely to vote for Democratic congressional candidates. The General Assembly clearly assigned precincts likely to vote for Democratic voters to particular congressional districts so as to maximize Republicans' overall advantage across the Commonwealth.

D. The 2011 Map Produced a Durable 13-Seat Republican Majority in Pennsylvania's Congressional Delegation

1. Republican Candidates Have Won 13 of 18 Seats In Each of the Three Congressional Elections Under the 2011 Map

193. In each of the three congressional elections under the 2011 map, Republican candidates have won 13 of Pennsylvania's 18 congressional seats—the same 13 seats each time. JSF ¶¶ 73, 78, 82.

194. In 2012, Republican candidates won a minority—only 49%—of the total statewide vote, but still won a 13 of 18 seats—72% of them. JSF ¶¶ 71-73.

195. The extreme partisan bias in the 2011 map is evident from the distribution of vote percentages across the districts. Democrats win five relatively lopsided victories, while Republicans win in closer—but still reliably red—districts. This is exactly how a well-crafted partisan gerrymander operates.

196. Stipulated Fact 73 shows the election results in 2012:

District	Democratic Vote	Republican Vote
1	84.9%	
2	90.5%	
13	69.1%	
14	76.9%	
17	60.3%	
3		57.2%
4		63.4%
5		62.9%
6		57.1%
7		59.4%
8		56.6%
9		61.7%
10		65.6%
11		58.5%

District	Democratic Vote	Republican Vote
12		51.7%
15		56.8%
16		58.4%
18		64.0%
Average of Districts Won by Party	**76.4%**	**59.5%**
Statewide Vote Share	**50.8%**	**49.2%**

JSF ¶ 73.

197. As illustrated in the table above, in 2012, Democrats won approximately 51% of the statewide vote for Pennsylvania congressional candidates (50.8% precisely). JSF ¶ 73; Tr. 896:18-20. They won only 5 of 13 seats. JSF ¶ 72. Democrats would have needed to win an additional *seven percentage points* of the statewide vote—or 58%—to win a majority of the seats. Tr. 896:24-897:12 (Dr. Warshaw); Petrs. Ex. 41. That is the only way Democrats would have won in Districts 3, 6, 15, 8, and 12, which were their five next best districts after the five Democrats won. Tr. 896:21-897:12 (Dr. Warshaw). If Democrats had won *57 percent* of the statewide congressional vote in 2012, they still would only have won *one-third* of the seats. Tr. 897:17-898:8. By contrast, Republicans were able to win over *two-thirds* of the seats (13 of 18, or 72%) even though they won a *minority* of the statewide vote. JSF ¶¶ 72-73.

198. The 2014 elections were strikingly similar. That year, Republicans won only 55.5% of the statewide vote, yet still won the same 13 seats (72%). JSF

¶¶ 74-75, 78. Again, the distribution of votes across the districts in 2014 illustrates just how effectively the map packs and cracks Democratic voters across the state:

District	Democratic Vote	Republican Vote
1	82.8%	
2	87.7%	
13	67.1%	
14	100%	
17	56.8%	
3		60.6%
4		74.5%
5		63.6%
6		56.3%
7		62.0%
8		61.9%
9		63.5%
10		71.6%
11		66.3%
12		59.3%
15		100%
16		57.7%
18		100%
Average of Contested Districts Won by Party	**73.6%**	**63.4%**
Statewide Vote Share	**44.5%**	**55.5%**

JSF ¶ 78.

199. The fact that Republicans in 2014 won an extra six percentage points of the statewide congressional vote compared to 2012 but did not pick up any additional seats further demonstrates the durability of the 13-5 Republican split. The 2011 map is utterly unresponsive to the will of the voters.

200. And in 2016, the most recent election under the 2011 map, the results were almost identical. Republicans won 54.1% of the statewide vote and again

won the exact same 13 of 18, or 72%, of the congressional seats. JSF ¶¶ 80-82. The 2016 results appear below:

District	Democratic Vote	Republican Vote
1	82.2%	
2	90.2%	
13	100.0%	
14	74.4%	
17	53.8%	
3		100.0%
4		66.1%
5		67.2%
6		57.2%
7		59.5%
8		54.4%
9		63.3%
10		70.2%
11		63.7%
12		61.8%
15		60.6%
16		55.6%
18		100.0%
Average of Contested Districts Won by Party	**75.2%**	**61.8%**
Statewide Vote Share	**45.9%**	**54.1%**

JSF ¶ 82.

201. In both the 2014 and 2016 elections, the margin of victory in districts Democrats won was far higher than the margin of victory in districts Republicans won, which provides further evidence of cracking and packing of Democrats. In 2014, the average vote share for successful Democratic candidates was 73.6%,

compared to 63.4% for successful Republican candidates (excluding uncontested elections). JSF ¶ 78. The 2016 average vote share was 75.2% for successful Democratic candidates and 61.8% for successful Republican candidates (excluding uncontested elections). JSF ¶ 82.

2. Expert Testimony Established That Republicans Won 2-5 More Seats Than They Otherwise Would Have

202. Dr. Chen's simulations establish that the partisan intent behind the 2011 plan has had significant effects on the number of congressional seats that Democrats have won in Pennsylvania. Tr. 204:16-205:6; Petrs. Ex. 1 at 27.

203. First, Dr. Chen's simulated plans in Simulation Set 1 establish that Republicans have won 4 to 5 more seats under the 2011 plan than they would have won under a plan that followed only traditional districting criteria. Tr. 204:16-205:6.

204. Second, Dr. Chen's simulated plans in Simulation Set 2 establish that Republicans have won an extra 2 to 5 seats under the 2011 plan than they would have under a plan that both followed the traditional districting criteria and intentionally avoided pairing 17 of 19 incumbents. Petrs. Ex. 1 at 27.

205. Dr. Chen's robustness analysis confirms these effects. Using the 2012-2016 statewide elections to measure partisanship rather than the 2008-2010 statewide elections, Dr. Chen found almost identical results in the number of additional seats that Republicans have won under the enacted plan relative to the

simulated plans in each Simulation Set. Petrs. Exs. 19-20. Dr. Chen's analysis leaves no room for doubt that the partisan intent behind the 2011 Plan has resulted in Republicans winning several additional congressional seats in Pennsylvania.

3. Dr. Warshaw's Expert Testimony Established That the 2011 Map's Pro-Republican Advantage Is Historically Extreme

206. Christopher Warshaw, Ph.D., is a Pennsylvania native and political scientist at George Washington University who was accepted as an expert in American politics with specialties in political representation, public opinion, elections, and polarization.

207. The purpose of a partisan gerrymander is to ensure that the advantaged party translates its votes into seats as efficiently as possible, while the disadvantaged party translates its votes into seats as inefficiently as possible. Tr. 839:6-21; Petrs. Ex. 35 at 4 (Warshaw Report). The goal is to make the advantaged party win as many seats as possible, given their number of votes. Tr. 839:22-24. Conversely, a partisan gerrymander attempts to "waste as many of [the] opponent's voters as possible." Tr. 840:17-20.

208. The Efficiency Gap is a measure for evaluating the partisan bias in a plan that picks up on the basic intuition that "what gerrymandering is ultimately about is efficiently translating votes into seats by wasting as many of your opponent's supporters as possible and as few as possible … of your own." Tr.

840:1-8. It directly captures the cracking and packing that is at the heart of gerrymandering. Tr. 852:15-853:6.

209. The efficiency gap is calculated by comparing the number of votes that each party "wastes" in a given election. Tr. 841:2-10. A party wastes all votes in any congressional district where its candidate loses (i.e., in cracked districts). When a party wins in a particular congressional district, the wasted votes are those above the 50%+1 needed to win (i.e., the excess votes in packed districts). Tr. 841:2-10. The basic equation to calculate the Efficiency Gap is as follows:

$$EG = \frac{W_R}{n} - \frac{W_D}{n}$$

Petrs. Ex. 35 at 6.

210. The Efficiency Gap is one party's total wasted votes in an election minus the other party's total wasted votes, divided by the total number of votes cast (n in the equation above). It captures in a single number the extent to which one party's voters are more cracked and packed than the other party's voters. Tr. 841:6-24; Petrs. Ex. 35 at 6. Because the Efficiency Gap is a percentage of the total votes cast in the election, the Efficiency Gap is comparable across time and across states. Tr. 842:15-843:13; Tr. 853:7-20.

211. In a hypothetical congressional districting plan involving 3 districts with 100 people each, where the Democrats win 80 to 20 in District 1 and the

Republicans win 60-40 in Districts 2 and 3, there would be a pro-Republican Efficiency Gap of 24%. In that hypothetical, the Democrats wasted 29 votes (80 minus the 51 needed to win) in District 1 and 40 votes in Districts 2 and 3, for a total of 109 wasted Democratic votes. The Republicans in that hypothetical waste 20 votes in District 1 and 9 votes in Districts 2 and 3 (60 minus the 51 needed to win), for a total of 38 wasted votes. Accordingly, the Efficiency Gap is 38/300 minus 109/300, for a 24% pro-Republican advantage. Tr. 844:18-848:20.

212. An advantage of the Efficiency Gap is that it can be calculated directly from actual congressional election results. Tr. 851:20-852:6; 853:21-23.

213. Dr. Warshaw calculated the Efficiency Gap across every state in the country in every congressional election between 1972 and 2016. Tr. 863:7-13. Respondents offered no challenge to his calculations. Tr. 1487:17-22.

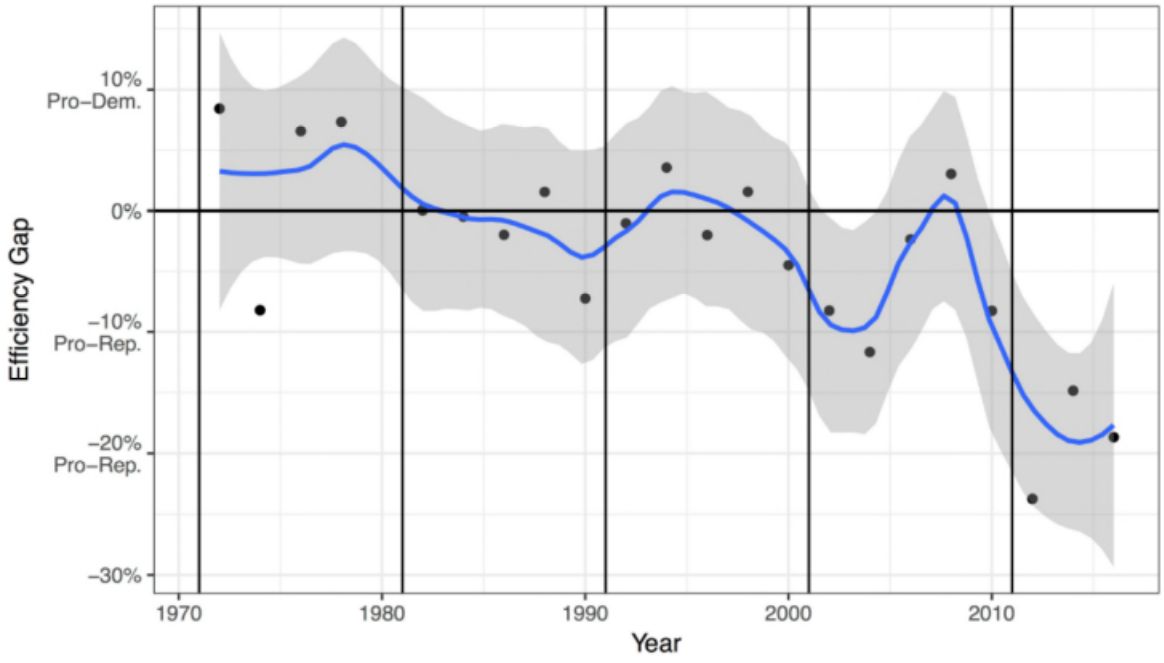
214. A large degree of partisan bias in a particular congressional election, as measured by the Efficiency Gap, is historically rare. The vast majority of Efficiency Gaps lie close to zero. Across all congressional elections since 1972 in states with more than 6 congressional seats, 75% of Efficiency Gaps show a 10% or less advantage for either party, and 96% of Efficiency Gaps show a 20% or less advantage for either party. Tr. 865:2-866:10; Petrs. Ex. 35 at 7-8; Petrs. Ex. 37.

215. The Efficiency Gap is not a measure of partisan bias that inherently or consistently favors either party. Tr. 866:17-867:18. Across history, sometimes

the Democrats have held an advantage as measured by the Efficiency Gap, and sometimes the Republicans have held an advantage. Tr. 866:17-867:18; Petrs. Ex. 38. There is no basis for concluding that Republicans have a substantial long-term advantage in the Efficiency Gap due to political geography or any other factor. Tr. 867:6-12.

216. The historical norm in Pennsylvania is a partisan bias relatively close to zero, as measured by the Efficiency Gap. Tr. 870:7-9.

217. Petitioners' Exhibit 40 plots the Efficiency Gap in Pennsylvania in every congressional election year between 1972 and 2016:



Warshaw Figure 4: Historical Trajectory of the Efficiency Gap in Pennsylvania. Each vertical line shows the demarcation between decennial redistricting plans. The blue line shows the moving average and the grey bar is a confidence interval. The dots represent the Efficiency Gaps in each year in Pennsylvania.

Petrs. Ex. 40

218. The partisan bias in Pennsylvania's 2011 map is historically extreme, both in comparison to prior Pennsylvania maps and other states' maps. Petrs. Ex. 42. The following undisputed chart illustrates the Efficiency Gaps in Pennsylvania relative to other states between 1972 and 2016:

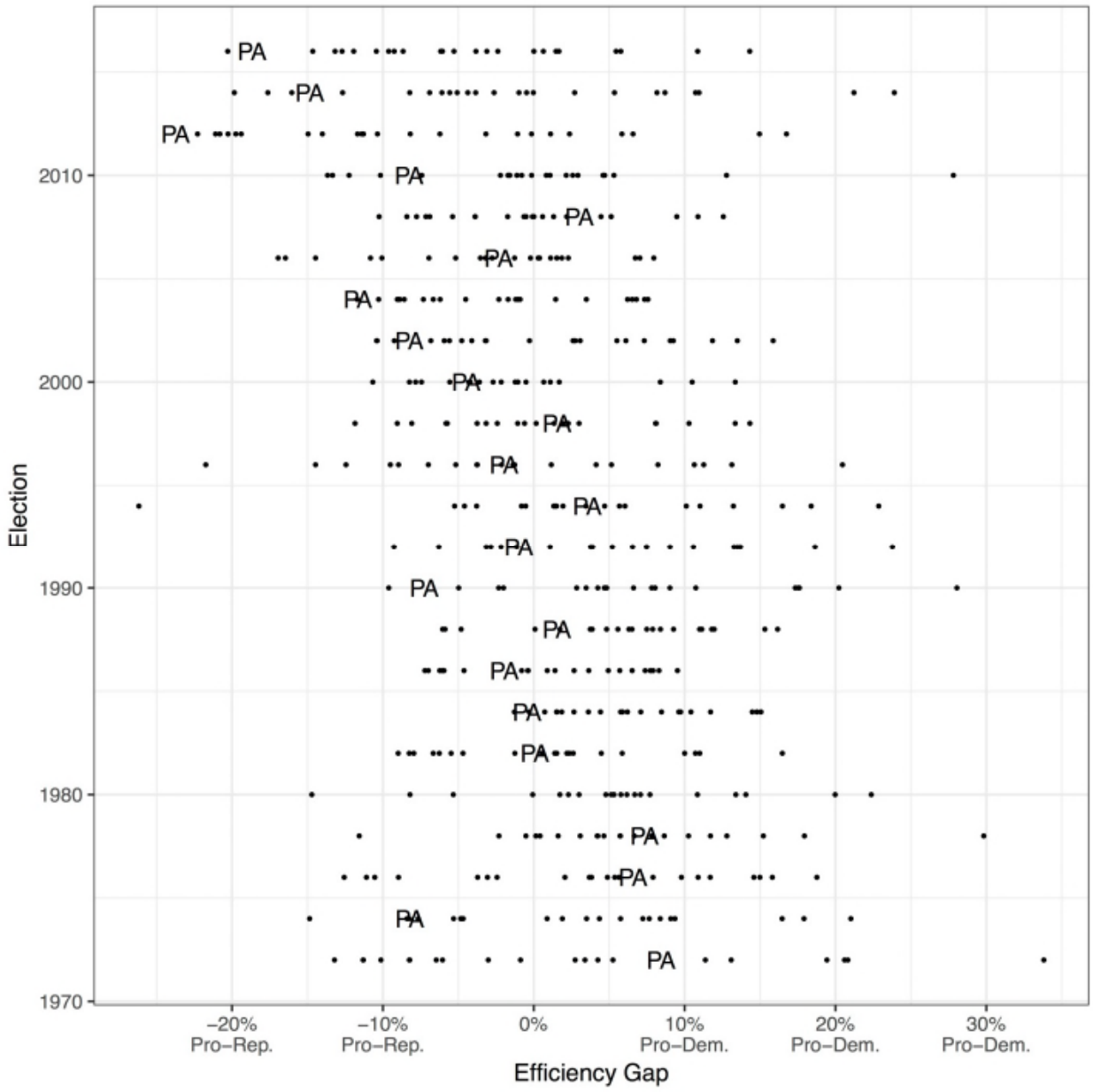


Figure 5: Efficiency Gap in Pennsylvania Relative to Other States. The dots represent the Efficiency Gaps in individual states. The Efficiency Gaps in Pennsylvania are labelled to distinguish them from other states.

Petrs. Ex. 42.

219. The partisan bias in Pennsylvania's 2011 districting plan is the largest in Pennsylvania history. Pennsylvania had a pro-Republican Efficiency Gap of 24% in the 2012 congressional elections, 15% in 2014, and 19% in 2016. Tr. 871:3-25. Prior to the 2011 redistricting plan, Pennsylvania had never once had an Efficiency Gap of 15% or greater in favor of either party, and only one time had an Efficiency Gap of even 10% or greater in favor of either party. Tr. 872:1-10.

220. The partisan bias in the 2011 plan is also extreme relative to the country as a whole. Pennsylvania's pro-Republican Efficiency Gap in the 2012 election was the largest in the country that year, and the second largest in modern history in any state. Tr. 874:11-16; 876:2-8; Petrs. Ex. 42. Averaging across all three elections to date under the plan, Pennsylvania had an average pro-Republican Efficiency Gap of 19%. Tr. 876:17-877:16. No other state save North Carolina had a larger average Efficiency Gap over the past three election cycles, and North Carolina only beat Pennsylvania by one percent. Tr. 876:17-877:16.

221. The partisan bias in the 2011 plan as measured by the Efficiency Gap gave Republicans an extra 3 to 4 congressional seats, on average, in each of the three congressional elections that have been held under the plan. Tr. 873:9-22.

222. The extreme partisan bias in the 2011 plan, as measured by the Efficiency Gap, cannot be attributed to Pennsylvania's political geography. Tr. 878:10-880:10. Although natural clustering of voters could theoretically contribute to partisan bias, the fact that the Efficiency Gap grew 15 percentage points more pro-Republican between the 2010 and 2012 elections indicates that the 2011 plan, rather than Pennsylvania's natural political geography, is responsible for the bias. Tr. 878:10-880:10. Political geography tends to change slowly, Tr. 879:17-23, as Legislative Respondents' expert Dr. McCarty agreed, Tr. 1587:8-10. No possible change in political geography could have led to the dramatic shift in the Efficiency Gap that occurred in Pennsylvania following the 2011 redistricting. Tr. 879:17-23. Legislative Respondents presented no contrary evidence; their expert "did not conduct any analysis to determine whether geographic factors" could cause the bias of the 2011 plan. Tr. 1587:3-7.

223. Although Efficiency Gaps can be volatile in states with only a few congressional seats where there are several toss-up, 51-49 districts, that does not affect the usefulness of the measure in evaluating the partisan bias in the 2011 plan. Dr. Warshaw's principal analysis focused on states with more than 6 congressional seats, where the Efficiency Gap is not volatile. Tr. 891:17-892:11. When he did a robustness check to find out whether the results held when comparing Pennsylvania to states with fewer than six congressional seats, he found

that they did. Tr. 892:23-893:12. The potential volatility of an Efficiency Gap in states with several 51-49 districts is not relevant to the analysis, because that is not a real world scenario. Tr. 1035:5-11. Nobody gerrymanders a congressional map by creating a lot of 51-49 districts, and that is not what Pennsylvania's map looks like. Tr. 1034:10-1035:11. Across the three elections following the 2011 redistricting cycle, the closest race was 52-48, the next closest after that was 55-54, and the average winning percentage in any contested district never dropped below 59% for the Republicans and 74% for the Democrats. JSF ¶¶ 73, 78, 82.

224. The partisan bias in the 2011 plan, as measured by the Efficiency Gap, will persist across the life of the plan and is unlikely to be remedied through the normal electoral process. Dr. Warshaw analyzed the durability of Efficiency Gaps across the nation in the elections following the 2011 redistricting, and found a "very high correlation" of 0.82. Tr. 889:14-25; Petrs. Ex. 39. He found that across the country, Efficiency Gaps in 2012 "are extremely predictive" of Efficiency Gaps in 2016, and the same is true in Pennsylvania. Tr. 890:1-5. In other words, the post-2011 Efficiency Gaps have persisted across three elections. Because the Efficiency Gaps immediately after the 2011 redistricting predict the vast majority of variation in Efficiency Gaps four years later in the 2016 election, the normal electoral process is unlikely to provide a remedy. Tr. 890:22-891:4; Petrs. Ex. 39.

225. Legislative Respondents' expert Dr. McCarty did not dispute that Pennsylvania's Efficiency Gap following the 2011 redistricting has been durable. Dr. McCarty testified that he did not believe that Efficiency Gaps were durable because Pennsylvania's pro-Republican Efficiency Gaps after the 2002 redistricting had persisted through two elections, but then swung back in the third. Tr. 1487:1-8. Dr. McCarty did not testify that any prior Pennsylvania plan had exhibited stable, durable Efficiency Gaps for the first three elections and then reverted to the mean.

226. Dr. Warshaw offered unrebutted testimony that the variability in the Efficiency Gap today is "much smaller" than it was in previous decades. Tr. 997:14-18. Dr. Warshaw testified that Efficiency Gap vacillation during a districting cycle in prior decades did not imply that the normal political process could remedy the partisan bias in the current plan, because the magnitude of the partisan bias in past plans was in every case much smaller than it was today. Tr. 1017:5-16. Dr. McCarty did not point to any historical example in which Efficiency Gaps of the magnitude currently seen in Pennsylvania dissipated within the life of a redistricting plan.

227. Dr. Warshaw ultimately concluded that "there is a large and durable Republican advantage in the districting process in Pennsylvania that spiked dramatically after the 2011 Plan went into place." Tr. 836:18-21.

E. The 2011 Map Disadvantages Petitioners and Other Democratic Voters in Electing Candidates of Their Choice

228. Petitioners are eighteen individual Pennsylvania voters, one from each congressional district. All of the Petitioners are registered Democrats who have consistently voted for Democratic candidates in congressional elections both before and after the enactment of the 2011 plan. *See* JSF ¶¶ 12-13, 19.

229. Petitioner Carmen Febo San Miguel is an Executive Director of a non-profit cultural organization and a former physician who resides in the 1st District in Philadelphia. Petrs. Ex. 163 (Febo Dep.) 6:23-7:10; 19:6 -11; JSF ¶ 12. The 2011 map dilutes Dr. Febo San Miguel's vote. Petrs. Ex. 163 (Febo Dep.) 9:7-8; 36:7-13. Although Dr. Febo San Miguel is in a packed Democratic district and thus able to elect a Democratic congressperson, this leaves "another district with less Democrats," and "maybe the other district would also choose a Democrat if there were a better distribution based on where people live, not what people practice in terms of the party that they practice." *Id.* at 34:6-22. This packing and cracking harms Dr. Febo San Miguel because she "cannot expect that [her] vote has the same strength and value to defend and move and push forward the agendas that [she] believe[s] in." *Id.* at 41:14-19.

230. Petitioner James Solomon is a retired federal employee who resides in the 2nd District in Philadelphia. Petrs. Ex. 164 (Solomon Dep.) 7:2-22. As a resident of "one of the poorest cities in the nation," Mr. Solomon is concerned

about food insecurity, basic shelter needs, and inequitable schoolfunding. *Id.* at 22:2-11. Mr. Solomon's "voice is ignored" because of "the imbalance in the number of representatives based on party affiliation." *Id.* at 21:2-21:10.

231. Petitioner John Greiner, a software engineer who owns his own business, resides in the 3rd District in Erie, Erie County. Petrs. Ex. 168 (Greiner Dep.) 7:18-25; JSF ¶ 12. Under the prior map, Mr. Greiner was able to vote for and elect a Democratic congressional candidate. Petrs. Ex. 168 (Greiner Dep.) 12:20-22; 19:20-23. But the 2011 map splits Erie County, which has a large Democratic population, between the reliably Republican 3rd and 5th Districts. *Id.* at 14:12-13; 17:22-18:19; 19:3-10. As a result, Mr. Greiner is no longer able to be represented by a Democratic congressperson. *Id.* at 19:11-21:24. Also as a result of splitting Erie County, no congressperson needs "to pay close attention to the constituents in Northwestern Pennsylvania." *Id.* at 18:10-13. Beyond the borders of his own district, Mr. Greiner is harmed by the 2011 map because the large Pennsylvania majority hinders any Democratic initiatives in the House of Representatives. *Id.* at 42:3-42:14. Mr. Greiner wants a map that gives "a Democratic candidate a better chance to get elected." *Id.* at 43:10-43:14.

232. Petitioner John Capowski, a law professor emeritus at Commonwealth Law School in Harrisburg, resides in the 4th District in Camp Hill, Cumberland County. Petrs. Ex. 166 (Capowski Dep.) 6:4-16; JSF ¶ 12. The 2011 map harms

Professor Capowski because a Democratic candidate for Congress in the 4th District has "no chance of winning." Petrs. Ex. 166 (Capowski Dep.) 24:9-19.

233. Petitioner Gretchen Brandt, a mother of two and a school board director, resides in the 5th District in State College, Centre County. Ms. Brandt "already know[s] the winner of [her] particular district." Petrs. Ex. 165 (Brandt Dep.) 14:19-21. The 2011 map results in "no competition among candidates for the U.S. House." *Id.* at 14:8-9. The shape of the 5th District results in "the Democratic Party producing unqualified candidates because the Democratic Party knows that a Democrat will not win in that district based on the way the lines are drawn." *Id.* at 35:20-35:25. Ms. Brandt further testified that "when the lines of the U.S. House districts are drawn to, in my case, dilute my vote, then it is not really representational democracy. " *Id.* at 25:7-10. Ms. Brandt's district "is not a competitive district based on the way the geographic lines are drawn for the district. And so because we don't have good highly qualified candidates, we don't even have discussions about issues." *Id.* at 34:22-35:2.

234. Petitioner Thomas Rentschler, an attorney, resides in the 6th District in Exeter Township, Berks County. Tr. 668:23-669:2; JSF ¶ 12. Mr. Rentschler has three children and two stepchildren who depend on the Affordable Care Act for health insurance and the ability to deduct student loan debt. Tr. 669:4-8; 675:10-21; 676:20-677:15. Mr. Rentschler himself depends on the preexisting condition

protections under the Affordable Care Act as he has Type 1 diabetes. Tr. 674:13-675:7. Mr. Rentschler votes in all primaries and general elections because it is his "civic duty to select people who represent me." Tr. 669:19-24. He testified that the 2011 map "has unfairly eliminated my chance of getting to vote and actually elect a Democratic candidate just by the shape and design of the district." Tr. 673:25-674:9. The 2011 map separates Mr. Rentschler from Reading, which is two miles from his house and the seat of Berks County, pairing Mr. Rentschler with communities in eastern Lebanon County with which he has no connection. Tr. 681:9-682:4. Mr. Rentschler testified that "the 2011 Plan has really diluted what I believe is my participation in the voting process and in selecting leaders. I believe that the plan has been so structured so that politicians have picked their voters in so many places, and that's not the way that it should work. We should be picking our elected representatives. And I believe that we've been picked by the politicians and we just fill in their slots for what they need." Tr. 682:5-16.

235. Petitioner Mary Elizabeth "Beth" Lawn, a mother and grandmother who works as a chaplain at a retirement community, lives in "Goofy's finger" in the 7th District in Chester, Delaware County. Tr. 134: 24; 138:1. Ms. Lawn votes in every election because she considers it her "duty as a citizen to participate, that if I want to have an impact, if I want to have a possibility of having my voice heard, of having the things that are important to me, the things that I value to be

listened to and to have some chance of . . . being enacted, that I need to vote." Tr. 136:13-20. Under the prior map, Ms. Lawn's home fell in the 1st district, where she was able to elect a Democratic congressman. Tr. 138:20-24; 139:6-12. But under the 2011 map, Ms. Lawn was moved to the 7th District, where Republican Congressman Pat Meehan has been elected. Tr. 138:17-139:9. As a result, she is in a "district now that is largely Republican, and it's safe for Republicans, so the Democratic candidate doesn't really have a chance." Tr. 140: 8-18. The Affordable Care Act is important to Ms. Lawn because her son, who was disabled at age 25 in an accident, depends in part on Medicaid. Tr. 142: 20-25. Ms. Lawn is also deeply concerned about income inequality. Tr. 141:2-9. But Congressman Meehan voted to repeal the Affordable Care Act and is one of the sponsors of the current tax bill. Tr. 143:9-16; Tr. 144:7-13. Ms. Lawn noted that Pennsylvania was founded by William Penn and that the Pennsylvania Constitution reflects the Quaker values of "fairness, of equality, of integrity, of community, of care for each other and that these are essential to our . . . engagement with each other in a democracy and . . . are being threatened." Tr. 147:3-17.

236. Petitioner Lisa Isaacs, an attorney, resides in the 8th District in Yardley, Bucks County. Petrs. Ex. 170 (Isaacs Dep.) 5:21-23. JSF ¶ 12. Under the prior map, voters in the 8th district had elected both Republican and Democratic congressman. Petrs. Ex. 170 (Isaacs Dep.) 27:7-9. Since the 2011 map was

enacted, Republican Michael Fitzpatrick and then his brother Republican Brian Fitzpatrick have represented Ms. Isaacs. *Id.* at 22:4-225, 23:8-12. The 2011 map harms Ms. Isaacs because "the drawing of the district has skewed the outcome just enough to dilute the Democratic vote in the district." *Id.* at 26:22-27:3. Election outcomes are "fait accompli" in the 8th District. *Id.* at 29:6-7. Ms. Isaacs's congressman fails to represent her on important issues such as "gun rights, gun control, . . . abortion rights . . . he voted to repeal the Affordable Care Act. He voted for the tax reform." *Id.* at 47:7-19.

237. Petitioner Don Lancaster, a retired special education teacher who has twice been elected to his borough council, resides in the 9th District in Indiana County. Petrs. Ex. 164 (Lancaster Dep.) 8:19-20; 9:13-9:18. The 2011 map splits communities of interest in the 9th District, pairing vastly different rural, agricultural regions with regions that are depressed former coal and industry based economies. *Id.* at 23:18-24:16, 44:1-7. Under the 2011 map, Democratic candidates "don't stand a chance" there. *Id.* at 28:12-13. Although Mr. Lancaster serves on bipartisan county boards, he receives no responses from his Republican congressman, Bill Shuster. The congressman "doesn't have to listen. He doesn't have to respond. He's still going to get elected." *Id.* at 33:13-15.

238. Petitioner Jordi Comas, an academic and chef who is very active in local politics, resides in the 10th District in Lewisburg, Union County. Petrs. Ex.

167 (Comas Dep.) 8:9-22, 11:25-14:10; JSF ¶ 12. It is now "virtually impossible for anyone to be even competitive" in his district. Petrs. Ex. 167 (Comas Dep.) 30:1-2. Mr. Comas is represented by Republican Congressman Tom Marino who is unresponsive on issues like the opioid crisis and gun control. *Id.* at 31:15-35:11. The 10th District splits the Susquehanna Valley and pairs parts of it with regions that have very different economic concerns. *Id.* at 40:5-8, 40:13-16. Having the region split into different congressional districts "means the very act of normal petitioning of the government is that much harder." *Id.* at 36:5-36:9.

239. Petitioner Robert Smith, a retired health executive, resides in the 11th District in Bear Creek Village Borough, Luzerne County. Petrs. Ex. 176 (Smith Dep.) 8:10-19; 9:9-10:10. Under the prior map, Mr. Smith was able to elect a Democratic congressman in several election cycles. *Id.* at 18:12-22; 19:21-24. But Republican congressman Lou Barletta has been Mr. Smith's representative since 2010. *Id.* at 17:6-7. Mr. Smith testified that "Congressman Barletta is assured of his seat under this redistricting and he doesn't really have to listen to me. He can be concerned about anybody running against him in the Republican Party more than he has to be concerned about a Democrat." *Id.* at 23:22-24:5.

240. Petitioner William Marx, a high school teacher in the Pittsburgh public school system who teaches U.S. History, Civics, and U.S. Government, resides in the 12th District in Delmont, Westmoreland County. Tr. 104:7-11; JSF

¶ 12. Previously, Mr. Marx was a Marine and an Army helicopter pilot, and he continues to serve in an Army Reserve unit. Tr. 16-23. Mr. Marx recently ran for and was elected to his borough council because when he "came back from deployment in January, I wanted to make the town that I was living in a little better place for my family. I was looking around and saw that there were some needs, so I decided to get on council to try to change." Tr. 105:13-18. Mr. Marx votes in every election—even school board elections—because "[o]ur founders really extolled . . . the benefits of having an engaged citizenry. Throughout our history, people have died to give me the right to vote, so I really honor them by voting. And it's one of those things where if I don't make my voice known, how are you going to know what I want." Tr. 106:23-107:3. Under the 2011 map, Mr. Marx was moved from the former 4th district to the current 12th District. Tr. 109:12-110:18. Under the prior map, Mr. Marx had been able to elect a Democratic congressman. Tr. 112:15-22. But now "there's no chance of a Democrat winning in this district," Tr. 113:12-14, and "the entire map of the state has really taken away any chance of having a Democratic majority Congressional delegation," Tr. 113:16-114:2. Since the enactment of the 2011 plan, Mr. Marx has been represented Republican Congressman Keith Rothfus. Tr. 111:4-112:14. Mr. Rothfus does not represent Mr. Marx's views on important issues such as the Affordable Care Act, the Violence Against Women Act, and anti-discrimination

legislation for gays and lesbians. Tr. 115:6-116:4. When Mr. Marx has called Congressman Rothfus's office, he gets a busy signal or a full voicemail box. Tr. 116:15-23. Congressman Rothfus doesn't hold town hall meetings. Tr. 117:9-11.

241. Petitioner Richard Mantell, a retired Philadelphia high school principal, resides in the 13th District in Jenkintown, Montgomery County. Petrs. Ex. 174 (Mantell Dep.) 7:6-18; JSF ¶ 12. As a voter in a packed Democratic district, Mr. Mantell is harmed by the 2011 map because the goal "was to pack Democrats into one boundary so that there would be less competition in other parts of the state or in other areas for the Republican candidate to win the election." Petrs. Ex. 174 (Mantell Dep.) 13:7-13:10. The 2011 map "singles out Democrats" and under it Mr. Mantell's "vote has been minimized." *Id.* at 18:19-18:20.

242. Petitioner Priscilla McNulty, a manager at a non-profit, resides in the 14th District in Pittsburgh, Allegheny County. Petrs. Ex. 173 (McNulty Dep.) 7:5-20; JSF ¶12. Ms. McNulty is harmed by the 2011 map because her "democratic positions have not been adequately represented in congress because the way the districts are drawn, the Democrats are unfairly—they can't win as many elections when the districts are drawn to favor the Republicans." Petrs. Ex. 173 (McNulty Dep.) 14:7-13. Ms. McNulty testified that "I can elect a Democrat which I appreciate, but my views that are generally supported by the Democratic party do not get fair examination or ability to be enacted because . . . the Republicans are

getting an unfair advantage in an overabundance of Republicans elected, so that drowns out the Democratic message." *Id.* at 66:8-67:3.

243. Petitioner Thomas Ulrich, a retired middle school teacher, resides in the 15th District in Bethlehem, Lehigh County. Petrs. Ex. 177 (Ulrich Dep.) 13:7-13; JSF ¶ 12. Mr. Ulrich cannot elect a Democratic congressperson because "the district is drawn so that it almost encourages people to not run against [Republican Congressman Charlie Dent]." Petrs. Ex. 177 (Ulrich Dep.) 21:13-21.

244. Petitioner Robert B. McKinstry, Jr., an environmental attorney, resides in the 16th District in East Marlborough Township, Chester County. Petrs. Ex. 175 (McKinstry Dep.) 13:3-4; JSF ¶ 12. Mr. McKinstry testified that the 2011 map harmed him because "the district was manufactured to keep a safe district for [Republican Congressman] Joe Pitts . . . who was a person who I knew did not represent me or my views and it was engineered to keep him in . . . power, and to have my vote diluted." Petrs. Ex. 175 (McKinstry Dep.) 101:11-19.

245. Petitioner Mark Lichty, a retired attorney and manufacturer, resides in the 17th District in East Stroudsburg, Monroe County. Petrs. Ex. 172 (Lichty Dep.) 8:11-15; 9:8-16. JSF ¶ 12. As a Democratic voter in a packed district, "the shape of [Mr. Lichty's] Congressional district affects the shape of the other Congressional districts and promotes gerrymandering." Petrs. Ex. 172 (Lichty Dep.) 43:17-21. The 2011 map harms him because "legislation that is important to

me just doesn't see the light of day . . . you have to look at the whole state and the configuration of the state." *Id.* at 33:19-34:8.

246. Petitioner Lorraine Petrosky, a retired preschool teacher, resides in the 18th District in Latrobe, Westmoreland County. Petrs. Ex. 171 (Petrosky Dep.) 14:22-15-8; JSF ¶ 12. Under the 2011 map, "pockets of Democrat were kind of moved away and put into other districts." Petrs. Ex. 171 (Petrosky Dep.) 43:7-10. Ms. Petrosky is unable to elect a Democratic congressman, *id.* at 41:16-18; in 2014 and 2016, she was unable even to vote for a Democratic candidate, *id.* at 85:8-15.

247. Dr. Chen's simulated plans leave no doubt that the 2011 enacted plan has deprived certain Petitioners of the ability to elect a candidate of their choice. Using the home address of each Petitioner, Dr. Chen analyzed the likelihood that each Petitioner would be in a Democratic-leaning district under the simulated plans. Tr. 268:21-270:17; Petrs. Ex. 1 at 35-38 (Chen Report).

248. Dr. Chen found that four Petitioners who currently reside in Republican-held districts—Beth Lawn (7th District), Lisa Isaacs (8th District), Robert Smith (11th District), and Thomas Ulrich (15th District)—would be in a Democratic district in a majority or even an overwhelming majority of the 1,000 simulated non-partisan plans. Tr. 280:4-19; Petrs. Ex. 18.

249. Petitioner Isaacs would be in a Democratic district in over 99% of the 1,000 simulated non-partisan plans. Tr. 277:19-279:4; Petrs. Ex. 18.

250. Petitioner Ulrich would be in a Democratic district in over 99% of the simulated plans in Simulation Set 1 and over 90% of the simulated plans in Simulation Set 2. Tr. 279:18-280:3; Petrs. Ex. 18.

251. Petitioner Lawn would be in a Democratic district in over 99% of the simulated plans in Simulation Set 1, and Petitioner Smith would be in a Democratic district in over 68% of the simulated plans in Simulation Set 1 and over 94% of simulated plans in Simulation Set 2. Tr. 279:18-280:3; Petrs. Ex. 18.

252. Petitioners' Exhibit 18 depicts the percentage of simulated plans in which each Petitioner would be placed into a Democratic-leaning district:

Chen Table 4: Petitioners' Districts in Act 131 and in Simulation Sets 1 and 2 Districting Plans
Percent of Simulated Plans Placing Petitioner into a Democratic District.

		Percent of Simulated Plans Placing Petitioner into a Democratic District:			
	Partisan Tilt of Petitioner's District In Enacted Plan (Act 131 Plan)	Simulation Set 1	Simulation Set 1: Plans Containing a District with BVAP > 56.8%	Simulation Set 2	Simulation Set 2: Plans Containing a District with BVAP > 56.8%
Carmen Febo San Miguel	1st Dist. (Democratic)	100%	100%	100%	100%
James Solomon	2nd Dist. (Democratic)	100%	100%	100%	100%
John Greiner	3rd Dist. (Republican)	7.6%	8.3%	5.2%	3.7%
John Capowski	4th Dist. (Republican)	0%	0%	0%	0%
Gretchen Brandt	5th Dist. (Republican)	1.0%	2.0%	0.4%	0%
Tom Rentschler	6th Dist. (Republican)	24.6%	12.7%	1.0%	3.7%
Beth Lawn	7th Dist. (Republican)	99.8%	100%	26.8%	11.1%
Lisa Isaacs	8th Dist. (Republican)	99.8%	100%	99.4%	98.1%
Don Lancaster	9th Dist. (Republican)	0.6%	0.5%	6.2%	7.4%
Jordi Comas	10th Dist. (Republican)	0%	0%	0.6%	0%
Robert Smith	11th Dist. (Republican)	68.4%	72.7%	94.4%	92.6%
William Marx	12th Dist. (Republican)	1.8%	1.5%	38.4%	40.7%
Richard Mantell	13th Dist. (Democratic)	100%	100%	100%	100%
Priscilla McNulty	14th Dist. (Democratic)	99.8%	100%	98.6%	100%
Thomas Ulrich	15th Dist. (Republican)	99.6%	99.0%	90.6%	77.8%
Robert McKinstry	16th Dist. (Republican)	8.8%	1.0%	7.0%	7.4%
Mark Lichty	17th Dist. (Democratic)	94.0%	95.6%	43.2%	46.3%
Lorraine Petrosky	18th Dist. (Republican)	1.8%	1.5%	37.6%	42.6%

Petrs. Ex. 18

253. Many districts are uncontested because of the gerrymander. After the Republican candidate won 64% of the vote in the 18th District in 2012, JSF ¶ 73, Democrats did not even contest the seat in 2014, JSF ¶ 76. As a result, Petitioner Lorraine Petrosky did not even have an opportunity to vote for a Democratic candidate. Petrs. Ex. 171 (Petrosky Dep.) 41:22-43:6, 84:1-10.

254. Nor did Petitioner Thomas Ulrich have an opportunity to vote for a Democratic candidate in the 15th District in 2014, JSF ¶ 76, even though he is placed in a Democratic district in over 99% of Dr. Chen' simulated plans in Simulation Set 1 and over 90% of the simulated plans in Simulation Set 2. Tr. 279:18-280:3; Petrs. Ex. 18.

255. In the 2016 congressional elections, the elections in the 3rd, 13th, and 18th Districts were all uncontested. JSF ¶ 83. There was no Democratic challenge in the 3rd and 18th Districts, depriving Petitioners John Greiner and Lorraine Petrosky of the opportunity to vote for a Democratic candidate. JSF ¶ 84.

256. Without competitive districts, promising future political leaders do not even bother running for office because they know they have no realistic likelihood of success. For example, Greg Vitali, a Democratic member of the Pennsylvania House of Representatives, testified that he contemplated a congressional run in the 7th District in 2012, but decided not to do so after he "saw the lines and analyzed the data and [saw] that it was no longer a competitive seat." Petrs. Ex. 179 (Vitali

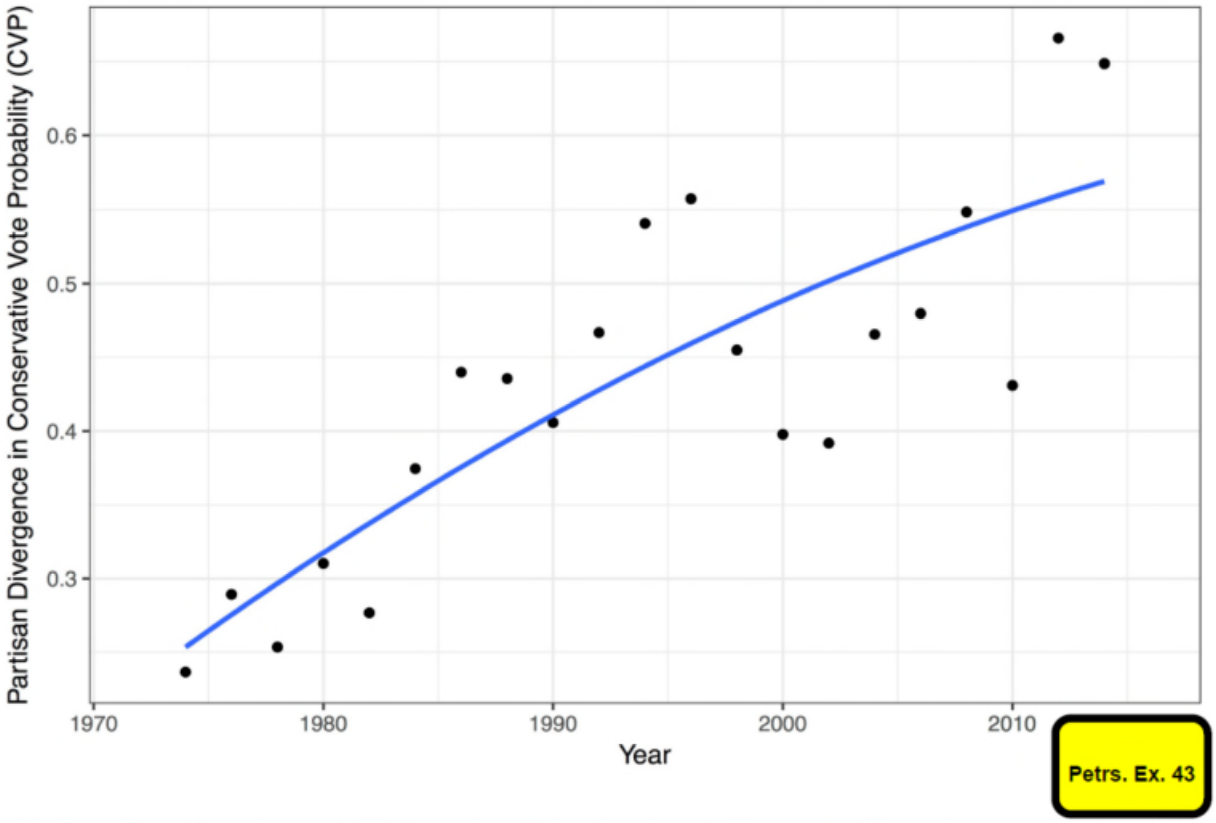
Dep.) 34:23-35:9. After "stud[ying] the maps and talk[ing] with people," Representative Vitali realized that running for Congress in the 7th District "would be a suicide mission." *Id.* at 35:21-23.

F. The 2011 Map Deprives Petitioners and Other Democratic Voters of an Effective Voice in the Political Process

257. Petitioners' expert Dr. Warshaw testified that the partisan bias exhibited in the 2011 map has extreme and negative representational consequences for Pennsylvania's voters. *See generally* Tr. 899:23-946:23. The overwhelming majority of his testimony on the representational consequences of gerrymandering was not rebutted at all, and none of that testimony was rebutted persuasively.

258. There is a consensus among political scientists that polarization in today's Congress is not only extremely large, but that it is much larger today than it used to be. Tr. 900:9-15. Polarization in Congress has increased dramatically over the past 40 years. Tr. 900:14-15.

259. In today's Congresses, there is a 65 percentage point difference in the percentage of time that Democratic and Republican members of Congress voted in a conservative direction. Tr. 903:4-15. Petitioners' Exhibit 43 demonstrates that the partisan divergence in voting behavior by Members of Congress has increased dramatically:



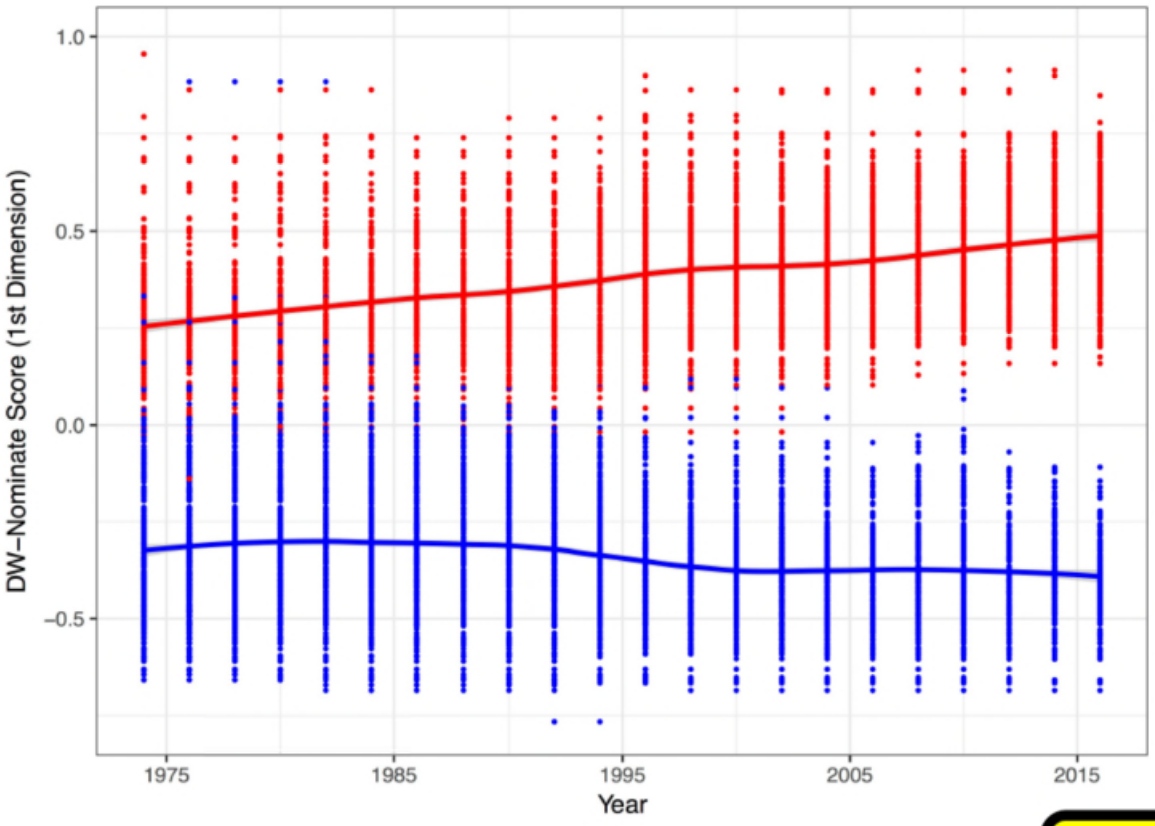
Warshaw Figure 6: Difference in the Proportion of the Time that Members of Each Party Vote Conservatively. The dots represents the averages in each year, and the line shows a moving average.

260. Today, every single Republican member of Congress is substantially more conservative than the most conservative Democrat. Tr. 911:11-13. There is no overlap between the parties. Tr. 911:10-11. If voters in a particular district elect a Republican to Congress instead of a Democrat, there is essentially a 100% chance that they will be substantially more conservative than the Democrat that would have been elected if the district had gone Democratic. Tr. 911:14-20. This testimony from Dr. Warshaw went unrebutted.

261. The gulf between the parties has widened over time. Tr. 912:12-19. There are now no moderates in either party who are similar to members of the

other party. Tr. 912:12-19. When Pennsylvania' prior congressional districting map was drawn, that was not the case. While Republicans were more conservative than Democrats on average in the early 2000s, there was still some overlap between the parties, including some individual Republican House members who were more liberal than the most conservative individual Democratic House members, and vice versa. Tr. 913:1-14; Petrs. Ex. 44.

262. Petitioners' Exhibit 44, shown below, maps the individual ideology of each member of Congress in every Congress since the early 1970s. Tr. 904:9-905:6; 909:6-14; 910:3-6. The red and blue dots indicate ideology scores for individual Representatives from each party, with higher numbers indicating a more conservative Representative and lower numbers indicating a more liberal Representative. Tr. 908:20-23; 909:6-14. The white space between the two parties at the right of the graph visually illustrates that every single Republican member of Congress today is more conservative than every single Democratic member. Tr. 911:5-13; 912:8-19. The red and blue horizontal lines show that the average ideology of Democrats and Republicans in Congress is also increasingly diverging. Tr. 908:15-23.



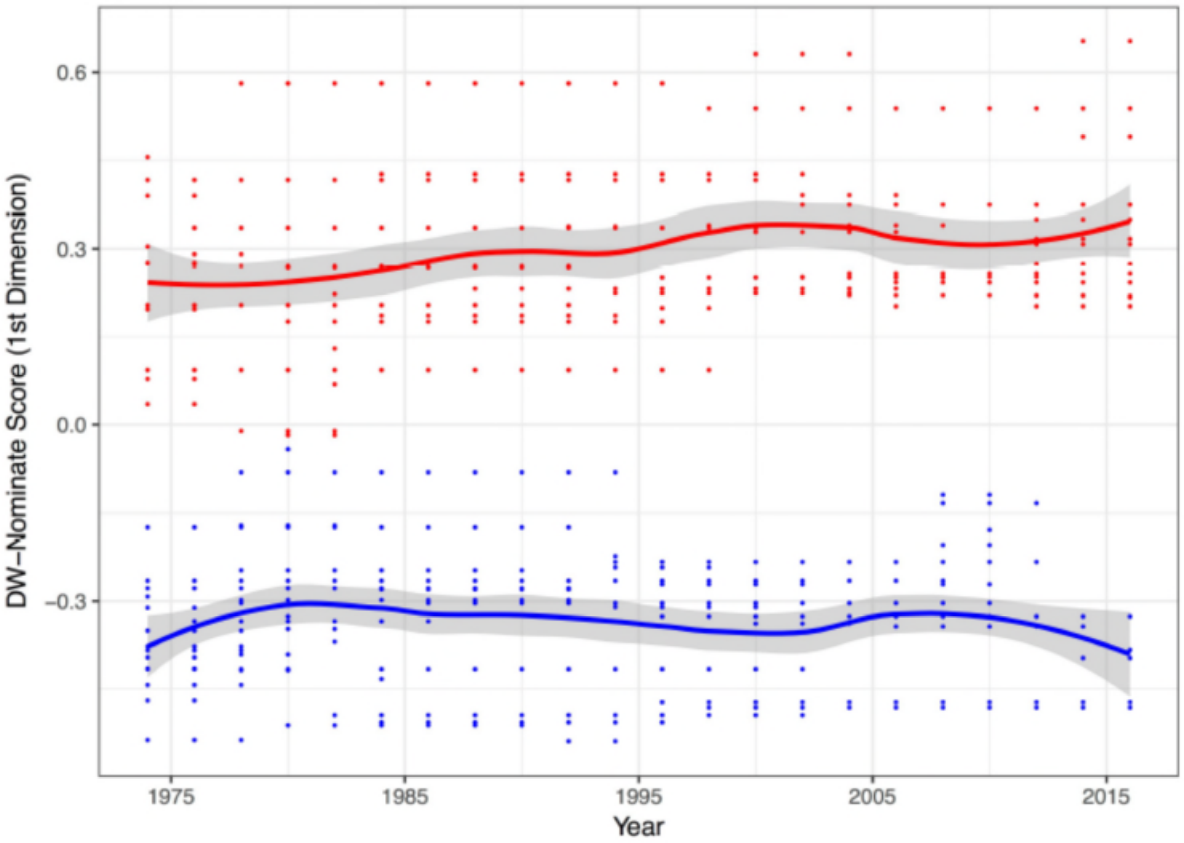
Warshaw Figure 7: The average ideology of members of each party.

Petrs. Ex. 44

263. The national trend of extreme polarization holds true in Pennsylvania. Today, there is no overlap among representatives from each party within Pennsylvania's congressional delegation. Tr. 922:1- 925:4; Petrs. Ex. 46. If a particular congressional district in Pennsylvania elects a Republican legislator instead of a Democratic one, there will be a vast difference in their voting behavior in Congress, and the Republican is going to be much more conservative than the Democrat would have been in that same district. Tr. 924:15-24.

264. Petitioners' Exhibit 46 (the top panel of which is shown below) demonstrates the growing gulf between Republican and Democratic members of

Pennsylvania's congressional delegation. Each dot represents a Republican or Democratic member of the delegation, and the white space in the chart illustrates that every Republican member of Pennsylvania's delegation is significantly more conservative than every Democratic member, and vice versa.



Petrs. Ex. 46.

265. Among the Pennsylvania delegation as a whole, there is today a very large, substantive difference between the average Democratic and Republican congressperson in Pennsylvania. Tr. 926:4-17; Petrs. Ex. 46.

266. Consensus among Pennsylvania legislators has also reached historic lows. Petrs. Ex. 35 at 20. There is no consensus among Pennsylvania legislators on issues facing the nation or the Commonwealth. Tr. 928:9-11. In prior decades, Pennsylvania legislators voted together in the U.S. House around 30% or even 40% of the time; in the most recent Congresses, Democrats and Republicans from Pennsylvania vote together less than 10% of the time. Tr. 927:7-928:8.

267. After the 2012 elections, members of Pennsylvania's congressional delegation voted with the majority of their own party in Congress virtually all the time. Tr. 930:5- 932:24; Petrs. Ex. 48. On average, Pennsylvania's representatives took the same position as the majority of their own party 93% of the time, and 90% of the time counting only non-unanimous votes (*i.e.*, excluding non-controversial votes like naming post offices). Tr. 932:16-24; Petrs. Ex. 48.

268. This effect holds even for members of Congress who were elected in more competitive races. Members of Congress do not take more moderate positions simply because they represent a more moderate district. Tr. 917:2-921:3. For example, the most competitive election in the 2012 congressional elections in Pennsylvania was the 12th District, where Republican Keith Rothfus won with about 52% of the vote. Tr. 934:12-25; Petrs. Ex. 41. But Congressman Rothfus still votes with a majority of members of his own party 96% of the time. Tr.

935:6-9; Petrs. Ex. 48. That is more than Tom Marino, who won with 66% of the vote in 2012. Petrs. Ex. 48; Petrs. Ex. 41; JSF ¶ 73.

269. Legislative Respondents had no persuasive rebuttal to any of Petitioners' evidence regarding polarization. Legislative Respondents' expert Dr. McCarty testified on direct that Figure 5 of his report showed that "as districts become more competitive, the differences between the two parties become much smaller." Tr. 1479:7-18; *see* Leg. Resps. Ex. 18 at 7. He testified on direct that this showed that because districts in Pennsylvania are purportedly "reasonably competitive," Tr. 1497:7-11, Democratic voters in any competitive, "slightly Republican" districts where Republicans won would purportedly receive "more moderate" representation from their Republican congresspersons, Tr. 1481:11-24. He testified that Figure 5 showed that "Democrats and Republicans who represent competitive districts tend to be more moderate." Tr. 1482:15-20.

270. But Dr. McCarty undermined his own conclusions on cross-examination. First, Dr. McCarty acknowledged that in his academic work, he had taken the exact opposite position, and had conducted research showing that Democrats and Republicans who represent moderate districts are not more moderate. Dr. McCarty explained that in a figure in one his articles that was "exactly the same idea" as Figure 5, he had concluded that "Republican representatives from districts with a given presidential vote are much more

conservative than are Democratic representatives from districts with similar presidential votes." Tr. 1576:1-1577:1; Petrs. Ex. 266 at p.671. The article described this as a "large gap between Republican and Democratic [ideology] scores" in districts with the same presidential vote share. Petrs. Ex. 266 at p.670. Dr. McCarty similarly wrote in a Washington Post op-ed that "polarization has grown because Democrats and Republicans are representing moderate districts in increasingly extreme ways." Tr. 1579:14-23.

271. Confronted with this contradiction, Dr. McCarty agreed on cross-examination that "Members of Congress are taking positions that are more extreme than the average voter in their district." Tr. 1586:13-16. He agreed that there was "no real overlap" of Democratic and Republican legislators in "moderate districts." Tr. 1575:2-10. Dr. McCarty confirmed his agreement that the consequence of that fact was that polarization could lead to "poor representation." Tr. 1586:17-21.

272. Dr. McCarty's second premise—that Pennsylvania has "reasonably competitive" districts, Tr. 1497:7-11—is not credible either. Dr. McCarty acknowledged on cross-examination that Pennsylvania's districts under the 2011 plan are neither moderate nor competitive. Tr. 1580:11-20, 1582:1-3, 1582:4-17, 1582:18-1583:20. In particular, of the 54 congressional elections held under the 2011 plan (18 seats times 3 elections), only one was even plausibly described as competitive. Tr. 1583:10-20. In other words, Dr. McCarty suggested that the

average partisanship of a legislator in a competitive district would be in the middle—this was the purple line he drew on Figure 5. Tr. 1482:6-14, 1572:21-1573:1. But given his acknowledgment on cross that Pennsylvania's districts are not competitive, the average partisanship is irrelevant to the analysis.

273. Petitioners' expert Dr. Warshaw persuasively testified that combining a partisan gerrymander with the immense polarization in Congress creates stark and negative representational consequences for Pennsylvania's voters. If Pennsylvania voters in a particular district are unable to elect someone of their own party, voters in that district are unlikely to see their preferences represented by their representatives, and effectively have no voice in Congress via their representative. Tr. 933:18-22. Even in a close district, Democratic voters with a Republican congressperson have essentially no influence on that congressperson, and it is very unlikely that their preferences are going to be reflected in their congressperson's roll call votes in Congress. Tr. 936:5-10.

274. Dr. Warshaw testified that because of the partisan bias of the 2011 map, many Democratic voters are unable to elect a representative of their choice. And because Democrats and Republicans in Congress almost always vote the party line, Pennsylvanians who are shut out of the political process by not being able to elect a representative of their choice effectively have no voice in Washington and no influence on how their member of Congress votes. Tr. 947:10-948:3.

275. Dr. Warshaw testified that, based on the partisan bias of the 2011 map and the gulf between the parties, Democratic voters in Pennsylvania whose votes are wasted through cracking have little or no voice in Washington. Tr. 837:21-838:1. The majority of Democratic voters in Pennsylvania live in districts that Republicans won, and Democratic voters in Pennsylvania whose votes are "wasted" in cracked districts—*i.e.*, districts Democrats lost—constitute 80 percent of the total wasted votes by Democrats in Pennsylvania. Tr. 1020:18-25.

276. Dr. Warshaw testified to his opinion that the availability of alternative forms of expression, like writing an op-ed, cannot make up for an inability to influence a member of Congress. The key feature of democratic representation is the ability of citizens to affect the lawmaking process in Congress through elections. Tr. 948:10-13. Dr. Warshaw concluded that gerrymandering has large and pernicious effects on democratic representation in our country. Tr. 948:17-19.

277. Although Dr. Warshaw did not testify that gerrymandering causes polarization, his unrebutted analysis showed that a pro-Republican shift in a state's Efficiency Gap leads to a quantifiably more conservative congressional delegation. In other words, because a more pro-Republican Efficiency Gap leads to more Republican legislators in any particular state, it also leads to a more conservative congressional delegation overall. Tr. 904:20-25, 937:24-938:9, 940:6-15, 940:23-25; Petrs. Ex. 49.

278. Dr. Warshaw concluded that if the Efficiency Gap moves in a Republican direction, as in Pennsylvania, the Members of Congress from that state are going to take much more conservative roll call positions than one would see in a state with a partisan-neutral Efficiency Gap. Tr. 942:1-6.

279. Dr. Warshaw concluded that Republican representatives in districts where Democratic voters are cracked are unlikely to represent those voters on the most important issues of the day. Tr. 942:20-946:15. He analyzed the congruence between public opinion and legislative votes on the Affordable Care Act, and how partisan bias affected that congruence. Dr. Warshaw concluded that in states with a pro-Republican Efficiency Gap, like Pennsylvania, Republican voters are much more likely to agree with their legislators' votes on Affordable Care Act repeal. Tr. 945:18-24. Conversely, in states with a pro-Democratic advantage in the Efficiency Gap, Democrats are more likely to agree with their legislators. Tr. 945:25-946:6; Petrs. Ex. 50. Dr. Warshaw concluded that voters are extremely unlikely to see their preferences on major bills translated into action in Congress when their legislator is from the opposite party. Petrs. Ex. 35 at 24.

280. Petitioners' testimony confirms that the extreme bias of the 2011 map has deprived them of any effective voice in Congress. Petitioner Bill Marx, who lives in the heavily Republican 12th District, testified that 2011 map has "really taken away my voice, because I have no hope of expressing my voice and making

it heard." Tr. 113:23 - 114:2. And the 2011 has also "taken away any chance of having a Democratic majority Congressional delegation." Tr. 113:16-22.

281. Petitioner Priscilla McNulty, in the 14th District, testified that "Pennsylvanians are deprived a full voice" because Republicans have an unfair advantage in winning seats. Petrs. Ex. 173 (McNulty Dep.) 67:3. "[L]aws that are enacted in Washington, it requires more than just Mike Doyle's point of view to get our issues addressed." *Id.* at 66:20-25.

282. John Capowski testified that "there may be no political or social views that [his Republican congressman] and [Professor Capowski] have in common," Petrs. Ex. 166 (Capowski Dep.) 17:7-16, and "in terms of voting, [he] seems to be a party line Republican," *id.* at 17:23-24. Professor Capowski testified that "not only am I not represented by someone who shares my view, the Pennsylvania Congressional Delegation does not share or represent my views." *Id.* at 37:25-38-11.

283. Petitioner Bob Smith's Republican congressman "supports the Republican party 95% of the time and so there are things enacted that [Mr. Smith] is totally in disagreement with." Petrs. Ex. 176 (Smith Dep.) 30:18-21. Mr. Smith testified that "I don't feel as though I have a voice in congressional affairs." *Id.* at 23:22-23.

284. The 2011 map "negated" Petitioner Don Lancaster's "vote and the votes of people like [him]self." Petrs. Ex. 164 (Lancaster Dep.) 27:20-27:24.

285. Since the enactment of the 2011 plan, Jordi Comas (10th District) testified that "if I want to try to effect the final outcome, I have to change my registration. Aside from not wanting to do that . . . I would have to make a choice. Do I care more about having a vote in the Republican primary, which is the only way to have a meaningful vote—and then I have to sacrifice what else is up in 2016." Petrs. Ex. 167 (Comas Dep.) at 56:14-24.

286. Beth Lawn, in the 7th District, is unable "to elect a candidate of my choice" and is "just shut out." Tr. 148: 8-18. Ms. Lawn testified that she is "very frustrated, because we feel we can't make a difference. We can't get the attention of our representative, because he's just not available to us; he doesn't have to listen to us; there's no incentive for him to do that." Tr. 145:22-146:2.

287. Petitioners Tom Rentschler, Lisa Isaacs, Gretchen Brandt, and Robert McKinstry testified that their representatives do not represent their views on issues like the Affordable Care Act, tax policy, reproductive rights, gun control, and the environment, and simply vote with their party leadership. Tr. 675:22-676:3, 676:4-14 (Rentschler); Petrs. Ex. 170 (Isaacs Dep.) 47:7-19 ; Petrs. Ex. 175 (McKinstry Dep.) 73:9-74:4; Petrs. Ex. 165 (Brandt Dep.) 40:15-21, 68:11-69:5. Their Republican congressmen vote "with the party leadership very consistently." Petrs.

Ex. 175 (McKinstry Dep.) 75:14-16. It was "hard for" Ms. Brandt "to think of an issue where I have heard about something that [her congressman] voted on that is the way I would have wanted him to vote." Petrs. Ex. 165 (Brandt Dep.) 40:18-21.

288. Some districts are so reliably red that no Democrat bothers running, denying Democratic voters in those districts any opportunity even to cast a ballot for the candidate of their choice. For example, Tom Ulrich testified that his "ideas are not competitive in [his] district or not being heard." Petrs. Ex. 177 (Ulrich Dep.) 21:4-22:1. In 2014, Mr. Ulrich could not even cast a vote for a Democratic candidate for Congress because no Democrat ran. *Id.* at 35:9-35:14. Mr. Ulrich testified that "it is hard to get a person to run where there's very little chance that in that district that someone other than a Republican is going to be elected . . . [w]as it interference with my right to vote . . . . I still could vote, but there was nobody there to vote for." *Id.* at 49:15- 50:1.

289. In 2014 and 2016, Lorraine Petrosky was unable even to cast a ballot for a Democratic candidate because no Democrat would run in such a safe Republican district. Petrs. Ex. 171 (Petrosky Dep.) 41:22-43:6, 84:1-10. Ms. Petrosky currently has no representative in Congress because Republican congressman Tim Murphy has resigned. While he was in office, Mr. Murphy did not represent Ms. Petrosky's views and she "couldn't find any commonality" with him. *Id.* at 85:8-15.

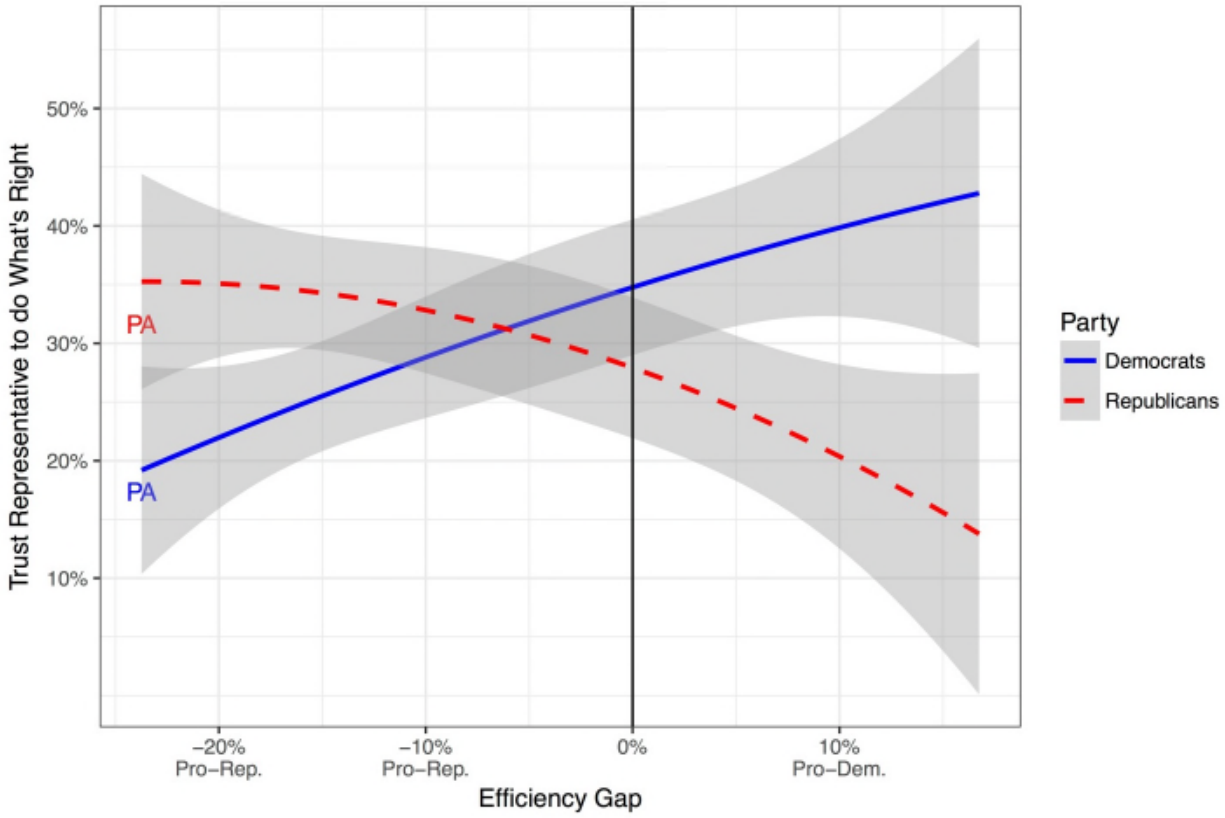
290. John Greiner (3rd District) is concerned about healthcare, taxation, immigration and preservation of the environment. Mr. Greiner's Republican congressman does not support any of his positions on these key issues and his vote is "very much straight political Republican party line." Petrs. Ex. 168 (Greiner Dep.) 40:5-41:11. In 2016, Mr. Greiner was not even able to vote for a Democratic candidate because the Republican incumbent ran unopposed. *Id.* at 17:5-10; 21:25-22:2; 22:25-23:11.

G. The 2011 Map Undermines Citizens' Trust in Government

291. Dr. Warshaw testified that partisan gerrymandering is undermining citizens' trust in their government. He used a study called the Cooperative Congressional Election Study, which asks thousands of people across the country whether they trust their district's representative in Congress to "do what's right." Tr. 949:5-20; Petrs. Ex. 35 at 26. Dr. Warshaw concluded that, across the country, Republican voters in states with a pro-Republican Efficiency Gap are far more likely to trust their representatives than Democrats are. Conversely, in places with a pro-Democratic Efficiency Gap, Democrats are more likely to trust their representative than Republicans. Tr. 952:14-23.

292. The numbers showed a strong relationship between the Efficiency Gap and citizens' trust in government. Tr. 952:14-16. Democratic voters in Pennsylvania were roughly 15 percentage points less likely to trust their

representatives than Republicans, and less than 20% likely to trust their representatives overall. Petrs. Ex. 35 at 27; Petrs. Ex. 51. Petitioners' Exhibit 51 shows the relationship between the Efficiency Gap and citizens' trust in government; the red and blue "PA" markers show Pennsylvania on the chart:



Petrs. Ex. 51.

293. Dr. Warshaw concluded that partisan gerrymandering is undermining citizens' faith in democracy and government itself. Tr. 838:17-21, 953:9-19.

294. The testimony of the Petitioners bore out, on an individual level, Dr. Warshaw's expert opinion about the broad-scale effects of gerrymandering on Pennsylvanians' trust in government. Richard Mantell testified that the 2011 map

is "contrary to the essence of a Democratic society." Petrs. Ex. 174 (Mantell Dep.) 18:12-13. Mark Lichty testified that the 2011 map "undermine[s] our sense of trust in our democracy." Petrs. Ex. 172 (Lichty Dep.) 37:8-9.

295. Petitioner Comas testified that "one of the strengths of American democracy is that we have faith in our political institutions in general. And, when that is eroded, it is hard to get it back. . . . Partisan gerrymandering [means] that, not just in my district but across the state, that instead of thinking that these are well-intentioned civil servants who are trying to do their best to represent their constituents, I assume that because of partisan gerrymandering that they are only beholden to their party structure which drew the lines and can constantly threaten them." Petrs. Ex. 167 (Comas Dep.) 36:17-37:11.

296. Bill Marx discussed gerrymandering with his students, "and how Pennsylvania has a 13-5 representation in Congress—and how it will always be 13-5 because of the way these districts have been drawn to [be] such safe districts—and you just see these 18-year-olds, before I send them out to the world, before they even have experience—they just ask me questions, like, Well, then, why should we vote? Why does this matter? I'm not going to make a difference. Why should I care? And as a civics teacher, as somebody who . . . really puts my heart out there . . . that's upsetting to me, and that's depressing." Tr. 124:15-125:3.

"This is causing people to distrust our Government, pull away from the political process . . . [a]nd it's wrong and it needs to change." Tr. 126:1-9.

H. Legislative Respondents Offered No Defense of the 2011 Map

297. Legislative Respondents offered no affirmative defense of the 2011 map. They put on two witnesses, Dr. Cho and Dr. McCarty. Dr. McCarty testified that he was offering no "opinion on whether or not Pennsylvania's map is a gerrymandered map." Tr. 1417:17-21. Dr. Cho testified that she had her own approach, using a supercomputer, to determine whether a map was gerrymandered, but that she had not completed her own analysis of the map because she was too "busy." Tr. 1324:7-1328:3. Legislative Respondents withheld all information about legislators' actual intent in drawing the 2011 map and had no witness who testified that the legislators were motivated by anything other than partisan intent.

298. A hypothetical effort to protect incumbents does not explain, and could not justify, the extreme partisan bias in Pennsylvania's 2011 map. First, Legislative Respondents failed to establish that incumbency protection is a traditional districting criteria in Pennsylvania, much less one that should subordinate traditional criteria like contiguity, compactness, and avoiding county and municipal splits. Legislative Respondents' own expert Dr. McCarty testified that incumbency protection is an "invitation to overt corruption" and "does little to enhance legitimacy of American democracy." Tr. 1591:2-1592:21.

299. Dr. Cho, Legislative Respondents' only witness who testified that incumbency protection is traditional, was entirely unfamiliar with the prior Pennsylvania districting plan, did not know that six Democratic incumbents were paired together in that plan, and was not qualified to testify about districting criteria in Pennsylvania. Tr. 1271:10-1272:4. After being shown a video of a presentation she gave at a conference at Tufts, Dr. Cho admitted that incumbency protection is subordinate to districting principles like compactness and contiguity, and that incumbency protection can be used "in a bad way." Tr. 1261:21-1264:5.

300. Dr. Cho's original testimony was inconsistent with the approach she has taken in her own academic work. While Dr. Cho testified on direct that leaving out incumbency protection when simulating maps might lead someone to conclude that a map was partisan when it was "at least partly . . . incumbency protection," Tr. 1179:13-17, she acknowledged on cross-examination that in her own academic article running simulations to ascertain whether a map is gerrymandered, she doesn't "consider the preservation of incumbency." Tr. 1339:11-15; *see* Tr. 1330:8-12, 1334:8-11, 1334:22-1335:11.

301. Incumbency protection "doesn't make sense" if the existing map is "arguably a gerrymander," said Dr. Cho. Tr. 1265:2-6. Pennsylvania's 2002 districting plan produced the incumbents existing at the time of the drawing of the 2011 map. The Pennsylvania Supreme Court, with respect to the 2002 map, found

that "the legislature deliberately drew the congressional districts so as to grant an advantage to the Republican party" and agreed "that there was a discriminatory intent." *Erfer v. Commonwealth*, 794 A.2d 325, 332 (Pa. 2002).

302. In any event, any effort at incumbency protection in drawing the 2011 map was itself partisan. The two incumbents paired were both Democrats, Jason Altmire and Mark Critz. JSF ¶ 122. No other incumbents were paired; each and every Republican incumbent was protected. JSF ¶ 122. Petitioners' experts established both qualitatively and quantitatively that that outcome would not have occurred absent a deliberate, partisan effort. Dr. Kennedy testified that the newly combined 12th District bypasses four other districts along the way from the Ohio border to Johnstown, in an effort to pair Altmire and Critz. Tr. 633:15-25, 634:13-24. He testified that pairing Altmire and Critz required the mapmakers to create a 120-mile long district that combined "two disparate communities of interest." *Id.*; *see* Tr. 635:6-8. Quantitatively, Dr. Chen established that pairing Altmire and Critz could not have occurred as a result of a non-partisan effort to protect 17 incumbents. Tr. 225:25-227:14; Petrs. Ex. 11.

303. Legislative Respondents' expert Dr. Cho stated that she did not analyze the question whether any incumbency protection in the 2011 plan was done for partisan reasons. Tr. 1251:2-6. Nor did she address the fact that, when

the 2011 plan was enacted, five of the Republican incumbents had been in office for less than a year.

304. Dr. Chen's testimony established that an effort at incumbency protection could not justify the 2011 map's partisan bias—or negate a conclusion that the map was drawn with partisan intent. Dr. Chen conducted a set of 500 random simulations that avoided pairing 17 incumbents. Not a single one produced 13 Republican seats, and the most common outcomes were plans with 9 or 10 Republican seats. Tr. 232:22-234:21. Every single one of these plans was significantly more compact than the enacted 2011 map and split fewer counties and municipalities. Tr. 215:7-217:7; Tr. 218:9-220:5; Petrs. Ex. 1 at 24-26. Dr. Chen's conclusion, with overwhelming statistical certainty, that a non-partisan effort to protect incumbents cannot explain the partisan bias in the 2011 map is reliable, and the Court accepts it. Tr. 222:19-223:2; Petrs. Ex. 1 at 27. Partisan intent was the predominant factor behind the 2011 plan even controlling for incumbency. Tr. 223:3-6.

305. Dr. Cho testified that preserving "district cores" is purportedly a traditional redistricting principle, Tr. 1252:6-11, but neither Dr. Cho nor any other witness for Legislative Respondents testified that the 2011 map actually *did* preserve district cores. To the contrary, Dr. Kennedy offered unrebutted testimony that the 2011 map carved up communities of interest. *See generally* Petrs. Ex. 53.

306. There is no evidence to establish that the Voting Rights Act was a consideration at all in drawing the 2011 map. The only two districts with sizable African-American voting age populations became *less* African-American in the 2011 map. Petrs. Exs. 13, 14 (showing that District 1 went from 43.9% African-American in the 2002 map to 32.8% in the current map, while District 2 went from 58% African-American to 56.8% in the current map); *see also* Tr. 238:1-241:14 (Dr. Chen). Dr. Cho initially testified that any districting plan that did not produce a district with at least a 56.8% African American voting age population would violate the Voting Rights Act, Leg. Resps. 11 at 23; Tr. 1274:24-1276:11, but admitted on cross-examination that she had no basis for offering that opinion because she had not conducted any analysis of the *Gingles* factors. Tr. 1281:11-23. Dr. Cho confirmed that "cannot make [the] statement" that any of Dr. Chen's maps have to be thrown out based on the VRA. Tr. 1286:10.

307. Nor could any *hypothetical* racial goal explain or justify the partisan bias present in the map, or alter the conclusion that the map was drawn with the intent to discriminate against Democratic voters. Dr. Chen's simulations demonstrated that a hypothetical goal of creating a majority-minority district could not explain the 2011 map's pro-Republican bias. Dr. Chen found that hundreds of simulated maps produced a district with an African-American voting age population of 50% or even 56.8%, and that such a hypothetical goal would not

alter the expected Republican seat share. Tr. 242:13-245:19; Tr. 246:15-247:4; Tr. 249:17-250:18; Petrs. Exs. 15, 21, 23. Dr. Chen found that a total of 534 of his 1000 simulations would produce a majority African-American district (234 in Simulation Set 1 and 300 in Simulation Set 2). Petrs. Exs. 21, 23. The partisan breakdown of those plans mirrored that of the broader simulations. *Id.*

308. Dr. Pegden froze District 2, and still found with a greater than 99.99% mathematical confidence level that intentional drawing of the 2011 plan to maximize partisan advantage was the only explanation for his results. Tr. 1384:22-1385:4; Tr. 1385:21-1386:12; Tr. 745:9-19; Petrs. Ex. 117 at 3.

PROPOSED CONCLUSIONS OF LAW

I. STANDING AND JUSTICIABILITY

1. As Democratic voters from each of Pennsylvania's 18 congressional districts, Petitioners have standing to challenge the 2011 congressional districting map. *See Erfer v. Commonwealth*, 794 A.2d 325, 329-30 (Pa. 2002).[3]

2. Partisan gerrymandering claims are justiciable under the Pennsylvania Constitution. *See Erfer*, 794 A.2d at 331; *In re 1991 Reapportionment*, 609 A.2d 132, 141-42 (Pa. 1992).

II. THE 2011 MAP VIOLATES THE PENNSYLVANIA CONSTITUTION'S FREE EXPRESSION AND FREE ASSOCIATION CLAUSES

3. The Pennsylvania Constitution guarantees the rights of free expression and free association. Pa. Const. Art. I, §§ 7, 20. Article I, Section 7 provides in relevant part: "The free communication of thoughts and opinions is one of the invaluable rights of man, and every citizen may freely speak, write and print on

[3] The League of Women Voters of Pennsylvania ("LWVPA") is a nonpartisan organization that encourages the informed and active participation of citizens in government, works to increase understanding of major public policy issues, and influences public policy through education and advocacy. The LWVPA supports full voting and representational rights for all eligible Commonwealth citizens and opposes efforts to disadvantage or burden voters based on their political affiliation. Petition for Review, ¶ 13; Petitioners' Answer to the Preliminary Objections of Respondents Pennsylvania general Assembly, Michael C. Turzai. And Joseph B. Scarnati III, at 4, ¶ 65. The LWVPA was dismissed from this Action on November 13, 2017. JSF ¶ 11. The LWVPA has standing as a membership organization of voters. *See Applewhite v. Commonwealth*, No. 330 M.D. 2012, 2014 Pa. Commw. Unpub. LEXIS 756, at *21 (Pa. Commw. Ct. Jan. 17, 2014); *Hunt v. Wash. State Apple Advert. Comm'n*, 432 U.S. 333, 343 (1977).

any subject, being responsible for the abuse of that liberty." Pa. Const. Art. I, § 7. Article I, Section 20 provides: "The citizens have a right in a peaceable manner to assemble together for their common good . . . ." Pa. Const. Art. I, § 20.

A. Pennsylvania's Constitution Provides Greater Protection for Speech and Associational Rights Than the First Amendment

4. The rights of free expression and free association were a vital part of Pennsylvania's political identity long before the enactment of the federal Bill of Rights in 1791. In 1681, William Penn drafted a social contract—his "Frame of Government"—granting eligible residents the right to vote and liberty of conscience, protecting what he saw as their basic natural rights. Frederick D. Rapone, Jr., *Article I, Section 7 of the Pennsylvania Constitution and the Public Expression of Unpopular Ideas*, 74 Temp. L. Rev. 655, 659-60 (2001).

5. Pennsylvania's Constitution, enacted in 1776, provided that the people "have a right to freedom of speech" as well as "a right to assemble together, to consult for their common good, [and] to instruct their representatives." Seth F. Kreimer, *The Pennsylvania Constitution's Protection of Free Expression*, 5 U. Pa. J. Const. L. 12, 15 n.7 (2002). Pennsylvania's Constitutional Convention of 1790 consolidated the free expression provisions into their current form, introduced by a new declaration that the "general, great, and essential principles of liberty and free Government" enumerated therein would "forever remain inviolate." *Id.* at 17-18.

6. Pennsylvania's Constitution was the first to explicitly incorporate the freedom of speech, placing it "squarely within the framework of natural rights and popular sovereignty." Steven J. Heyman, *Righting the Balance: An Inquiry Into the Foundations and Limits of Freedom of Expression*, 78 Bos. Univ. L. Rev. 1275, 1287 (1998). The concept of free association blossomed in the Commonwealth. In 1793, Pennsylvania became home to the first political society in the nation. John D. Inazu, *The Forgotten Freedom of Assembly*, 84 Tul. L. Rev. 565, 577 (2010). Pennsylvania also had the largest of the "Democratic-Republican" societies that sprung up in the late 1790s. *Id.*

7. Naturally, "freedom of expression has special meaning in Pennsylvania given the unique history of [the] Commonwealth." *Pap's A.M. v. City of Erie* ("*Pap's II*"), 812 A.2d 591, 604 (Pa. 2009). As the Pennsylvania Supreme Court has recognized, "[t]he protections afforded by Article I, § 7 are . . . distinct and firmly rooted in Pennsylvania history and experience. The provision is an ancestor, not a stepchild, of the First Amendment." *Id.* at 605. The federal Bill of Rights "borrowed heavily from the Declarations of Rights contained in the constitutions of Pennsylvania and other colonies." *Commonwealth v. Edmunds*, 586 A.2d 887, 896 (Pa. 1991). "For instance, the Pennsylvania Declaration of Rights was the 'direct precursor' of the freedom of speech and the press." *Id.*

8. Pennsylvania courts were called upon to interpret the Pennsylvania Constitution's Free Expression Clause "long before the passage of the Fourteenth Amendment provided a basis for application of the First Amendment against the states; *i.e.*, before there was an applicable federal interpretation to follow or diverge from." *Pap's II*, 812 A.2d at 605-06. Pennsylvania courts thus have forged an "independent constitutional path" in analyzing freedom of expression issues. *Pap's II*, 812 A.2d at 606; *accord Goldman Theatres v. Dana*, 173 A.2d 59, 61 (Pa. 1961).

9. Key here, the Pennsylvania Constitution "provides greater protection of speech and associational rights than does its federal counterpart." *Working Families Party v. Commonwealth*, 169 A.3d 1247, 1262 (Pa. Commw. Ct. 2017). The Pennsylvania Supreme Court has repeatedly held that "Article I, Section 7 provides broader protections of expression than the related First Amendment." *DePaul v. Commonwealth*, 969 A.2d 536, 546 (Pa. 2009); *accord Pap's II*, 812 A.2d 591, 605 (Pa. 2002); *Uniontown Newspapers, Inc. v. Roberts*, 839 A.2d 185, 193 (Pa. 2003); *Commonwealth, Bureau of Prof'l & Occupational Affairs v. State Bd. of Phys. Therapy*, 728 A.2d 340, 343-44 (Pa. 1999).

10. The Pennsylvania Supreme Court accordingly has invalidated speech restrictions under Article I, § 7, irrespective of whether a restriction also violates the First Amendment. *See, e.g., Ins. Adjustment Bureau v. Ins. Comm'r for*

Commonwealth of Pa., 542 A.2d 1317, 1324 (Pa. 1988) (striking down statute as impermissible burden on speech under Article I, § 7 rather than First Amendment); *Commonwealth v. Tate*, 432 A.2d 1382, 1387-90 (Pa. 1981) (political leafleting deemed protected expression under Article I, § 7, even though First Amendment may not provide protection); *Goldman Theatres*, 173 A.2d 59 (statute censoring motion pictures violated Article I, § 7, even if it did not violate First Amendment).

11. In *Pap's II*, the Pennsylvania Supreme Court considered whether a public indecency ordinance proscribing nudity in public places violated the freedom of expression guaranteed by Article I, § 7. A plurality of the U.S. Supreme Court had earlier concluded that the restriction satisfied the applicable intermediate scrutiny test under, and thus did not violate, the First Amendment. *City of Erie v. Pap's A.M.*, 529 U.S. 277, 283 (2000). On remand, the Pennsylvania Supreme Court rendered an "independent judgment as a matter of distinct and enforceable Pennsylvania constitutional law," irrespective of the U.S. Supreme Court's First Amendment ruling. *Pap's II*, 812 A.2d at 607. The Pennsylvania Supreme Court concluded that the "state of flux" and "uncertain teachings" of the U.S. Supreme Court "afford[ed] insufficient protection to fundamental rights guaranteed under Article I, § 7." *Id.* at 611. The Pennsylvania Supreme Court therefore declined to analyze the ordinance in the same manner, noting that "[a]s a matter of policy, Pennsylvania citizens should not have the

contours of their fundamental rights under our charter rendered uncertain, unknowable, or changeable, while the U.S. Supreme Court struggles to articulate a standard to govern a similar federal question." *Id.*

12. Accordingly, although their analysis may be "guided by the teachings of the United States Supreme Court on these rights," Pennsylvania courts may conclude that a law burdening the rights of free expression and association violates the Pennsylvania Constitution irrespective of whether the law violates the First Amendment. *Working Families Party*, 169 A.3d at 1262; *see also Edmunds*, 586 A.2d at 894 (In interpreting the Pennsylvania Constitution, Pennsylvania courts are not bound by U.S. Supreme Court decisions interpreting "similar (yet distinct) federal constitutional provisions.").

B. Voting for the Candidate of One's Choice Constitutes Core Protected Political Expression and Association

13. Voting for the candidate of one's choice and associating with the political party of one's choice constitute core political expression and association protected by the Pennsylvania Constitution's Free Expression and Free Association Clauses. "The act of voting is a personal expression of favor or disfavor for particular policies, personalities, or laws." *Commonwealth v. Cobbs*, 305 A.2d 25, 27 (Pa. 1973). "Each individual voter as he enters the booth is given an opportunity to freely express his will." *Oughton v. Black*, 61 A. 346, 348 (1905).

14. Indeed, if providing campaign donations to a candidate "constitute[s] expressive conduct protected by Article I, Section 7," *DePaul*, 969 A.2d at 542, 548, voting for a candidate plainly constitutes expressive conduct as well. Voting, even more so than campaign donations, provides citizens a direct means of "express[ing] . . . support for [a] candidate and his views." *Id.* at 547 (quoting *Buckley v. Valeo*, 424 U.S. 1, 20-31 (1976)). Voting provides "opportunities [for] all voters to express their own political preferences," *Norman v. Reed*, 502 U.S. 279, 288 (1992), namely, "to express their support for [their chosen candidate] and the views [the candidate] expressed," *Anderson v. Celebrezze*, 460 U.S. 780, 806 (1983); *see also In re 223 Absentee Ballot Appeals*, 245 A.2d 265, 267 (Pa. 1968) ("[T]he will and intent of the voter, clearly expressed, must be the paramount consideration in determining the result of any election.").

15. As Chief Justice Roberts has explained, "[t]here is no right more basic in our democracy than the right to participate in electing our political leaders," including, of course, the right to "vote." *McCutcheon v. FEC*, 134 S. Ct. 1434, 1440-41 (2014) (plurality opinion). "[P]olitical belief and association constitute the core of . . . those activities protected by the First Amendment." *Elrod v. Burns*, 427 U.S. 347, 356 (1976); *see also Reynolds v. Sims*, 377 U.S. 533, 555 (1964) ("The right to vote freely for the candidate of one's choice is . . . the essence of a democratic society and any restrictions on that right strike at the heart of

representative government."); *Buckley v. Valeo*, 424 U.S. 1, 15 (1976) (The First Amendment protects the "freedom to associate with others for the common advancement of political beliefs and ideas," including "the right to associate with the political party of one's choice."). "[N]o right is more precious in a free country than that of having a voice in the election of those who make the laws." *Wesberry v. Sanders*, 376 U.S. 1, 17 (1964). Other constitutional rights, even the most basic, "are illusory if the right to vote is undermined." *Id.*

16. The constitutional guarantees of free expression and association require that "each citizen [must] have an *equally effective voice* in the election" of their representatives to government. *Reynolds*, 377 U.S. at 565 (emphasis added). "The right of qualified voters, regardless of their political persuasion, to cast their votes *effectively* . . . rank[s] among our most precious freedoms." *Anderson*, 460 U.S. at 787 (internal quotation marks omitted) (emphasis added).

C. The 2011 Map Is Subject to Strict Scrutiny Because It Discriminates Against Democratic Voters Based on the Content and Viewpoint of Their Political Expression and Association

17. Laws that discriminate against or burden protected expression based on its content or viewpoint are subject to strict scrutiny. *See Pap's II*, 812 A.2d at 611-12; *Purple Orchid, Inc. v. Pa. State Police*, 813 A.2d 801, 806 (Pa. 2002); *Free Speech LLC v. City of Phila.*, 884 A.2d 966, 971 (Pa. Commw. Ct. 2005). The government may not restrict expression "because of its message, its ideas, its

subject-matter, or its content." *Police Dep't of City of Chicago v. Mosley*, 408 U.S. 92, 95 (1972). The guarantee of free expression "stands against attempts to disfavor certain subjects or viewpoints." *Citizens United v. FEC*, 130 U.S. 876, 898 (2010); *see also Reed v. Town of Gilbert*, 135 S. Ct. 2218, 2226 (2015).

18. A law is content-based if it "target[s] speech based on its communicative content." *Reed*, 135 S. Ct. at 2226. "Viewpoint discrimination is a more blatant and egregious form of content discrimination." *Id.* A law is viewpoint-based if it targets speech conveying a "particular point of view," *FCC v. League of Women Voters of Col.*, 468 U.S. 364, 383-84 (1984)—"because of disagreement with the message [the speech] conveys," *Sorrell v. IMS Health Inc.*, 564 U.S. 552, 566 (2011) (quotation marks omitted). Thus, the government may not "burden[] a form of protected expression" while leaving "unburdened those speakers whose messages are in accord with its own views." *Id.* at 580.

19. The government unconstitutionally burdens speech where it renders disfavored speech less *effective*, even if it does not ban such speech outright. "Lawmakers may no more silence unwanted speech by burdening its utterance than by censoring its content." *Sorrell*, 564 U.S. at 566 (internal quotation marks omitted). "It is thus no answer to say that petitioners can still be 'seen and heard'" if the burdens placed on their speech "have effectively stifled petitioners' message." *McCullen v. Coakley*, 134 S. Ct. 2518, 2537 (2014) (Roberts, C.J.); *see*

also Rosenberger v. Rector & Visitors of the Univ. of Va., 515 U.S. 819, 828 (1995); *Forsyth Cty. v. Nationalist Movement*, 505 U.S. 123, 134-35 (1992).

20. In *McCullen*, for instance, the U.S. Supreme Court invalidated a law that imposed a buffer zone around abortion clinics because the law "compromise[d] [the] ability" of the plaintiffs" to "initiate the close, personal conversations that they view as essential" to effectively communicate their message. 134 S. Ct. at 2535. And in *Sorrell*, the U.S. Supreme Court invalidated on viewpoint discrimination grounds a state law that burdened drug manufacturers by denying them information that made their marketing more effective. 564 U.S. at 580. The Court stressed that "the distinction between laws burdening speech is but a matter of degree and the Government's content-based burdens must satisfy the same rigorous scrutiny as its content-based bans." *Id.* at 555-56 (internal quotation marks omitted); *see also Ins. Adjustment Bureau v. Ins. Comm'r for Commonwealth of Pa.*, 542 A.2d 1317, 1323-24 (1988) (invalidating, under Article I, § 7, a statute that restricted insurers' ability to communicate effectively with potential customers); *Arizona Free Enterprise Club's Freedom Club PAC v. Bennett*, 564 U.S. 721, 747 (2011) (invalidating, on free speech grounds, a state law that burdened privately-financed candidates' speech by providing matching funds for publicly-financed candidates).

21. Pennsylvania's 2011 congressional districting map burdens protected political expression by discriminating against Democratic voters and burdening their core political speech and expressive conduct. It is no answer for Legislative Respondents to say that Democratic voters may still cast a ballot in Pennsylvania's congressional elections—the 2011 map targets Democratic voters and reduces the effectiveness of their votes by making it harder for them to translate votes into congressional seats. The 2011 map has thereby prevented Democratic voters from electing representatives of their choice**.**

22. The 2011 map's disfavored treatment of Democratic voters is textbook viewpoint discrimination. The map targets a "particular point of view"—that is, support for Democratic candidates as opposed to Republican candidates. *League of Women Voters of Col.*, 468 U.S. at 383-84; *see also Bd. of Educ., Island Trees Union Free Sch. Dist. No. 26 v. Pico*, 457 U.S. 853, 870-71 (1982) ("If a Democratic school board, motivated by party affiliation, ordered the removal of all books written by or in favor of Republicans, few would doubt that the order violated [the Constitution]"); *Anderson*, 460 U.S. at 793 (early filing deadline burdened an identifiable segment of Ohio's independent-minded voters who share a particular viewpoint); *William v. Rhodes*, 393 U.S. 23, 25, 32 (1968) (striking down Ohio election laws that "in effect tend[ed] to give [Republicans and Democrats] a complete monopoly," making it "virtually impossible" for a new

political party to get on the ballot). By packing and cracking Democratic voters to make it harder from them to translate votes into congressional seats, the map "single[s] out a subset of messages for disfavor based on the views expressed." *Matal v. Tam*, 137 S. Ct. 1744, 1766 (2017) (Kennedy, J., concurring). "This is the essence of viewpoint discrimination." *Id.* The burden is also content-based because it targets protected expression "based on its communicative content"—*i.e.*, support for a political candidate. *Reed*, 135 S. Ct. at 2226.

23. The 2011 map targeted Democratic voters on the basis of their political beliefs, expressive conduct, and association. Overwhelming evidence established this point. Dr. Kennedy's testimony demonstrated that the map packed and cracked Democratic voters to minimize the effectiveness of their votes. *See supra* Proposed Findings of Fact ("FOF") § B. Dr. Chen's analysis of the Turzai data files demonstrate that General Assembly used partisan preference scoring of every precinct in Pennsylvania to maximize Republican voters' advantage. *Supra* FOF § C.1. The independent statistical and mathematical analyses of Dr. Chen and Dr. Pegden established that partisan intent was the predominant motivation behind the 2011 map. *Supra* FOF §§ C.2, C.3.

D. The 2011 Map Fails Strict Scrutiny and Indeed Any Scrutiny

24. "In the ordinary case it is all but dispositive to conclude that a law is content-based and, in practice, viewpoint-discriminatory." *Sorrell*, 564 U.S. at

571. Such laws "are presumptively unconstitutional and may be justified only if the government proves that they are narrowly tailored to serve compelling state interests." *Reed*, 135 S. Ct. at 2226. At trial, Legislative Respondents made no effort to satisfy strict scrutiny. They offered no non-partisan justification for the map.

25. Nor could the map satisfy strict scrutiny. Drawing congressional district boundaries to disadvantage Democratic voters does not serve any legitimate government interest, much less a compelling interest.

E. The 2011 Plan Impermissibly Retaliates Against Democratic Voters Based on Their Voting Histories and Party Affiliations

26. The Pennsylvania Constitution's Free Expression and Free Association Clauses separately and independently prohibit retaliation against individuals because of their protected expression or association. *See Southersby Dev. Corp. v. Twp. of South Park*, 2015 WL 1757767 *8-9 (W.D. Pa. Apr. 17, 2015) (plaintiff adequately pled retaliation claim under Article I, §§ 7 & 20).

27. In general, courts are wary of permitting patronage or retaliation by the political party in power because of the damaging effect such actions have on political belief, association, and the electoral process. *See Elrod*, 427 U.S. at 356; *Branti v. Finkel*, 445 U.S. 507 (1980); *Rutan v. Republican Party of Ill.*, 497 U.S. 62 (1990); *Bd. of Cty. Comm'rs, Wabaunsee Cty., Kan. v. Umbehr*, 518 U.S. 668 (1996). When patronage restrains citizens' freedoms of belief and association, it

is "at war with the deeper traditions of democracy embodied in the First Amendment." *Elrod*, 427 U.S. at 357 (internal quotation marks omitted).

28. In the redistricting context, the prohibition on retaliating against protected expression and association is implicated when the government uses "data reflecting citizens' voting history and party affiliation" to "mak[e] it harder for a particular group of voters to achieve electoral success because of the views they had previously expressed." *Shapiro v. McManus*, 203 F. Supp. 3d 579, 597 (D. Md. 2016); *see also Shapiro v. McManus*, 136 S. Ct. 450, 456 (2015) (reversing the dismissal of a First Amendment retaliation claim, "along the lines suggested by Justice Kennedy in his concurrence in *Vieth*," challenging a Democratic gerrymander of a congressional district in Maryland).

29. "[W]hen a State draws the boundaries of its electoral districts so as to dilute the votes of certain of its citizens, the practice imposes a burden on those citizens' right to 'have an equally effective voice in the election' of a legislator to represent them." *Shapiro*, 203 F. Supp. 3d at 595-97 (quoting *Reynolds*, 377 U.S. at 565). "The practice of purposefully diluting the weight of certain citizens' votes to make it more difficult for them to achieve electoral success because of the political views they have expressed through their voting histories and party affiliations infringes this representational right." *Id.* at 595 (underlining in original). "It penalizes voters for expressing certain preferences, while, at the same

time, rewarding other voters for expressing the opposite preferences. In this way, the practice implicates the . . . well-established prohibition against retaliation, which prevents the State from indirectly impinging on the direct rights of speech and association by retaliating against citizens for their exercise." *Id.*

30. Both the "packing" and "cracking" aspects of a partisan gerrymander dilute the value of affected citizens' votes, in violation of the constitutional prohibition on retaliation. "[W]hile a State can dilute the value of a citizen's vote by placing him in an overpopulated district, a State can also dilute the value of his vote by placing him in a particular district because he will be outnumbered there by those who have affiliated with a rival political party." *Shapiro*, 203 F. Supp. 3d at 595. "In each case, the weight of the viewpoint communicated by his vote is debased." *Id.* (internal quotation marks omitted).

31. Thus, "when a State is alleged . . . to have not only intentionally but also successfully burdened 'the right of qualified voters . . . to cast their votes effectively,' by diluting their votes in a manner that has manifested in a concrete way, the allegation supports a justiciable [free expression] claim." *Shapiro*, 203 F. Supp. 3d at 598.

32. To establish such a retaliation claim, a petitioner must prove that (1) the district boundaries were drawn with the intent to burden the petitioner and similarly situated citizens "because of how they voted or the political party with

which they were affiliated"; (2) "the challenged map diluted the votes of the targeted citizens to such a degree that it resulted in a tangible and concrete adverse effect," *i.e.*, "the vote dilution must make some practical difference"; and (3) "absent the mapmakers' intent to burden a particular group of voters by reason of their views, the concrete adverse impact would not have occurred." *Shapiro*, 203 F. Supp. 3d at 596-97.

33. Pennsylvania's 2011 congressional districting map violates the Free Expression and Free Association Clauses by retaliating against Petitioners and other Democratic voters based on their past votes for Democratic candidates and their association with the Democratic party.

34. *First*, Legislative Respondents intentionally targeted Petitioners and other Democratic voters on their basis of their voting histories. Dr. Chen's analysis of the Turzai files proves that Legislative Respondents intentionally targeted Democratic voters because of their prior voting history and association with Democratic candidates. *Supra* FOF § C.1. The expert testimony of Dr. Kennedy, Dr. Chen, and Dr. Pegden separately confirmed through a variety of metrics that Democratic voters were singled out for disfavored treatment—cracked and packed into particular districts—because of their past protected expression and association. *Supra* FOF §§ B, C.2, C.3.

35. *Second*, the 2011 map diluted the votes of Petitioners and other Democratic voters to such a degree that it resulted in a tangible and concrete adverse effect—that is, it made a practical difference. Dr. Chen's expert testimony established that certain Petitioners currently residing in Republican districts—Beth Lawn, Lisa Isaacs, Robert Smith, and Thomas Ulrich—would have been virtually certain to live in Democratic-leaning districts under a non-partisan map. *Supra* FOF § E. The 2011 map injured these Petitioners by instead placing them into gerrymandered districts that have produced Republican representatives every time. *Supra* FOF § E.

36. Other petitioners suffer other concrete harms, such as splitting of their communities of interest (*e.g.*, Tom Rentschler, John Greiner, Jordi Comas, Don Lancaster), being placed in a packed district where their vote carries less weight statewide (*e.g.*, Carmen Febo San Miguel, James Solomon, Mark Lichty, Richard Mantell, Priscilla McNulty), being placed in a district so uncompetitive that no Democrat will run (*e.g.*, Tom Ulrich, Lorraine Petrosky, and John Greiner), or no qualified Democrat will run (*e.g.*, Gretchen Brandt), and being placed in districts that are absurdly contorted and barely contiguous (*e.g.*, Beth Lawn, Bill Marx). *Supra* FOF §§ B, E, F.

37. The map's retaliation against Petitioners and other Democratic voters also produces a tangible and concrete adverse effect on Democratic voters

statewide, including every Petitioner. Based on the dilution of Democratic voters' votes through packing and cracking, Republicans have won 13 of 18 seats—the same 13 seats—in each of the three congressional elections under the 2011 map. Republicans won those same 13 seats irrespective of swings in the vote—and even when Democrats won a majority of votes statewide. *Supra* FOF § D.1. Democrats would have won between 2 and 5 more seats each election absent the intentional retaliation against Petitioners and other Democratic voters. *Supra* FOF § D.2, D.3.

38. *Finally*, these adverse effects would not have occurred absent the intent to burden Petitioners and other Democratic voters. But for the retaliatory packing and cracking, Petitioners Beth Lawn, Lisa Isaacs, Robert Smith, and Thomas Ulrich specifically would have been in Democratic-leaning districts. *Supra* FOF § E. And but for the retaliatory packing and cracking, Petitioners would not have experienced the other harms just described, and Petitioners and other Democratic voters would have been able to elect more candidates of their choice across Pennsylvania's delegation, instead of being locked into a 13-5 Republican majority. *Supra* FOF § D.

39. With respect to Petitioners and other Democratic voters, Legislative Respondents "expressly and deliberately considered [their] protected . . . conduct, including their voting histories and political party affiliations, when it redrew the lines of" their districts. *Shapiro*, 203 F. Supp. 3d at 595. Legislative Respondents

"did so with an intent to disfavor and punish [Petitioners] by reason of their constitutionally protected conduct." *Id.* This intentional retaliation had an "actual effect" that would not have occurred but-for the retaliation. *Id.* Petitioners and other Democratic voters are inhibited in their ability to elect representatives of their choice and to influence the political process.

F. Petitioners' Free Expression and Association Claim Is Separate and Distinct From Their Equal Protection Claim

40. In their oral motion for nonsuit at trial, Legislative Respondents erred in suggesting that Petitioners' free expression and association claim is no different than the equal protection claim. The Pennsylvania Supreme Court made clear in *Erfer* that it was not considering any claim under Article I, §§ 7 & 20. *Erfer*, 794 A.2d at 328 n.2. And any question about an equal protection claim "does not necessarily doom a claim that the State's abuse of political considerations in districting has violated any other constitutional provision." *Shapiro*, 203 F. Supp. 3d at 594; *see also Vieth*, 541 U.S. at 294 (plurality opinion) ("It is elementary that scrutiny levels are claim specific. An action that triggers a heightened level of scrutiny for one claim may receive a very different level of scrutiny for a different claim because the underlying rights, and consequently constitutional harms, are not comparable"). In reversing the dismissal of a First Amendment retaliation claim in *Shapiro*, the U.S. Supreme Court noted that the plaintiffs' legal theory—which is

premised on the First Amendment rather than the Equal Protection Clause—was "uncontradicted by the majority in any of [its] cases." 136 S. Ct. at 456.

III. THE 2011 MAP VIOLATES THE PENNSYLVANIA CONSTITUTION'S EQUAL PROTECTION GUARANTEES AND ITS FREE AND EQUAL CLAUSE

41. The Pennsylvania Constitution guarantees equal protection of law as well as free and equal elections. Pa. Const. Art. I, §§ 1, 26; Pa. Const. Art. I, § 5. The equal protection guarantees provide that "[a]ll men are born equally free and independent," Pa. Const. Art. I, § 1, and that "[n]either the Commonwealth nor any political subdivision thereof shall deny to any person the enjoyment of any civil right, nor discriminate against any person in the exercise of any civil right," Pa. Const. Art. I, § 26. The Free and Equal Clause provides: "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.

42. Under these equal protection guarantees, the General Assembly is not "free to construct political gerrymanders with impunity." *Erfer*, 794 A.2d at 334. On the contrary, a congressional districting map violates equal protection if the map reflects "intentional discrimination against an identifiable political group" and "there was an actual discriminatory effect on that group." *Id.* at 332; *see also Whitford v. Gill*, 218 F. Supp. 3d 843, 884 (W.D. Wis. 2016) (finding equal

protection violation in Wisconsin redistricting where there was both discriminatory purpose and effects).

A. The Map Intentionally Discriminates Against Democratic Voters

43. Where, as here, one political party had unified control over a redistricting, "it should not be very difficult to prove that the likely political consequences of the reapportionment were intended." *Erfer*, 794 A.2d at 332 (quotation marks omitted).

44. As described above, the evidence overwhelmingly established beyond any shadow of a doubt that the 2011 map was drawn intentionally to discriminate against Democratic voters. *Supra* FOF §§ A, B, C.

B. Democratic Voters Are an Identifiable Political Group

45. In *Erfer*, the Pennsylvania Constitution rejected the "sweeping conclusion" that there is no "identifiable political class of citizens who vote for Democratic congressional candidates." 794 A.2d at 333. *Erfer* acknowledged that "future plaintiffs" might "adduced sufficient evidence to establish that such an identifiable class exists," "particularly since the field of information technology [was] advancing at breakneck speed." *Id.* *Erfer* thus "assume[d] without deciding that Petitioners ha[d] shown the existence of an identifiable political group." *Id.*

46. In the present case, the evidence at trial conclusively established that Democratic voters—that is, people likely to vote for Democratic congressional

candidates—are an identifiable political group. Dr. Chen's statistical correlation analysis confirmed that Pennsylvania voters who vote for Democratic candidates consistently do so across elections, and are likely to continue to do so in future elections. *Supra* FOF § C.4. Dr. Warshaw's testimony confirmed the point. *Id.* Neither of Respondents' experts suggested that people likely to vote for Democratic (or Republican) congressional candidates are not identifiable.

47. Dr. Chen's analysis of the Turzai data files removes any doubt that Democratic voters not only are identifiable, but they were in fact identified by the creators of the 2011 map. *Supra* FOF § C.1, C.4.

C. The 2011 Map Has an Actual Discriminatory Effect

48. An intentional partisan gerrymander has an "actual discriminatory effect" when the gerrymander "works disproportionate results at the polls; this can be accomplished via actual election results or by projected outcomes of future elections," and there is "evidence indicating a strong indicia of lack of political power and the denial of fair representation." *Erfer*, 794 A.2d at 333.

1. The Map Materially Disadvantages Democratic Voters in Electing Candidates of Their Choice

49. The evidence at trial conclusively established that the intentional gerrymandering of the 2011 map has had an "actual discriminatory effect." *Erfer*, 794 A.2d at 332. Republicans have won 13 of 18 seats—the same 13 seats—in each of the three congressional elections under the 2011 map. Republicans won

those same 13 seats irrespective of swings in the vote—and even when Democrats won a majority of votes statewide. In the 2012 congressional elections, Democrats would needed to win more than 57% of the statewide vote just to win 7 of 18 seats. *Supra* § D.1.

50. Petitioners produced extensive further evidence of adverse effects resulting from the dilution of Democratic voters' votes. Dr. Chen and Dr. Warshaw each independently concluded that the gerrymander has resulted in Republicans winning several more seats than they would have otherwise, with Dr. Chen finding that Republicans have won as many as five additional seats than they would under a non-partisan map. *Supra* FOF §§ D.1, D.2.

51. The 2011 map accomplishes these effects by wasting Democratic votes through a brutally effective cracking and packing scheme. Dr. Warshaw's Efficiency Gap analysis demonstrates as much. The Efficiency Gap under the 2011 map is an extreme outlier, unprecedented in Pennsylvania's history and among the highest in the nation, ever. *Supra* FOF § D.3.

52. The disadvantage to Democrat voters is both large and durable. *Supra* FOF § D.

2. Petitioners Need Not Show That Democratic Voters Have Been Effectively Shut Out of the Political Process

53. Because the Pennsylvania Constitution "is not easily amended and any errant interpretation is not freely subject to correction by any co-equal branch

of [the] government," the Pennsylvania Supreme Court is "not constrained to closely and blindly re-affirm constitutional interpretations of prior decisions which have proven unworkable or badly reasoned." *Holt v. 2011 Legislative Reapportionment Comm'n*, 38 A.3d 711, 759 n.38 (Pa. 2012). Rather, where a prior decision "obscured the manifest intent of a constitutional provision," "engagement and adjustment of precedent as a prudential matter is fairly implicated and salutary." *Robinson Twp., Washington Cty. v. Commonwealth*, 83 A.3d 901, 946 (Pa. 2013).

54. The Pennsylvania Supreme Court is not bound to—and should not—follow *Erfer*'s approach to the second prong of the equal protection "effects" element. *Erfer*'s approach to that second prong, under which the targeted group must show that it has "essentially been shut out of the political process," 794 A.2d at 333, has proven to be unworkable and badly reasoned.

55. *Erfer*'s approach to the second prong of the "effects" element is vague and unworkable. The Supreme Court in *Erfer* did not explain what it means for an identifiable political group to be "essentially . . . shut out of the political process." Nor did the Supreme Court identify what evidence might satisfy such a standard.

56. In holding that the *Erfer* petitioners failed to show they were effectively shut out of the political process, the Supreme Court noted only that the petitioners "ha[d] not alleged . . . that a winning Republican congressional

candidate" would "entirely ignore the[ir] interests" and that "at least five of the districts" were "safe seats" for Democrats. 794 A.2d at 334. While *Erfer* held that these facts "undermine[ed] Petitioners' claim that Democrats ha[d] been entirely shut out of the political process," *Erfer* said nothing about what facts might be sufficient for future petitioners to satisfy this standard. Without any more concrete guidance, Pennsylvania courts lack adequate guidance to evaluate whether petitioners in partisan gerrymandering cases have satisfied the second prong of the "effect" element.

57. *Erfer*'s statement that a group must have been "essentially been shut out of the political process" was also badly reasoned. The Supreme Court purported to draw this requirement from *Bandemer*, but the *Bandemer* plurality never imposed such a requirement. 478 U.S. at 127-39. Rather, the *Bandemer* plurality held that the effects test would be met when "the electoral system is arranged in a manner that will consistently degrade a voter's or group of voter's influence on the political process as a whole." *Id.* at 132; *see also id.* at 132-33 ("[T]he question is whether a particular group has been unconstitutionally denied its chance to effectively influence the political process."); *id.* at 133 ("[A]n equal protection violation may be found . . . where the electoral system substantially disadvantages certain voters in their opportunity to influence the political process effectively. . . . [S]uch a finding of unconstitutionality must be supported by

evidence of continued frustration of the will of a majority of the voters or effective denial to a minority of voters of a fair chance to influence the political process.").

58. By imposing a new "essentially shut out of the political process" requirement, *Erfer* opened the door for partisan mapmakers in the General Assembly to devise extreme gerrymanders and defend them on the ground that the minority party would still have *some* representation in the U.S. House. Legislative Respondents have made that argument in this case, asserting that the 2011 map is constitutional because Democrats have held five "safe seats." *Erfer* had it exactly backwards. The *point* of partisan gerrymandering is to pack the minority party's voters into a few "safe" districts. That is a vice, not a virtue, of a congressional districting map. If the "effects" element of an equal protection partisan gerrymandering claim cannot be met so long as the minority party holds "safe seats," then it may never be met. Any legal standard that imposes such a requirement therefore cannot be correct.

59. If this rationale from *Erfer* were correct, where would it end? Would a partisan gerrymandering claim fail at the "effects" element if it reliably and durably entrenched a 17-1 Republican majority, simply because Democrats always win one seat? That cannot be right, but it is what *Erfer* suggests.

60. Nor is it required that representatives "entirely ignore the interests" of the minority party's voters to prove an equal protection challenge to partisan

gerrymandering. It is enough that the gerrymander deliberately discriminates against the minority party's voters, artificially preventing them from electing candidates of their choice and reducing electoral incentives for representatives to serve the interests of all of their constituents.

61. For these reasons, the Pennsylvania Supreme Court should not follow *Erfer*'s "essentially shut out of the political process" requirement.

3. In Any Event Democratic Voters Have Been Effectively Shut Out of the Political Process

62. In any event, Petitioners and other Democratic voters "ha[ve] essentially been shut out of the political process" as a result of the intentional gerrymander. *Erfer*, 794 A.2d at 333. They are not "adequately represented by the winning candidate" in districts where Republicans win due to partisan gerrymandering, and they do not have "as much opportunity to influence that candidate as other voters in the district." *Id.* (quoting *Bandemer*, 478 U.S. at 132).

63. In recent years, partisan polarization has grown to unprecedented levels, amplifying the harmful consequences of a partisan gerrymander on the minority party's voters in cracked districts. *Supra* FOF § F. Representatives in Congress no longer represent the views and interest of constituents of the opposite party, but rather vote overwhelmingly if not exclusively along national party lines. *Id.* This is true regardless of the margin of victory. In districts where elections are lopsided and competitive alike, it is winner take all. *Id.* There is no overlap at all

in the ideological position of *any* Democratic and Republican candidate—the most moderate Republican representative is still far more conservative than the most moderate Democrat, and vice versa. *Id.* This was not true when *Erfer* was decided in 2002. At that time, there was still some overlap among Republicans and Democrats in Congress. Petrs. Ex. 44.

64. The national trend is no less true in Pennsylvania. The Commonwealth's representatives in the U.S. House are sharply divided along party lines, without any overlap. *Supra* FOF § F. Republicans in Pennsylvania's delegation vote with the national Republican party in virtually every roll call vote, and the same is true for Democrats. *Id.* Nor do Democratic and Republican representatives from Pennsylvania get together on issues facing Pennsylvanians. In the most recent Congresses, Democratic and Republican representatives from Pennsylvania vote together less than 10 percent of the time. *Id.*

65. In today's Congress, a Democratic voter who is artificially deprived of the ability to elect a Democratic representative effectively receives no representation in the U.S. House, lacks any influence over the views and votes of her representative, and lacks any influence over policy in the U.S. House. *Supra* FOF § F.

66. Multiple Petitioners testified that they have suffered the effects of this lack of influence and effective representation firsthand, and that they have no voice in Washington through their congressional representatives. *Supra* FOF § F.

IV. THE REMEDY

67. Petitioners are entitled to declaratory and injunctive relief invalidating the 2011 map and prohibiting its use in the 2018 primary and general congressional elections. There is "an important role for the courts when a districting plan violates the Constitution." *LULAC v. Perry*, 548 U.S. 399, 415 (2006) (opinion of Kennedy, J.). Petitioners seek the following relief:

68. A new map shall be established on an expedited schedule. Following the Supreme Court decision, Legislative Respondents and Executive Branch Respondents shall be given two weeks to enact a map using non-partisan criteria. In the event they enact a map within the two week period, the map shall be presented to the Supreme Court for review, with the assistance of a special master. Any changes ordered by the Court shall be final.

69. In the event Legislative Respondents and Executive Branch Respondents are unable to enact a map within the two week period, Petitioners request that the Supreme Court, with the assistance of a special master, adopt a map using non-partisan criteria. The map adopted by the Court shall be final.

70. Depending on the timing of the Supreme Court's decision, Petitioners may ask the Court to direct a special master to begin work on developing a new map simultaneously with Legislative Respondents' and Executive Branch Respondents' consideration of a new map, so that an alternative map is timely available in the event they are unable to enact a non-partisan and constitutionally valid map.

CONCLUSION

For the foregoing reasons, the Court should declare Pennsylvania's 2011 congressional districting map to be an unconstitutional partisan gerrymander and issue a permanent injunction preventing Respondents from conducting the 2018 primary and general congressional elections under the 2011 map.

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Respectfully submitted,

/s/ Mary M. McKenzie

Mary M. McKenzie
Attorney ID No. 47434
Michael Churchill
Attorney ID No. 4661
Benjamin D. Geffen
Attorney ID No. 310134
PUBLIC INTEREST LAW CENTER
1709 Benjamin Franklin Parkway
2nd Floor
Philadelphia, PA 19103
Telephone: +1 215.627.7100
Facsimile: +1 215.627.3183
mmckenzie@pubintlaw.org

David P. Gersch*
John A. Freedman*
R. Stanton Jones*
Elisabeth S. Theodore*
Helen Mayer Clark*
Daniel F. Jacobson*
John Robinson*
John Cella (Atty. ID No. 312131)
Andrew D. Bergman*
ARNOLD & PORTER KAYE SCHOLER LLP
601 Massachusetts Ave., NW
Washington, DC 20001-3743
Telephone: +1 202.942.5000
Facsimile: +1 202.942.5999
David.Gersch@apks.com
* Admitted pro hac vice.

Andrew D. Bergman*
ARNOLD & PORTER KAYE SCHOLER LLP
Suite 1600
700 Louisiana Street
Houston, TX 77002-2755
Telephone: +1 713.576.2400
Fax: +1 713.576.2499
* Admitted pro hac vice.

Counsel for Petitioners