

Expert Report of
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I am a Professor of Political Science in the Department of Government at the University of Maryland, College Park. I received a Ph.D. in political science at the University of Chicago in 1990. My areas of specialization include political behavior, political geography, geographic information systems (GIS), state politics, population mobility and immigration. Publications include papers in well-regarded peer reviewed political science journals (*AJPS*, *APSR*, *JoP*, *QJPS*), journals in other social science fields, as well as several books relating to the same subjects. I was retained at the rate of \$300 per hour plus costs. My opinions expressed in this case are in no way contingent on the payment of any monies owed to me for my services. My opinions in this report are given within a reasonable degree of professional certainty. Any monies owed to me are not contingent on the outcome of this case.

Focus of Research and Overview

On October 24, I was asked by the legislative respondents in this case to respond to the petitioners' expert reports on Pennsylvania's present congressional redistricting plan, passed into law by the Pennsylvania legislature on December 22, 2011, and under which the 2012, 2014 and 2016 congressional elections were carried out. I begin by reviewing the values and redistricting criteria commonly used by state legislatures to draw legislative districts. These criteria are often in conflict with each other, creating challenges for any would-be mapmaker. There is no perfect map that optimizes the value of all of the measures now incorporated into the redistricting process. Automated map drawing might reveal redistricting options much more quickly than a well-trained professional can use GIS software to draw the maps one-at-a-time, but the automated tools still fail to produce a perfect map, insulated from credible legal challenge (Browdy 1990; Cho and Liu 2016). Those charged with the task

of drawing, then approving, district boundaries inevitably weigh some priorities more heavily than others, some criteria must take precedence, and these decisions are inherently value laden and political, not within the capacity of technical expertise to decide. Technical experts can produce a large number of plans to consider, but nothing about their expertise leads inexorably to the conclusion that one plan is best.

The expert reports by the petitioners use a variety of measures to show that the Pennsylvania congressional districts have a Republican advantage, though this could be argued to be an incumbency protection plan, rather than a “Republican” plan, per se. Conflicting criteria are involved in map drawing and the balance of conflicting values creates trade-offs. Among the traditional and widely applied redistricting criteria are the following:

1. Contiguity
2. Equal population across districts
3. Compactness of shape
4. Consistency with past districts
5. Districts should not split county and municipal boundaries
6. Districts should be politically balanced between the parties
7. Some districts should be drawn to ensure descriptive representation of minorities
8. Districts should be composed of persons with a community of interest.
9. Districts should protect incumbents

Extended discussions of the regularity of specific types of conflicts can be found elsewhere (Lowenstein and Steinberg 1985; Cain 1992). Most plainly, the demand for equality of population may limit the shape and compactness of districts. Sparse populations may require enclosure by protruded shapes. Attempting to preserve communities of interest will commonly make it difficult to achieve an

even balance of partisans. Ensuring descriptive representation of minority voters in one or more districts will also make it more difficult to achieve partisan balance in nearby districts (Brace, Grofman and Handley 1987).

The underlying residential patterns in Pennsylvania and many other states also make it very difficult to create competitive districts in some areas. In Philadelphia and its suburbs, for instance, with a significant share of the state's low income and minority population, drawing politically competitive seats that preserve the city as a community of interest will be close to impossible given the electoral groups that presently constitute the two major parties. The same is probably true throughout the northcentral part of the state where rural and small town residents have established histories of identifying with Republicans. The upshot of residential settlement is that some partisan tilt in a Republican direction is going to be the result of a redistricting plan that ensures descriptive representation for the state's racial/ethnic minorities while also ensuring equal population across districts, and the preservation of communities of interest.

In the end, there is no such thing as an unobjectionable map, especially for one containing more than three or four districts. Moreover, the shapes of districts and the calculation of the efficiency gap are not useful tools for detecting partisan intent and do not provide Courts with a manageable standard for identifying unconstitutional gerrymanders. Finally, partisan gerrymandering is not easy to accomplish because across and within cycles there is considerable variation in party inclination and support. Map makers intent on producing anything but the most one-sided majorities for one party or the other face too much uncertainty in states as evenly divided and as closely contested as Pennsylvania. Even the districts that the petitioners single out do not turn out to have steeply lopsided Republican majorities of the kind one might expect from uninhibited partisan map making. Nor are the members of Congress elected to and occupying these districts ideological or immoderate in their political behavior and viewpoints. Evidence at the end of this report will show that Republican

incumbents presently occupying these seats are among the most moderate members of the House Republican Conference. The lines resulting from passage of Act 131 have not resulted in a more polarized Pennsylvania delegation and the incumbents occupying these seats have not been demonstrated to be less responsive to constituents than they were before their elections under the 2011 congressional redistricting plan in Pennsylvania (“2011 Plan”), or than their predecessors were in cases in which they are newly elected.

Redistricting Principles in Conflict

By now it is no secret that the goals of redistricting frequently run counter to one another, creating trade-offs that are impossible to resolve in the absence of a consensus on priorities (Lowenstein and Steinberg 1985; Butler and Cain 1992, Chap 4; Niemi and Deegan 1978). The desirable features of congressional districts encompass both geographic (and geometric) features, as well as those thought to achieve the goal of fairness. Among the familiar geographic aspects are: contiguity and compactness, which need little explanation. To these is frequently added consistency or congruity with past districts, certainly to the extent possible. One would not switch a district from one side of the state to the other, or from a dense core city, to a sparsely settled rural area. In the redistricting process, new map drawing almost always begins with the implicit restrictions imposed by the boundaries of the previous map, not by throwing it out and starting from scratch. This desire for continuity is an important constraint, even if it is “understood” rather than expressly identified in legislative language. In many cases the demand to have districts consistent with past mappings is also in the service of the related aspiration to preserve “territorial community” (Stephanopoulos 2012) or ensuring that a map recognizes and preserves communities of mutual interest (Forest 2004).

Among the fairness criteria are very well established principles such as equality of numbers, or certainly *near* equality. Under redistricting cases since the 1960s, this fairness doctrine has been

interpreted consistent with Section 2 of the 14th Amendment to mean equality across the *whole* number of persons; not just those of voting age, those who are registered to vote, or those who identify with a political party. For practical reasons it is sometimes difficult to come by exact equality, but large deviations from equality are not desirable, except in cases in which several small states receive a singular representative in the U.S. House in spite of having considerably fewer people than the average House district elsewhere.

The demand for population equality is often thought of as the most fundamental goal to be met in a new redistricting plan. Population equality with close to zero deviation is the primary requirement a plan must fulfill. But given the uneven population distribution within states, it is challenging to draw compact districts that are also equal in population or equal population districts that fully respect community boundary lines. In many states, mid-sized and larger cities stand out alone among a sea of sparsely populated rural areas and towns that they have traditionally served as a commercial hub and transit center. For a city of considerable size traditionally positioned near the edge of a district, or on a border, there are many circumstances in which it cannot be encompassed whole, within a single district, as would be desirable from a community-of-interest standpoint. Instead it must be divided between two or more districts as a practical measure in compromise to the state's underlying population distribution.

Another aspect of population equality that is frequently passed over in hasty critiques of redistricting maps is the need to reapportion voters into equal sized districts after a seat has been lost, such as in Pennsylvania after the 2011 reapportionment. Seat loss usually follows steady population loss in an area. Ordinarily, however, a region does not lose a full district's worth of citizens in a ten year span, but instead loses a much smaller fraction, perhaps 20-30 percent, perhaps as much as half. With the new redistricting, then, some 500,000 people from the abolished district (approximately 30 percent less than the 710,000 size of current congressional districts) will have to be redistributed among

neighboring districts in the region. The effect will be to require serious and controversial alterations to existing district lines to absorb the excess population from the eliminated district. To maintain population equality, it may well be necessary to parcel out the population among multiple districts since pushing 500,000 voters into a single district would almost certainly create imbalance. Typically, however, all of the districts receiving the population from the abolished district will have to be adjusted.

Fairness also dictates that population growth must be accommodated, not merely population loss. Some may be of the impression that since Pennsylvania lost a seat, there was no population growth to be seen, and none to be accounted for in the 2011 Plan. This is flat wrong, as it turns out that the state's population growth was quite uneven, with an uptick in the Central and Southeastern counties. A district that adds anywhere from 5,000 to 80,000 new residents will have to be altered to maintain its population equality with neighboring districts. Obviously the higher the rate of growth the more boundaries will have to shift, typically contracting to encompass a smaller land area but encompassing greater population density.

Other fairness criteria that must be met include minority descriptive representation, proportionality of seats with votes, and competitiveness of individual elections – presumably assured by drawing districts that encompass approximately even shares of identifiers with the two major political parties. These fairness goals are commonly in conflict with each other, and also with the geometric criteria. Creating a more competitive district involves the uncertain calculation that voters will follow their party registration or their past voting inclinations in future elections. Strong partisans, to be sure, are highly predictable across election cycles, but weaker partisans and independents are not. Encompassing an approximately equal mix of Republicans and Democrats may require some highly distorted boundary drawing, to say nothing of the guesswork involved in estimating the future political tendencies of independents and weak partisans.

Minority descriptive representation is understood to mean that minority, mainly African American and Latino, populations should have a reasonably sure chance to elect someone from their own racial/ethnic group. Minorities should not be spread so thinly across districts that they have no opportunity to elect one of their own through bloc voting. Ensuring that African Americans and Latinos have an ability to elect an African American or Latino candidate, under circumstances of racially polarized voting, has been deemed necessary to achieving this end by assorted judgments under the Voting Rights Act of 1965, as amended in 1982. The challenge in some states, however, is to place ethnic minority voters in sufficiently concentrated pockets to ensure descriptive representation, without hindering the achievement of other important goals. A plan is not permitted to “pack” minorities into super majorities, nor is it permitted to “crack” them into small minority-sized parcels. The ambiguity in much redistricting analysis and criticism is that all redistricting maps involve the grouping and dispersing of populations. Every map with any large number of districts will always reflect some “packing” and “cracking” – perhaps this is why the petitioners have not presented an alternative map. It is far easier to critique someone else’s map, than to draw an alternative map and subject it to critical review.

Ambiguity in the Interpretation of Districting Plans

The attempt to balance descriptive representation and competitiveness presents a clear example in which ambiguity about the terms “packing” and “cracking” become problematic. The report by the petitioners’ s’ expert John J. Kennedy criticizes the 2011 Plan for packing certain populations and cracking others. The problem is that any effort to group politically similar populations can be labeled as packing by this account. Any effort to diversify the population of a district can be conversely derided as cracking. But only two possibilities exist on this continuum between grouping and diversifying a district population.

Any multiple district plan can be critiqued for having moved districts in one direction or the other. One is always either packing or cracking. To respect a community of interest, the author of a map will usually be engaged in grouping (packing). To produce competitive districts, often the opposite will happen and the district will fit the characteristics of having been diversified (cracking) in some way. In this manner, the utility of the concepts of packing and cracking as they might pertain to tests for gerrymandering is eliminated. Any critic of a plan can point to “packing” and “cracking” on a map they happen to dislike. What counts as an acceptable grouping or dispersion of a population is contestable, and the perspective one brings to a map may well influence a critic’s judgment. The reality is that what is commonly called packing is usually essential to serve another redistricting value, while what is known as cracking – the diffusion of a population across more than one district -- may be exactly what is required to serve an alternative value.

A second important point is that certain possibilities for map drawing are constrained once initial districts are drawn with particular values in mind. Given the close association of race and ethnicity with party identification, when African Americans and Latinos are grouped into geographic blocs within districts they are removed from having influence on the outcome of elections in the adjacent districts. The benefit of the majority-minority districts is descriptive representation for black and Latino voters. The cost is that other nearby districts are less likely to be competitive without the presence of those voters to support Democratic candidates. With a sufficiently large minority population share, coupled with multiple districts promoting descriptive representation, the remaining seats could well become safe, or at least *safer*, for the opposing party, distancing the seat share from the vote share. This is the sense in which the goals of descriptive representation and competitiveness come into conflict, and also how descriptive representation and proportionality come into direct conflict.

Principles of fairness also regularly conflict with the requirement to hold together communities of interest that have formed over the course of state history. There is no universal agreement on what makes a community-of-interest, probably because these vary with the unique histories of states and regional communities. These communities of interest are sometimes conceived of as smaller official jurisdictions with well-defined boundaries such as counties or municipalities. By tradition, communities of interest are understood as counties and MCDs (municipalities or Minor Civil Divisions) with the goal of keeping these jurisdictions whole within congressional districts. Such a principle makes sense as counties and municipalities are often governing bodies in their own right, with a county council, a county executive, a clerk, a controller, and a litany of other elected officials. Larger towns and cities also have elected officers; including mayors, controllers, treasurers, city councils and school directors. Moreover, Pennsylvanians, like residents of other states, are known to identify with their counties and towns as places they originate from and dwell. They are not arbitrary lines drawn on a map, but have come to constitute discrete locations with well-recognized qualities, social attachments and affiliations. Place attachments define people who come to believe “they are part of the same coherent entity.” (Stephanopolous 2012, 1385).

Preventing county and municipal splits is not the only possible way to measure the preservation of communities of interest. A state legislature is certainly entitled to look at other criteria. Many communities of interest have an economic thrust, such as ports, military installations, or commercial hubs. Indian reservations and other areas of racial, ethnic and cultural importance may make reasonable claims to having a common interest. These places are frequently without official boundary lines, but are well-known to local residents and officeholders who carry about a unique local expertise an insular map maker will lack. A powerful argument in favor of state legislative involvement in the redistricting process is the impressive amount of local knowledge legislators amass in living out their lives in a particular place, running for office, and serving a particular geographic constituency over a

period of time. A high level of local knowledge is required to develop the kind of following that insulates a legislator from adverse electoral swings. But this same kind of knowledge is what uniquely enables legislators to draw maps encompassing interests known to belong together, as a territorial community, rather than woodenly applying principles that would divide them, hampering the expression of common values and aspirations.

This kind of familiarity recognizes important community-level details unknown and often unknowable to the redistricting consultant; how neighborhoods relate to one another, how roadways and waterways separate communities psychologically not just physically, and other borders that distinguish interests that cannot be easily mapped relying on available boundary files. Typically, a redistricting consultant will gloss over communities of interest, not having the local expertise about what to include and what to discount. A state legislator, however, is apt to know every strip mall; ethnic restaurant; road construction project; pipeline; water tower; neighborhood association; grain elevator; intersection; power plant, and garbage dump. Not all of these features are going to be relevant to drawing boundaries, and clearly not everywhere, which is why a GIS specialist would not be inclined to collect this information on a statewide basis. Drawing upon local knowledge, however, on a district-by-district basis, this kind of information can identify a community of interest invisible to outsiders, but obvious to everyone occupying local ground.

Race-based districts aside, it takes little imagination to understand how achieving competitiveness is frequently at odds with the goal of preserving communities of interest. The anthracite coal region of Northeastern Pennsylvania is well recognized as a historical and cultural region distinctive from the rest of the state. Northwestern Pennsylvania is also distinctive, with a characteristically conservative brand of politics. Given that the politics of the inhabitants of these regions have developed hand-in-hand with their other cultural attributes, it is extremely difficult, if current party allegiances endure, to create a competitive congressional district utilizing the turf lying

wholly outside the city of Erie in District 3. This difficulty also arises in other parts of the state, such as the South Central counties (i.e., Franklin, Adams, York, Cumberland, and Lancaster) given the way political party loyalty has long been expressed in local settlement (Frey and Teixeira 2008).

Finally, fairness criteria are often in conflict with the goal of maintaining stability and continuity in representation – also a longstanding value upheld as a priority in many legislative district maps. Sometimes this value is also known as incumbency protection, and cynically characterized as allowing politicians to pick their voters, but there are principled arguments for wanting to draw districts favorable to the reelection of officeholders. Among them is the desire for continuity in a state’s congressional delegation, perhaps because a state is well served by the accruing seniority of its delegation in the U.S. House of Representatives. A state, through its legislature and governor, is in an authoritative position to decide if the promotion of incumbency through the redistricting process better serves state interests than having seats that can potentially change hands with even tiny shifts in public opinion. Redistricting maps that take the partisan tilt of districts into consideration are usually aimed at the goal of incumbency protection, though it is also unclear from existing research just how much redistricting contributes to promoting incumbency given that incumbents also have other advantages (McCarty, Poole and Rosenthal 2009; Abramowitz, Alexander and Gunning 2006).

A Statewide Overview of District Changes

Experts can examine districts one-by-one, in a kind of static or snap-shot approach, but this manner of analysis misses the interactive and dynamic nature of the way redistricting maps are drawn. Districts need to be considered at least in the context of their entire region, including the adjacent districts, and indeed the entire state. District drawing does not involve the sole consideration of the

shape of a district and its population composition, but how the drawing of that district affects the lines of all the other districts (Tufté 1973, 554). A study that relies on the boundary and shape of single districts lacks a sufficient appreciation for the way in which adding and removing units (precincts, blocks, municipalities, counties) from one district will affect the population of the adjoining ones. Chiefly among the criteria that must be balanced across districts is that they be of equal population size, a principle so fundamental and so crucial that states routinely lose seats from one redistricting cycle to the next when districts lose even small portions of their population. Map makers therefore start with this standard and in interaction with the state's underlying settlement and growth patterns, the goal of creating equal population districts is remarkably determinative of a map's shape, including which communities remain intact and which must be divided.

Table 1 shows how the state's districts from the 2002 map increased/decreased in population by the time of the 2010 census (see also Figure 1). The population losses across districts came from Western Pennsylvania, in and around Pittsburgh, from the 4th, 14th and 12th Districts shaded in gray (see Table 1 and Figure 1). Although the 14th district experienced the greatest population losses, it has been a longstanding tradition in the state to award a single seat to Pittsburgh and the greater Allegheny County area. Consequently, the 14th district is only marginally changed with some adjustment stretching up the Allegheny River to offset population loss. With only small changes made to the 14th District, the 4th District and the 12th District were quite obvious candidates for a merge, but with adjustments to the boundaries of the adjacent 18th and 3rd District (compare Figures 2 and 3). The 3rd District also lost population, specifically from the northernmost tier (Erie) including from the city of Erie itself, and was adjusted southward to represent the population remaining from the erasure of the 4th District. In addition, Butler County is reportedly the only one of the ten westernmost counties that experienced population growth (+5.6 percent from 2000-2010), offering another explanation for the southward shift of the 3rd District.

The split in Erie County was implemented primarily to maintain population balance as the district was shifted southward to help absorb the population from the lost district. Erie County is quite sizable, home to an estimated 280,000 people in 2010, with about 101,000 living in the city of Erie itself. There is no way that the 3rd District could shift to the South and encompass all of Erie County while

District	Total 2010	Total 2000	Difference 2000-2010	% Change
1	656,523	646,548	9,975	1.5
2	632,980	646,355	-13,375	-2.1
3	639,120	646,311	-7,191	-1.1
4	607,128	646,661	-39,533	-6.1
5	649,941	646,387	3,554	0.5
6	726,487	653,422	73,065	11.2
7	661,602	643,077	18,525	2.9
8	682,876	644,631	38,245	5.9
9	667,255	646,638	20,617	3.2
10	664,666	646,534	18,132	2.8
11	692,451	646,209	46,242	7.2
12	609,710	644,120	-34,410	-5.3
13	679,551	647,858	31,693	4.9
14	575,547	647,092	-71,545	-11.1
15	717,967	642,831	75,136	11.7
16	726,281	641,988	84,293	13.1
17	685,611	646,291	39,320	6.1
18	652,303	647,372	4,931	0.8
19	728,617	646,389	82,228	12.7

Source: U.S. Decennial Census

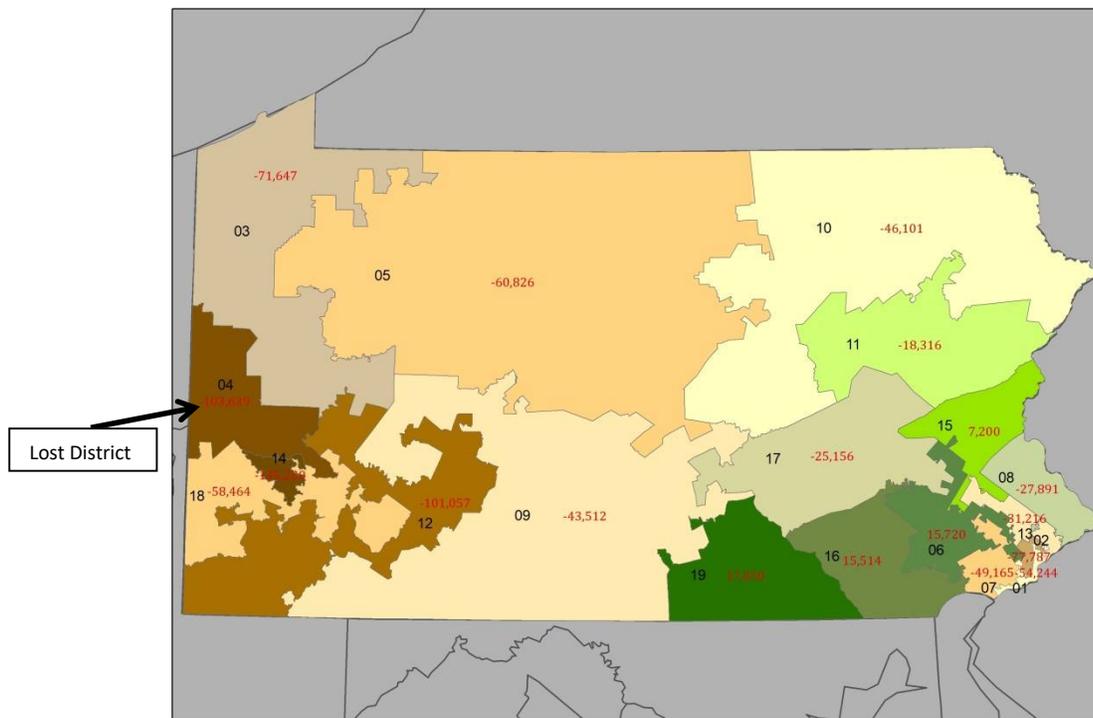


Figure 1. Population Deviation from Target Population Size (710,767) for the 2002 Pennsylvania Districts. (Figures in red shows by how much district population exceeded or fell below target size.)

remaining equal in population with adjacent districts. Erie County is considerably larger than neighboring counties in Western Pennsylvania and dividing them would not have provided the numbers that Erie offered. The decision to divide the city of Erie from smaller towns around it was made to maintain the city as a community-of-interest represented by a single member of Congress. Looking at it from the viewpoint of the 5th District to the west, as the 3rd District shifted southward, the 5th District had to shift westward (and into Erie County), as the boundaries move in a kind of counter-clockwise direction to cover the population no longer represented by the previous 4th District.

The shift of the 5th District to the West required the adjustments made to the 10th, 11th, 17th and 15th in the Northeast, and arguably the 6th in the Southeast, once the 15th was resized. As Table 1 shows, the 6th, 11th and 15th also gained population, though the 11th still remained below ideal size (Figure 1). Each of these districts required boundary adjustments to ensure equality. In the South Central region, the fastest growing locations were in the 16th and the 19th – the latter was renamed the

new 4th District in the 2011 Plan (for reference see Figures 1 and 2). The loss of just one seat, in the far western part of the state, in spite of rather modest population losses there, resulted in a chain reaction of significant boundary shifts throughout the rest of Pennsylvania. The differential levels of population growth in Eastern Pennsylvania also had to be accommodated.

One crucial aspect of the state's political development should be reckoned with as the 2011 plan is compared with the previous one. Changes in the balance of party registration have followed the population growth in some areas and decline in others. Across the state, Republican electoral prospects were strong throughout the decade leading up to 2011. Even so, Republican registration has declined in many Districts. Democrats have not always benefitted in direct proportion to GOP losses because an increasing number of voters are registering as unaffiliated. The increase in unaffiliated registration, and the gulf between electoral performance and party registration, speaks to the fluidity of partisanship, a subject to be addressed in more detail later.

The figures in Table 2 for a number of Districts that the petitioners complain were "packed" with Democrats instead simply gained Democratic registrants in the intervening years. Or, alternatively, Republican registration dropped in these areas, important facts that the petitioners' reports fail to mention. Table 2 presents figures for change between 2001 and 2011 viewed from within the 2001 districts, so the differences are not as a result of boundary drawing, but because the underlying population became more Democratic in its political preference. This is true in Districts 1 and 2, in Philadelphia, where Democratic registration increased by 35,000 and almost 17,000 well before the 2011 maps were drawn. In four districts shaded in gray, Democratic Party registration dropped. When the petitioners complain about Democratic "cracking" or dispersion, they fail to account for the possibility that in the districts, precincts and blocks where more Republicans emerge in 2011 it is because Republican registration increased in the previous decade, as in the District 12 area, and in the vicinity of the abolished District 4.

Table 2. Change in Democratic Party Registration, 2001-2011 within the 2002 Congressional Districts			
District	Dem Reg 2011	Dem Reg 2001	Difference 2000-2010
1	346,581	311,034	35,547
2	372,293	355,379	16,914
3	186,424	183,897	2,527
4	209,030	225,120	-16,090
5	157,822	146,457	11,365
6	208,509	150,254	58,255
7	179,037	115,515	63,522
8	204,662	165,614	39,048
9	145,482	139,273	6,209
10	164,947	149,696	15,251
11	237,691	220,289	17,402
12	225,118	255,891	-30,773
13	227,883	185,832	42,051
14	307,221	337,671	-30,450
15	222,307	177,110	45,197
16	151,632	106,783	44,849
17	173,607	134,772	38,835
18	232,032	244,376	-12,344
19	162,974	128,250	34,724
Source: Pennsylvania Secretary of State			

The petitioners' experts uniformly ignore alternative explanations for the composition of the 2011 map that result from underlying growth and change in population subgroups including major voting blocs. In their rush to conclude that partisan intent motivated the creation of the 2011 map, the petitioners' experts ignore the exigencies and constraints created by population growth and secular, district-specific trends in Republican and Democratic electoral strength. Most pointedly, they ignore the elimination of the previous 4th District and the attendant complications that followed from trying to parcel out more than 500,000 Pennsylvanians among nearby districts while meeting the ideal size of 710,767 residents each. More detailed district level analysis follows:

District 1

District 1 can be described as a “minority influence” district, in the sense that the minority population is a sufficiently large number to exert influence in an election, although not always a controlling influence (Kousser 1992; Pildes and Niemi 1993). This district was originally expanded into Delaware County in 1991 to address requirements of the Voting Rights Act so this is not a new development as the petitioners’ expert, Professor Kennedy, appears to suggest. The district kept those areas and expanded to pick up additional population as Philadelphia’s numbers continued to decline relative to other areas in the state. Notably, Philadelphia’s Latino population is encompassed by this district as a community of interest. To make this district competitive, Republican voters would have to be added from Delaware County, while minority voters would have to be divided between two or more districts. The 2011 Plan divides the city of Chester because of its sizable population (34,000 in 2010). The minority population declines because the district had to incorporate additional population to meet population size requirements. Adding Republican areas would further dilute minority influence, generating the opposite complaint from the petitioners.

The Kennedy report complains about an appendage of the District that extends from the city of Chester outward to encompass Swarthmore College and other nearby (Democratic) boroughs. He interprets this to mean that these Democratic voting areas were “packed” into District 1 out of partisan intent. One gets the impression elsewhere from the Kennedy report that if Swarthmore would have been divided up among two or more districts he would reflexively conclude that it was cracked out of partisan intent. An alternative interpretation of the present District 1 configuration is that planners sought to preserve Swarthmore as a distinctive community of interest. Not every college community in the state can be accommodated in this way, but it is consistent with the multiple goals of redistricting to accommodate geographic interests whenever possible.

District 2

This district was redrawn to exclude Cheltenham Township, which voted overwhelmingly Democratic in the 2010 U.S. Senate race. Lower Merion is entirely in this District except for parts of one precinct that were removed to meet population requirements. Professor Kennedy suggests that the district was packed with Democrats, but this is an overstatement. The district is geographically surrounded by very Democratic areas and gained 16,914 Democratic registrants over the previous decade, while losing 20,525 Republicans. Very distorted line drawing would be required to reach the nearest Republican concentrations. The district's political leaning simply reflects the underlying patterns of political inclination and population change in the area.

District 3

As indicated in the summary above, the major development here was the shift southward to incorporate populations that were in the eliminated district (see Figures 1 and 2). Notably, in the 2001 map, Armstrong, Butler, Mercer, Venango and Warren Counties were split, and these county splits were eliminated in the 2011 map. Crawford was also split in the 2001 map. The question then arises as to why Erie County should be treated as a whole, while the other counties are split? What makes more sense, to make one split of 50,000 people, or 10 splits of 5,000 each, or 20 splits of 2,500 each? These trade-offs constitute the reality confronted by map makers in the effort to achieve population balance.

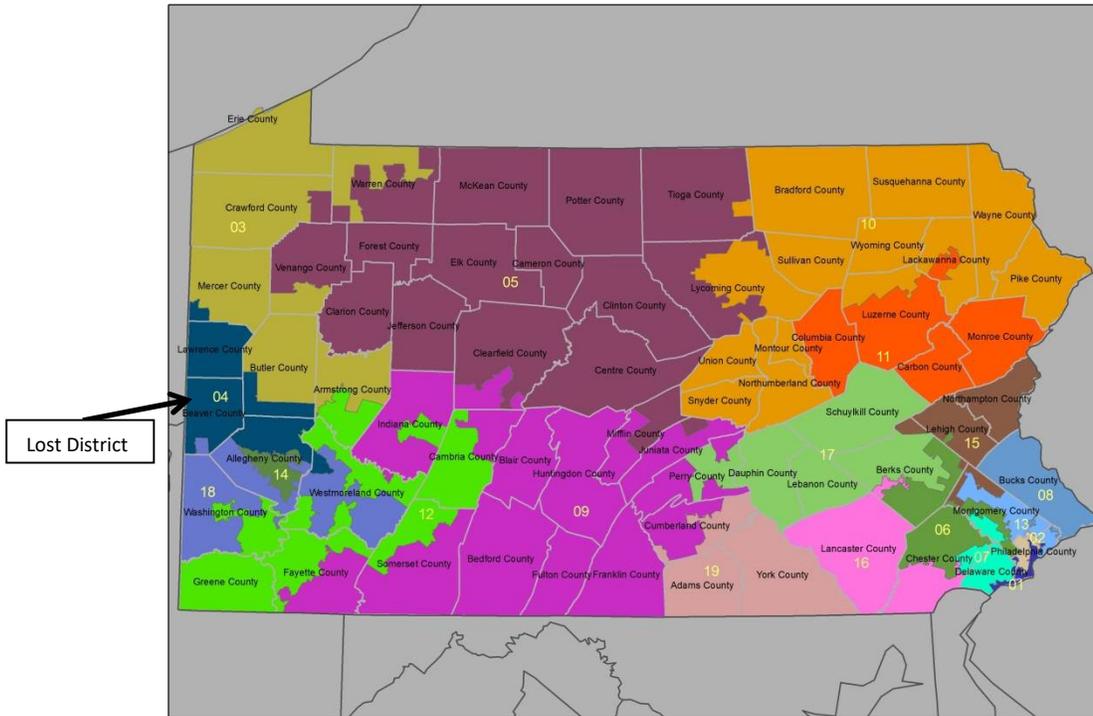


Figure 2. 2001 Pennsylvania Congressional Districts

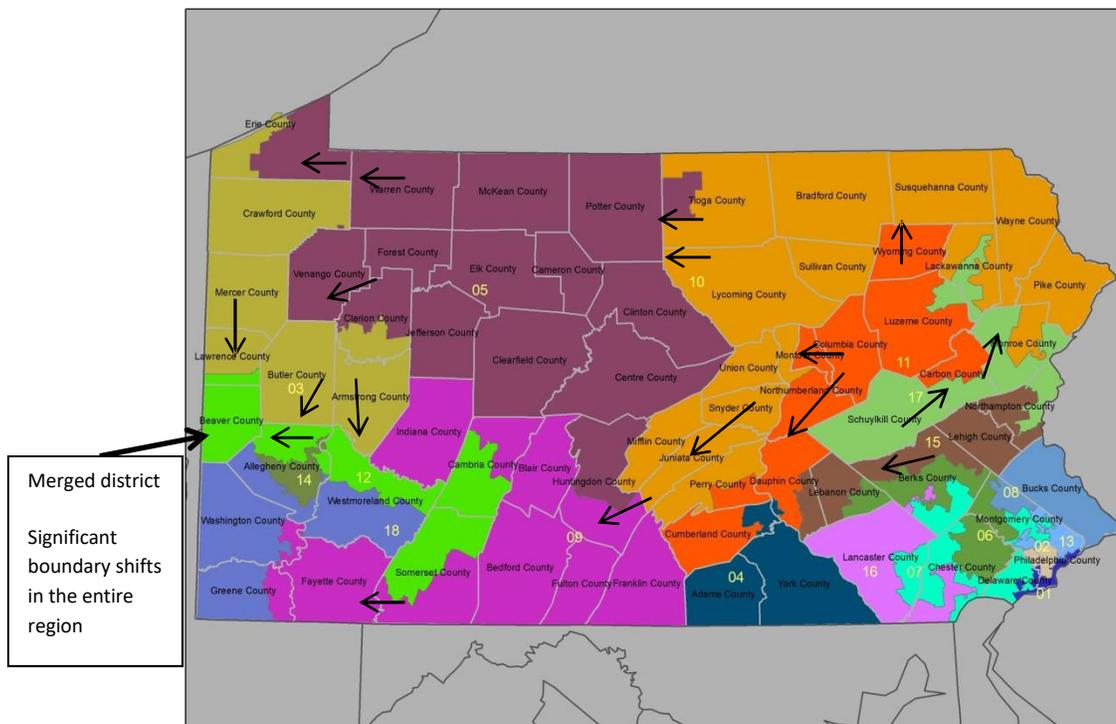


Figure 3. 2011 Pennsylvania Congressional District, (arrows show direction of major boundary shifts)

The new 3rd District does not extend as far south as Allegheny County. The 2011 Plan made Butler County whole, but the 3rd District has extended into Butler County since the 1991 map. The Kennedy report also fails to notice that a majority of Erie County's registered Democratic voters remain in District 3 (63 percent) and were not moved to District 5. The Kennedy report speculates that there were Democratic voters in Mercer County who had to be counterbalanced elsewhere. Mercer County is a reliably Republican area where GOP candidates have frequently carried all but a few of the 48 municipalities. There was no thought of a need to counterbalance or isolate Mercer's Democratic population when the 3rd District boundaries were redrawn.

In summary, a critic of the 2011 Plan can complain about the Erie metro having been divided, but keeping city and suburbs together in this case would result in considerable population imbalance between these two districts that would be more difficult to makeup elsewhere. To be sure, one might have drawn the boundary in a slightly different place across Erie County, but making the split within the city most certainly would have produced complaints opposite to the ones the petitioners are now airing. In the end, readers of the petitioners' accounts obtain the impression that any dividing line will generate an objection.

District 4

This is the previous District 19, as shown in Figure 1. As Table 1 shows, the population of the 19th District grew substantially between 2001 and 2010, exceeding targeted population size (see Figure 1), necessitating a contraction of boundaries. Dauphin County and Harrisburg are divided to maintain population equality across the multiple districts that converge in this area. Harrisburg and the adjacent suburbs in Dauphin County constitute a sizable population center (Harrisburg is about 49,800; the balance of Dauphin County adds another 224,000) and it sits at the intersection of a number of districts

that encompass rural areas and small towns, as in the northwest. To achieve population balance across Districts 4, 11 and 15 necessitates a split of Dauphin County because of its large and dense population.

Encompassing Dauphin County entirely within one of these districts, though desirable from one standpoint, would almost certainly make it difficult to maintain equality of population across them. As in the case of Erie, there may be room to argue about exactly where the divisions cut through the county, but separating just two Harrisburg precincts from the rest is not a drastic split. The Kennedy report greatly exaggerates the extent to which Harrisburg was divided; making it sound like it was cracked down the middle. In reality, the division was quite limited.

District 5

As indicated above, the boundaries of District 5 were adjusted westward to accommodate the shift of District 3 to the south (see Figure 2). In the adjustment, Armstrong, Warren, Venango and Crawford Counties are kept whole but they had been split in the previous plan.

District 6

The 6th District grew by 73,000 voters between 2001 and 2010 (see Table 1) and also gained 58,255 Democratic registrants (see Table 2). In the 2001 map, it contained parts of Berks, Chester and Montgomery counties. The 15th District was shifted to the East in 2011 (as was the 17th) and this resulted in adjustments to the 6th District as parts of it were moved to the 15th. The 6th wound up incorporating parts of Lebanon and Berks Counties that were more similar to the areas it maintained. The Kennedy report fails to note that Reading had been split in the 2001 map. In the 2011 map Reading is made whole and included in the 16th District. The petitioners interpret this move in the most negative possible light, as “packing,” but had Reading been divided they would have complained that it had been “cracked.”

District 7

Congressional District 7 did gain population from 2001 to 2010. It also gained Democratic registrants over the same period. In spite of its often noted non-compact shape, it is politically competitive according to party registration figures with only a slim Republican majority reported below (see Table 8). One would think that if partisan intent were the overriding factor in determining the shape of this district the map makers could have made it a much safer bet for Republican candidates than it is now. The most densely populated part of the district in Delaware County is substantially continuous with the boundaries of the previous district. This House seat should draw able competitors from both political parties.

District 8

Bucks County is not sufficiently populous to warrant a single congressional district even with the population growth in the district from 2001 to 2010. To meet population equality requirements one of the adjacent counties must be split. Previously, the district included parts of Philadelphia and a piece of Montgomery. The 2011 map eliminated the extension into Philadelphia and included a larger section of Montgomery, creating only two county splits from what had been three. This version of the district is also consistent with history. The 8th has included parts of Montgomery since 1971 and the only time it had extended into Philadelphia was in 2001. Prior to 1971, Lehigh County was included with Bucks County to form the 8th District.

District 9

In 2001, the number of county splits was reduced from 9 to 6 even though the District had to shift westward to accommodate the seat loss. This is why the 9th no longer encircles Mifflin, Juniata, Perry and Cumberland Counties. Republicans gained ground over the decade measured in terms of

party registration. The 9th District drawn in 2001 (see Figure 1) gained 16,000 Republican voters from 2001 to 2011, while Democrats lost about 6,200. As it was redrawn in 2011, the Democratic losses from the previous decade were reduced to about 2,200 and the Republican registration gains remained about the same, not an outcome one would expect from a purely partisan line drawing process.

District 10

With the 9th District moving out of Mifflin, Juniata, Perry and Cumberland Counties, District 10's boundaries were shifted to fill in this territory (see Figure 2). This District has gradually expanded its geographic reach as Pennsylvania has lost House seats, moving from 25 in 1971, to 21 in 1991, down to 18 in 2011. With the boundary adjustments, the number of county splits here was reduced from 5 to 4.

District 11

The Kennedy report complains that this district does not include the cities of Scranton and Wilkes-Barre. The 2001 map is the only time District 11 incorporated both Scranton and Wilkes-Barre extending back to 1931. Remarkably, this District was drawn to split only 4 municipalities out of 224, but the Kennedy report's slanted exaggeration makes it sound far more sinister.

As far as the geographic expanse of the district, Representative Barletta has been more than accommodating to his constituents, opening four district offices 9 to 5 weekdays, and meeting constituents for casework in additional offices throughout the district on a part-time basis. Many members of Congress serve in Districts far more expansive than the 11th with great competence and professionalism. A district of this expanse is not an obstacle to representation, nor it is indicative of a partisan gerrymander, or many representatives in states lying to the west would be judged ineffectual and incompetent.

District 12

As noted above, the 2011 reapportionment required the elimination of one seat. Past practice has been to merge adjacent districts so that two incumbents compete for the remaining seat, and usually they are of the same political party. The new 12th district is drawn to encompass large sections of the abolished 4th District and the previous 12th District, both of which experienced population loss in the intercensal period (see Table 1). Contrary to the characterization in the Kennedy report, there was nothing especially “meticulous” or “calculating” about it given that the 14th District – Pittsburgh and the bulk of Allegheny County – was to remain substantially unaltered. A Republican now occupies this seat, but it *was certainly not constructed as a safe Republican seat*. The figures in Table 8 (below) show that Republican registration was only 37.4% at the time it was drawn, compared with 52.9% for Democrats. Democrats have lost registrants in the area encompassed by the previous District 12, as Table 2 indicates, but unaffiliated ranks have grown faster than Republicans. The conclusion to be drawn is that the district is competitive, and may well move back to Democratic hands at some point in the near future.

District 13

This district had to be considered on a block-by-block basis to meet equal population requirements and to adjust for the growth in the Philadelphia suburban population. The previously drawn 13th District also grew by 42,000 Democratic registrants, while Republicans declined by 47,000. At the time of 2011 creation, the redrawn 13th District had a significant Democratic edge with 58 percent of the registrants, but it is not so lopsided so as to be uncontested, even though the Democratic incumbent went unchallenged in 2016. In spite of its non-compact shape, Democrats were not excessively grouped (“packed”), nor were they unduly scattered (“cracked”).

District 14

The Kennedy report complains that municipalities are split in this district. In fact, only *four* are split, all to achieve population balance. Township splits were reduced from 12 in the 2001 map to 4 in 2011, a substantial improvement. Because this district lost 71,500 people, both Republican and Democratic registrants, over the course of the decade, it was expanded along the Allegheny River adding some small boroughs. These particular towns form more of a community-of-interest than adding suburban areas further away. This district encompasses many river communities on both sides of the Ohio and Allegheny Rivers. It is about as safely Democratic as it was before the redistricting.

District 15

As noted above, District 15 was adjusted westward as other district boundaries were shifted in that direction. From 1930 to 1970 Lehigh and Bucks County combined to form the 8th District. Northampton County was part of the 15th District that included Carbon and Monroe Counties – the former a coal county, the latter known for tourism in the Pocono Mountains. The economic diversity in the district has some history.

When Lehigh and Northampton Counties were combined in the 1971 map, the Democrats held the seat for six terms, but Republicans have held it for sixteen thereafter. Contrary to the impression conveyed in the Kennedy report, 79% of the population of Lehigh and Northampton counties remains in the 15th District indicating substantial continuity with the past

The city of Bethlehem is characterized by Kennedy as having been “cracked.” It is not cracked. Four census blocks in a single ward were removed for population equality purposes and placed into District 15.

The District is also mischaracterized by Kennedy as “extremely Republican.” At the time it was drawn, it was 46 percent Republican by registration, and 39 percent Democratic. By no one’s standard

is this “extremely” Republican. Republican registration declined there between 2001 and 2011.

Judging by the close balance of party registration, this district should regularly draw viable candidates from both parties.

District 16

Reading is singled out in the Kennedy report as having been “packed” into the 16th District. First, the city is made whole as a community-of-interest in the 2011 map, whereas in the 2001 map it had been divided. Arguably this change results in improved representation for Reading, not diluted.

Furthermore, the reality of District 16’s construction is more complicated than Kennedy’s misinformed characterization. Population growth in the 1990s formed suburban settlements around Reading as transportation networks into the city improved. In the 2001 map, Reading was in a district that included expansive farmlands and encompassed the coal counties of Schuylkill and Northumberland, two counties that have little in common with Reading.

The Latino population in this area is also growing quickly. The Route 222 corridor connecting the city of Lancaster and Reading, on its way north to Allentown, is considered a Hispanic boom area. District 16 was drawn along Route 222 in a manner that joins up the Hispanic population of southern Chester County and the Coatesville area.

Kennedy complains that Cumru township is split. But it is divided this way because it is noncontiguous. Placing all of Reading in one district and all of Cumru in another district will unavoidably result in a split township.

District 17

District 17 encompasses an area historically anchored in the anthracite coal region: Schuylkill, Carbon, Luzerne and Lackawanna Counties. The district shifted to the northeast partly because the 11th

and 10th District boundaries shifted north and west (see Figure 2). As indicated above in the discussion of District 15, the city of Bethlehem is not “cracked”. Four census blocks in the 17th ward were removed to establish population equality. The 17th tipped in a Democratic direction (55 percent) at the time of its creation but not overwhelmingly so (Table 8).

District 18

Like the other Districts in Western Pennsylvania, the 18th District’s boundaries underwent a major shift to accommodate the seat loss. In the 2011 map, District 18 splits fewer townships than the previous map, though the same number of counties. In spite of the boundary shifts, the District shows a modest Democratic registration edge of 53 percent at the time it was drawn (Table 8). If the intent was to draw a truly safe Republican district, then 53 percent falls well short of this goal. The 18th District should draw lively and vigorous challengers from both political parties, and if it does not, it is not because of the way the lines have been drawn.

Summary of District Analysis

The burdensome task for Pennsylvania map makers in 2011 was how to rebalance the population of districts when one seat had been removed in response to a modest population loss, leaving more than 500,000 voters to be distributed across the remaining districts. This simply could not be done without some significant boundary alterations. The changes made in Western Pennsylvania, in turn had a ripple effect on boundaries further away, clearly in the Northeast, but also in the South Central regions. The stringency of the equal population criteria makes it surprisingly difficult to balance populations when a map maker is forced to move populations in pieces, by blocks and precincts, rather than individuals. Under the constraint of minimizing split municipalities and counties, and the demand to draw districts largely continuous with the way they were drawn in the previous map, along with other

considerations, the room to maneuver is not nearly as free and expansive as the petitioner’s experts imagine. Perhaps this is why none of them have presented an alternative map.

Critics of legislative districting plans regularly complain when counties, towns and other communities of interest are split by district boundaries as in the image of neighborhoods cut up to look like Swiss cheese. One simple gauge of preserving communities of interest used by map makers in many states is to keep counties and towns wholly within districts, rather than dividing them. But compact shapes do not always preserve communities of interest.

As for the plan Pennsylvania presently has in place, it does have the very desirable quality of having minimized county and municipality splits from the previous plan. Analysis conducted by GIS experts in the state legislature indicate that the number of total splits in counties dropped from 42 to 39, and, more remarkably, the number of total splits in municipalities dropped from 97 to 73 (see Table 3). Not only were the total number of splits reduced, but the number of counties and municipalities with any split at all was reduced, from 29 to 28 for counties and from 94 to 68 for municipalities. These are not easy achievements under the constraints posed by Pennsylvania’s underlying population settlement, the demand for equal population districts, and the other goals of the redistricting process.

Table 3. Total Splits in Counties and Municipalities Under Recent Pennsylvania Redistricting Plans			
Plan Year	1992	2002	2011
Counties	27	42	39
MCDs (Municipalities)	17	97	73
Source: PA General Assembly Legislative Data Processing Center			

The present Pennsylvania district shapes can be understood deploying alternative explanations not considered by the petitioner's experts, none of which go to extreme partisanship, but remain entirely consistent with the multiple goals of the redistricting process. In some cases, non-compact districts are necessary to ensure that a politically balanced district can be drawn. The petitioners desire competitive districts across the state, but drawing 11, 12 or more *compact* competitive districts is not at all a straightforward task in Pennsylvania, which is perhaps why neither the Kennedy report nor the other reports offer an alternative plan.

Variations in Partisanship within Districts

Partisan advantages are not always as enduring or permanent as the petitioners' experts want to claim. Averages taken across a large number of elections and offices obscure the variability of political results within them. Certainly party identity is a valuable piece of information to have about a voter, but there is a reason why political scientists prefer to place voters on a seven-point scale, ranging across the following values: Strong Democrat, Democrat, Lean Democrat, Independent, Lean Republican, Republican and Strong Republican (Carsey and Layman 2006; Lewis-Beck, Jacoby, Norpoth and Weisberg 2008). The behavior and patterns of party support and loyalty across these categories are variable, predicting the propensity to vote at all, and to cast a ballot for the opposing party. Even in a highly polarized era there is crossover voting reported in every major election, especially among partisans whose identities are less anchored in issue congruence with their usually preferred party (Hillygus and Shields 2008). Campaigning does turn out to matter as political parties and candidates adapt to the composition of districts, emerging to run competitive elections in redrawn districts. Political scientists do not fully understand persuasion, but it is observed in every election as voters cast ballots in support of candidates who are not of the same party as themselves.

For evidence germane to Pennsylvania, we might consider the behavior of the state's voters grouped into the present eighteen congressional constituencies as they vote for different offices in the very same general election. Table 4 shows results from the 2016 general election, with the Republican and Democratic percentage of party registrants captured in the columns headed "R Reg" and "D Reg". The columns headed "D Max" and "R Max" contain the maximum percentage across the listed offices for each of the Republican and Democratic parties. So, for example, the maximum Republican vote across these offices in District 1 was 20% in the U.S. Senate race. The far right columns headed "Dif R" and "Dif D" simply reflect the difference between the party registration percentage and the maximum Republican and Democratic percentages across offices. In District 1, R Reg=15.2, and R Max=20.0. In turn, $15.2 - 20.0 =$ the Dif R figure of -4.8.

What is notable about the differences is that they are quite substantial, in the double digits in 13 of the 18 districts for Republicans. Differences for Democrats are not as high, but exceed 5 points in 8 of the 13 districts. Generally, Republican candidates do far better in most districts than their party registration figures suggest. In the aforementioned District 9, Republicans outperformed their party registration by as much as 21 points. In District 17, lying northeast of Allentown, Republicans outperformed their registration percentage by a maximum of 19 points. In District 18, on the opposite end of the state, Republicans outperformed their registration percentage by a maximum of 17 points. This clearly suggests substantial independence from partisanship, enough to indicate that party registration is a very imperfect indicator of partisan preference in actual elections. Though it is certainly true that turnout levels vary across these districts, the gaps between party registration and party performance in elections cannot solely be attributed to differences in voter turnout. If some

District	R% Pres	D% Pres	R% AttGen	D% AttGen	R% Treas	D% Treas	R% Aud	D% Aud	R% US Sen	D% US Sen	R Reg	D Reg	R Max	D Max	Dif R	Dif D
1	18.2	79.4	18.5	81.5	16.8	80.6	18.4	78.8	20.0	78.7	15.2	73.2	20.0	81.5	-4.8	-8.3
2	7.6	90.4	9.5	90.5	9.3	88.4	10.1	87.5	10.6	88.4	8.3	80.3	10.6	90.5	-2.2	-10.2
3	60.6	34.7	59.3	40.6	52.5	41.0	53.7	40.0	58.9	41.0	44.9	42.5	60.6	41.0	-15.7	1.5
4	58.2	36.9	60.8	39.1	55.6	37.6	52.0	42.5	58.5	37.6	48.0	36.6	60.8	42.5	-12.8	-5.8
5	61.7	33.1	60.8	39.1	55.6	37.6	55.9	37.1	59.4	37.6	47.0	38.6	61.7	39.1	-14.7	-0.4
6	47.6	48.0	52.5	47.5	48.5	46.5	51.1	43.6	52.1	46.5	43.8	39.6	52.5	48.0	-8.7	-8.4
7	46.8	49.2	52.0	48.0	49.7	47.1	52.4	44.0	53.1	47.1	49.0	36.5	53.1	49.2	-4.1	-12.6
8	48.1	47.8	49.9	50.1	48.8	48.3	51.2	45.6	52.5	48.3	41.8	42.1	52.5	50.1	-10.7	-8.0
9	69.3	27.0	64.3	35.6	57.8	35.5	58.6	35.4	63.8	35.5	48.6	40.1	69.3	35.6	-20.8	4.5
10	65.5	29.9	64.5	35.3	58.2	34.7	60.0	33.5	61.9	34.7	52.3	33.6	65.5	35.3	-13.2	-1.7
11	59.8	36.0	57.6	42.3	51.3	42.5	51.5	42.5	56.6	42.5	45.5	41.1	59.8	42.5	-14.3	-1.4
12	58.5	37.8	56.1	43.8	49.0	45.1	48.0	46.8	56.4	45.1	41.2	46.6	58.5	46.8	-17.3	-0.2
13	31.7	65.3	31.0	69.0	30.8	67.0	33.9	63.7	35.6	67.0	27.0	60.0	35.6	69.0	-8.6	-9.0
14	30.6	66.0	29.5	70.5	24.2	69.4	22.8	71.7	29.6	69.4	18.6	67.8	30.6	71.7	-12.0	-3.8
15	51.7	44.2	52.3	47.7	48.5	46.2	50.5	44.3	53.3	46.2	39.5	43.9	53.3	47.7	-13.8	-3.8
16	50.5	43.8	54.8	44.9	50.4	42.7	50.8	42.7	52.9	42.7	44.8	39.3	54.8	44.9	-10.0	-5.6
17	53.1	43.0	48.0	51.9	42.1	51.9	44.3	49.9	47.9	51.9	34.1	52.0	53.1	51.9	-18.9	0.1
18	57.9	38.4	56.1	43.8	49.6	45.0	47.8	47.3	56.2	45.0	41.1	46.8	57.9	47.3	-16.8	-0.5

Source: Percentages calculated from election returns provided by the Pennsylvania Secretary of State.

portion of the variability is accounted for by differences in turnout it only proves that the decision to turn out to vote or to abstain is itself a substantively important decision that contributes to the variability of a party's performance. Moreover, voter turnout is a behavioral outcome that is mutable to campaign effort (Green and Gerber 2015).

Several interesting examples from Table 4 also show Democratic candidates outperforming their district registration figures in the 2016 elections. In District 2, including Philadelphia and some of its suburbs, Democrats performed up to 10 percent better than a strict accounting by party registration would predict, giving nearly 91 percent of their vote to the Democratic candidate for Attorney General. No doubt it helped that the Democratic candidate, Josh Shapiro, was from Montgomery County, buoyed by a friends-and-neighbors vote. Even so, there are other examples. In District 7, Democratic registration was about 37 percent at the fall closing date, but Hillary Clinton won the district with 49.2 percent of the vote. In District 13, covering parts of Philadelphia and Montgomery County, Democratic registration was at 60 percent, but the Democratic candidate for State Auditor won 69 percent of the vote, and Hillary Clinton won 65 percent.

These are comparisons biased against finding big differences because all of these elections are taking place at the same time, in November 2016. There are no comparisons in Table 4 across election years, which would reveal even larger deviations from what could be described as party normality. The upshot is that party registration is a valuable predictor of vote choice, but it is not unchanging, or all-controlling.

At the voter level, political scientists have long known that party identification as recorded in surveys does not explain the entirety of self-reported vote choice (Campbell, Converse Miller and Stokes 1980). There is even some discrepancy between party identification and party registration. For instance, in the 2016 Cooperative Congressional Election Survey of Pennsylvanians, conducted by the Palo Alto based firm, *YouGov*, comparing three-point party identification to party registration yields the

cross-tabulation reported in Table 5. About 16 percent of the state’s Republican registrants tell survey researchers that they identify as independents. Among Democratic registrants, about 11 percent identify themselves as independents and another 2 percent report they are really Republicans, offsetting the 2 percent of Republicans who really identify as Democrats. Without question party registration is probably the best predictor of party identification available, but even then there is not a perfect association.

Table 5. Association Between Party Registration and Party Identification for Pennsylvanians, 2016				
Party Label	Democratic	Unaffiliated	Republican	Total
Democrat	86.7	8.3	2.4	43.3
Independent	11.4	85.3	16.1	22.3
Republican	2.3	6.3	81.5	34.4
Total	1,145	300	960	2,405

$\chi^2=2,600.9$; $p\leq.0001$
 $\phi=1.01$; $p\leq.0001$
 Source: 2016 YouGov Cooperative Congressional Election Study, Pennsylvania

Table 6. House Vote Preference and 7-Point Party Identification in Pennsylvania, 2016								
Party Label	Strong Dem	Not Strong Dem	Weak Dem	Ind	Weak Rep	Not Strong Rep	Strong Rep	Total
Dem	90.8%	73.0%	80.9%	37.3%	7.2%	6.1%	3.3%	43.8%
Rep	9.2%	27.0%	19.1%	62.7%	92.8%	93.9%	96.7%	56.2%
N=2,097	553	270	141	153	180	345	455	2,097

$\chi^2=1,270.6$; $p\leq.0001$
 $\phi=.778$; $p\leq.0001$
 Source: 2016 YouGov Cooperative Congressional Election Study, Pennsylvania

Not surprisingly, when it comes to vote choice for various offices, the differences between party identification and candidate preference are more striking, especially when we consider the ambivalence of weak and leaning partisans – identifiers who sometimes call themselves independents but are still registered with one of the two major parties. Table 6 (above) shows a cross-tabulation of 7-point party identification, including the weaker identifiers, with voter preference in the 2016 U.S. House elections in Pennsylvania. *Strong* Democrats and Republicans reliably prefer to vote for candidates of their party. But those who are *less* strong show greater tendency to defect, particularly on the Democratic side. An estimated 27 percent of the Democrats who are “not strong” preferred Republican candidates, according to these data. Republicans were less inclined to defect overall, although even six percent of the “not strong” Republicans preferred a Democratic candidate. The conclusion to be drawn from voter self-reports of party identity is that partisan voting blocs cannot be identified, measured, and diluted in the same manner as racial voting blocs. Partisanship is not the type of durable identity that one finds attached to race and ethnicity.

Partisanship and the Variability of the Efficiency Gap in Pennsylvania

Various redistricting experts have promoted the efficiency gap as a measure of proportionality between seats and votes, upholding that measure as an important standard by which to evaluate existing and proposed maps (Stephanopoulous and McGhee 2015). In the view of proponents, redistricting plans should exhibit a match between votes earned and seats won -- proportionality. A low score on the efficiency gap ensures that a properly balanced plan is in place.

Numerous criticisms have been advanced to show that the efficiency gap is a flawed measure (Cho 2017; Chambers, Miller and Sobel 2017; Cover 2017). Among these weaknesses are the non-comparability of the measure across states and points in time; that the measure is sensitive to the size of the legislative delegation; that the measure is sensitive to the political data used to compute it; and

that the measure does not capture the concept of “partisan fairness” in the way proponents claim (Cho 2017). Below I will focus my attention on *one* of these criticisms consistent with my discussion of the mutability of partisanship in the foregoing pages; namely, that the measure is sensitive to the political data used to calculate it.

Because the efficiency gap is calculated using measures of partisan loyalty, and these measures fluctuate as voters change their minds, as turnout changes, and as political tides ebb and flow, a particular plan may have very different efficiency gap scores across a short span of time, or even at the very same time if we gauge party loyalty across offices that are voted on in the same general election. This raises the question of which measure really represents the true political identity of the electorate. Over the lifetime of a particular redistricting plan, the size of the efficiency gap can vary widely, as partisan tides raise the prospects for one party or the other. The data presented in Table 7 show the efficiency gap calculation varies for the present Pennsylvania plan for each office, even for the same election year. For a plan containing 18 US House seats, a greater than two seat advantage is considered imbalanced enough to reject a plan. This means that for Pennsylvania’s present map, values of the gap greater than 11 indicate a defective plan.

In Table 7, I also calculate a gap for the party registration balance only to show what gap would emerge if all voters voted and cast ballots strictly according to their party registration. Even across the 2012-2016 period, the gap ranges from 4.2 to 17 (with positive values indicating a Republican advantage). The gaps do vary in magnitude to a Democratic advantage of -7.3 in the 2012 Attorney General’s race. Although it is true that the efficiency gap exceeds 11 in most elections appearing in Table 7, certainly there are instances where the gap falls well below that level. Viewed over the last decade, election returns in Pennsylvania suggest that the Republican tide has been gradually rising across the state as a secular trend, not that something specifically about the 2011 plan suddenly improved Republican prospects. Under this same 2011 plan, we could well see this tide recede in the

Table 7. Efficiency Gaps Calculated Across Offices for Pennsylvania Under the 2011 Redistricting Plan, 2006-2016.					
2016		2014		2012	
Party	17.7	Party	9.3	Party	4.2
US House	14.0	US House	11.2	US House	18.0
President	15.9	Governor	15.4	President	22.2
Atty General	19.5			Atty General	-7.3
Treasurer	28.9			Treasurer	25.5
Auditor	27.4			Auditor	25.6
US Senate	26.3			US Senate	9.2
2010		2008		2006	
Party	2.7	Party	2.9	Party	5.2
US House	9.5	US House	-1.1	US House	9.9
Governor	20.0	President	7.8	Governor	7.5
US Senate	5.9	Atty General	16.9	US Senate	-11.5
		Treasurer	-6.1		
		Auditor	-12.2		
Source: Author's Efficiency Gap calculations from data provided by the Pennsylvania General Assembly Legislative Data Processing Center					

2011 District	R % Reg 2009	D % Reg 2009	R % Reg 2010	D % Reg 2010
1	18.32	72.57	18.17	72.38
2	9.20	81.51	9.28	81.10
3	41.05	48.29	41.54	47.49
4	46.89	39.46	46.92	39.01
5	44.99	43.03	45.05	42.54
6	44.57	40.21	44.31	40.03
7	51.86	35.49	51.43	35.55
8	42.21	43.14	41.97	42.99
9	42.28	47.80	42.61	47.15
10	50.24	37.11	50.39	36.75
11	43.75	44.69	43.87	44.24
12	37.02	52.92	37.36	52.30
13	30.47	58.37	30.09	58.22
14	17.55	71.76	17.66	71.14
15	39.12	45.93	39.19	45.64
16	46.31	39.46	45.95	39.51
17	32.20	55.93	31.92	56.06
18	36.40	53.33	36.82	52.64

Source: Author's calculations based on aggregating 2009 and 2010 precinct data to 2011 Congressional District boundaries. Blue shaded cells indicate Districts in which Democrats were at least a plurality of total registrants.

2018 and 2020 elections, resulting in a declining gap, or lopsided Republican wins may well increase it. Neither of those results would be the consequence of a redrawn map. In this connection, we should also note that when the present Pennsylvania map was drawn, Democrats held the majority or plurality of party registrants in 12 of the 18 seats (67% of the total), as shown in Table 8 shaded in blue.

Since there is no certain way to assign voters to one of the two major parties; and with the voters moving in and out of the electorate, and voters changing their minds regularly enough to alter their political classification, the efficiency gap calculation is too undependable to be a guide. After all, who is being unjustly denied a voice in Pennsylvania? Is it the Democratic Party's registrants in the

state? Is it the Democrats who voted for Auditor or Treasurer? Or the particular group of people who voted for Hillary Clinton, regardless of their party identification? (Chambers, Miller and Sobel 2017, 30). Twenty thousand African American voters in District 2 will be twenty thousand African American voters in District 7. But if a group of twenty thousand Republicans in District 2 becomes a group of thirteen thousand Republicans and seven thousand Democrats in District 7, it is absurd to say that the quality of the Republican Party's statewide representation was affected positively or negatively (Rush 2000, 250). If the identification of the group depends upon the district in which they happen to reside, or the candidates they happen to face, then this is not an identity group in the first place. Racial groups are enduring, but a constituency's partisanship is not.

Minority Descriptive Representation and Competitiveness

Among other mandates, the Pennsylvania legislature labored to produce the 2011 Plan under the requirement that they provide for minority descriptive representation, following the precedent set by previous plans. This is a serious constraint on the placement of congressional district boundaries in Southeastern Pennsylvania. Philadelphia is home to a substantial African American population (44% in 2015) with a sizable Hispanic population (14%). Adjacent Delaware County was reported to be 22% African American and 4% Hispanic.¹ This extent of minority population concentration dictates that for any plan to be insulated from legal challenge as a violation of minority voting rights, the Philadelphia metro area should receive at least one seat highly likely to elect a minority member of Congress, and probably another with significant minority influence. The current plan reflects this reality, as District 1 is 36 percent African American and District 2 is 56 percent African American.

The legislature could certainly have drawn more African Americans into District 2 than it did. The inevitable criticism had they done this would be that a greater degree of "packing" is in excess of

¹ As reported in Census Quickfacts, based on 2016 estimates.
<https://www.census.gov/quickfacts/fact/table/delawarecountypennsylvania/PST045216>, accessed 11/15/17.

what is needed to obtain descriptive representation for minorities. In reality, it is not clear just what the appropriate population percentage should be given the uncertainty of black turnout across Democratic primaries and election cycles. Any less than 56 percent and petitioner's experts would surely complain that the black population was being unlawfully "cracked." In the face of these uncertainties, 56 percent is probably the narrowest acceptable threshold to avoid legal challenge.

Once these two districts were drawn, any map maker then faces the challenge that having removed large and reliably Democratic populations from the map, politically balanced districts will be difficult to draw in nearby areas in Eastern Pennsylvania. By removing the precincts from the concentrated minority voter locations encircled by Districts 1 and 2, it becomes far more challenging to produce three, four or five competitive districts nearby. An investigator need not remove the precincts just from Districts 1 and 2, in particular. Removing clusters of contiguous high population African American precincts from other parts of Pennsylvania will make it harder to amalgamate adjoining areas so that they reflect political evenness, much less a Democratic tilt. Levitt (2016, 2) makes the same point about Arizona's congressional districts; competitive seats are hard to create if map makers also care about minority representation.

Competitiveness and Compact Shape

The standards to utilize to create a competitive district are confusing and unclear (Alexander and Prakash 2008). Partisanship and competitiveness cannot be judged simply by measuring the balance of party registration or voting in a district, as has been suggested in various reports by petitioners. The present understandings that rely on vote percentages for the major parties fail to offer any local baseline for what an acceptable distribution of partisanship should be. For a party decisively in the minority in a location such as Republicans in the city of Philadelphia, creating one or two competitive districts will require an intensely partisan effort. Some districts would rarely be

competitive given the underlying concentration of the population settled there (Levitt 2016). Given the current distribution of partisans in the densest parts of Allegheny County, the district there probably should not be highly competitive. Not surprisingly, Districts 1, 2 and 14 are all considered safe Democratic districts in the 2011 plan. A competitive map in these locales would reveal evidence of the ugliest kind of partisan map-drawing at work, turning the usual indicators for partisan bias and competition on their heads. Shape is once again a most unhelpful guide to the map maker's intent.

Repeatedly, however, the petitioners' expert reports rely on the non-compact shape of a district to draw a completely contestable inference about partisan intent. Districts 12 and 9 are faulted for cracking Democratic constituencies for partisan ends but the net result is to create competitive districts judged by criteria accessible to the map makers at the time. Even the much criticized District 7 contained a 51% (see Table 8) Republican majority by registration at the time of its creation, an edge hardly considered an unassailable party fortress by campaign professionals. District 15 did not have a Republican edge according to party registration estimates at the time of its creation, but instead had a Democratic plurality (45-46%, see Table 8). Districts 17 and 18 both maintain Democratic majorities according to party registration figures in 2009 and 2010, though not insurmountable ones. Some extension outward from the cores of these districts was required to make them more competitive. Shape compactness will undermine competitiveness in many locations on the Pennsylvania map. Obtaining any large share of competitive districts in Pennsylvania will require extensions outward from larger towns and cities out to less densely settled territory, much as the current map shows.

In summary, the 2011 Pennsylvania map is a completely reasonable response to the multiple and contradictory demands of the redistricting process, including that of descriptive representation, preservation of communities of interest, the fundamental requirement for equal population, and the desire to maintain compactness of shape. Even political competitiveness is preserved across a large number of districts, at least gauged at the time the maps were drawn by the balance of party

registrants. Remove descriptive representation and it is considerably easier to even out the balance of party identifiers across Eastern Pennsylvania's congressional districts (Levitt 2016; Nakao 2011). Draw a district that contains all of Harrisburg and it becomes considerably more difficult to equalize the population across the adjacent districts. Under existing law, map makers are not free to sketch in the boundaries in order to satisfy only a single demand or priority.

Are the Officeholders More Extreme after the 2011 Plan?

The petitioners' complaint and the expert report authored by Christopher Warshaw make a point of arguing that the officeholders elected from plans such as the 2011 Plan are political extremists, and that they cannot obtain proper representation from such immoderate candidates, leading to the conclusion that partisan map drawing is a primary cause of institutional failure.

In this brief section, I will argue that the evidence for the extremism of the Pennsylvania delegation is unconvincing, and that there is considerable evidence that the Pennsylvania delegation isn't extreme at all. In fact, Pennsylvania has a long tradition of electing practical, level-headed and ideologically moderate officeholders to Congress who pride themselves on constituency service. Unlike members elected from states further south, they are usually not at the front of the ideological battle lines in Washington. Moreover, their election and reelection under the 2011 redistricting plan has not changed their sensible posture, nor is it likely to during the remaining years it is in place.

Roll call voting data based on recorded votes are commonly used to gauge political extremism, as they are in the petitioners' original complaint, as well as in the expert report by Warshaw. These are not helpful measures, regardless of how widely they've been used and misused by political scientists. Measures such as the DW-Nominate scores are so general that they conflate party line voting on trivial measures with no policy content (e.g., procedural votes) with truly divisive ideological votes on substantive themes such as abortion rights, immigration control, defense spending and tax reform. The

best that can be said for such scores is that they measure some loyalty to a party and a member's tendency to vote with their party's majority, but they say little or nothing about ideological polarization.

There are measures by individual interest groups that may come closer to gauging what is meant by political extremism in the ideological or policy sense. These are based on specific votes selected by the group to represent their ideological agenda. They are also based on questionnaires that members fill out detailing their positions on specific issues important to the group. There are numerous examples of these specialized group ratings or scorecards, from organizations on the left, the right, and center, but I will take up seven of them here all representing conservative causes with different issue orientations. I choose the conservative groups on purpose because it is the threat posed by increasing ideological conservatism in the Pennsylvania delegation that the petitioners appear to fear most. The group scorecard/ratings are:

1. The American Conservative Union (Positions Score) 2011, 2016
2. The American Conservative Union (Lifetime Score) 2011, 2016
3. Eagle Forum (Positions Score) 2011, 2016
4. Heritage Foundation Action (Positions Score) 2011, 2016
5. The Club for Growth (Positions Score) 2011, 2016
6. Gun Owners of America 2011, 2016
7. Numbers USA (Positions) 2011, 2016

Like any voting or interest group scores, the ratings for any two years are not strictly comparable because the same issues are not considered every year. The fact of that difference, however, should constitute a test for differences that would be biased *in favor* of finding a significant difference before and after redistricting, not against it. If we find that there is no difference between the 2011 rating and the 2016 rating, then it would be especially remarkable given that the exact nature of the immigration, or gun rights, or tax reform issues before Congress will change. Finally, it's also important to note that there are several membership changes between 2011 and 2016: Matt Cartwright replaces Tim Holden in District 17; Brendan Boyle replaces Allison Schwartz in District 13; Keith Rothfus replaces Mark Critz in District 12, representing not only a member change, but a change in

party control; Scott Perry replaces Todd Platts in District 4, the former District 19; and Jim Gerlach is replaced by Ryan Costello in District 6. All of these changes would predict that we should see major differences in the scores between 2011 and 2016 too!

Amazingly, what we find in the paired sample t-test of difference in means is that across these 126 pairings of scores listed in Appendix Table A.1, there is no statistically significant difference between scores in the two years (*Mean difference=1.45; SE=2.31; t=.628; p<0.531*). The biggest difference occurs in the party switch in District 12 from Critz to Rothfus. To be sure, this is a substantively large shift in a more conservative direction with this change in party control. But aside from this difference, even with the *intraparty* changes in membership included, the differences do not become greater from 2011 to 2016. The Pennsylvania delegation is not becoming more conservative as a result of redistricting.

Finally, note in Table A.1. that the substantive scores for Republicans in the districts the petitioners complain about most are very moderate on the 0-100 scale. The occupants of these seats: Patrick Meehan in the 7th; Ryan Costello in the 6th; Mike Kelly in the 3rd; Bill Schuster in the 9th; and others – are not earning ratings way out on the extremes by these high profile conservative interest groups. None of these incumbents are recognized as leading right-wingers in the Republican Conference on Capitol Hill. They may look conservative to liberal extremists active in Democratic Party politics in Pennsylvania, but by objective standards they are not even close to the conservative extreme. The complaint that the 2011 Plan has generated some rightward lurch in the Pennsylvania delegation is not justified by the facts.

Conclusion

Redistricting plans have to satisfy many goals, and they always do this imperfectly because the goals are in conflict. A district that preserves a territorial community quite well is likely to be politically lopsided on a number of other measures because proximity promotes homogeneity of interest.

Conversely, competitive districts could well be disruptive of communities if they have to go out of their way to incorporate diverse interests.

Responsiveness, or “efficiency,” is not the preeminent goal of redistricting any more than other values that could be elevated. Just as there are reasonable arguments for creating more competitive districts, there are equally reasonable arguments for desiring lower turnover in leadership. Some argue quite reasonably for representatives who will ignore the short-run impulses and protests of constituents in favor of policy that will serve the longer-term interests of the state. Expertise and seniority in Congress are also valuable resources in exercising oversight, and advocating on behalf of a state’s voters. From this standpoint, having new and inexperienced leaders trading office in every election is not better than having a stable group of representatives in place to address the long-term interests of Pennsylvanians on Capitol Hill. Some would even insist that the U.S. House of Representatives is, by design, supposed to be a continuing and highly stable body, not subject to the whims of each new administration. The myriad conflicting redistricting criteria highlighted at the beginning of this report were all in place to make the Act 131 map what it is. In its inevitably imperfect balance of contradictory demands there are many aspects of the 2011 map that could be different than they are. But that does not mean that the map is unacceptable, or that it is unfairly partisan in inspiration or result.

All maps are imperfect, objectionable to someone. Representational gaps abound. Minority parties; independent voters; women; Catholics; coal miners; people of Dutch ancestry, and many other identity groups fail to find representation in the legislature proportional to their voting presence in elections. Some popularly elected legislative body has to be awarded the authority to adjudicate among these contending claims and priorities. These state legislators may well try to advantage themselves by drawing districts favorable to their reelection, but those legislators can also be defeated because voters come to disapprove of this practice. Voters, in the end, have control over whether there are competitive elections.

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Appendix

Table A.1. Conservative Interest Group Scorecards or Ratings for the Pennsylvania Delegation in 2011 and 2016			
Member Name	Rating or Scorecard Name	Score 2011	Score 2016
Brady 1	American Conservative Union - Positions	0	6
	American Conservative Union - Lifetime Score	6	4
	Eagle Forum - Positions	38	14
	Heritage Action for America - Positions (House Only)	11	16
	The Club for Growth - Positions	1	0
	Gun Owners of America	0	0
	NumbersUSA - Positions	28	10
Fattah 2	American Conservative Union - Positions	0	3
	American Conservative Union - Lifetime Score	2	12
	Eagle Forum - Positions	15	13
	Heritage Action for America - Positions (House Only)	0	16
	The Club for Growth - Positions	2	0
	Gun Owners of America	0	0
	NumbersUSA - Positions	21	10
Kelly 3	American Conservative Union - Lifetime Score	80	70
	American Conservative Union - Positions	80	72
	Eagle Forum - Positions	61	73
	Heritage Action for America - Positions (House Only)	57	67
	The Club for Growth - Positions	54	71
	Gun Owners of America	75	90
	NumbersUSA - Positions	57	71
Platts/Perry 4	American Conservative Union - Positions	48	96
	American Conservative Union - Lifetime Score	72	96
	Eagle Forum - Positions	53	100
	Heritage Action for America - Positions (House Only)	52	85
	The Club for Growth - Positions	48	91
	Gun Owners of America	75	90
	NumbersUSA - Positions	86	89
Thompson 5	American Conservative Union - Lifetime Score	85	71
	American Conservative Union - Positions	68	84
	Eagle Forum - Positions	69	46
	Heritage Action for America - Positions (House Only)	48	49
	The Club for Growth - Positions	48	62
	Gun Owners of America	75	10
	NumbersUSA - Positions	57	38
Gerlach/Costello 6	American Conservative Union - Positions	52	20
	American Conservative Union - Lifetime Score	62	29
	Eagle Forum - Positions	64	33
	Heritage Action for America - Positions (House Only)	47	33
	The Club for Growth - Positions	48	35
	Gun Owners of America	93	90
	NumbersUSA - Positions	71	24
Meehan 7	American Conservative Union - Positions	52	32
	American Conservative Union - Lifetime Score	52	46
	Eagle Forum - Positions	53	40
	Heritage Action for America - Positions (House Only)	38	36
	The Club for Growth - Positions	42	42
	Gun Owners of America	75	50
	NumbersUSA - Positions	57	38
Table continued			

Table A.1. Conservative Interest Group Scorecards or Ratings for the Pennsylvania Delegation in 2011 and 2016 (continued)			
Fitzpatrick 8	American Conservative Union - Lifetime Score	57	47
	American Conservative Union - Positions	64	39
	Eagle Forum - Positions	53	46
	Heritage Action for America - Positions (House Only)	52	40
	The Club for Growth - Positions	43	42
	Gun Owners of America	75	40
	NumbersUSA - Positions	71	30
Shuster 9	American Conservative Union - Lifetime Score	92	72
	American Conservative Union - Positions	75	82
	Eagle Forum - Positions	100	100
	Heritage Action for America - Positions (House Only)	65	53
	The Club for Growth - Positions	54	58
	Gun Owners of America	75	80
	NumbersUSA - Positions	57	71
Marino 10	American Conservative Union - Lifetime Score	84	86
	American Conservative Union - Positions	84	72
	Eagle Forum - Positions	53	73
	Heritage Action for America - Positions (House Only)	71	61
	The Club for Growth - Positions	60	60
	Gun Owners of America	75	80
	NumbersUSA - Positions	71	91
Barletta 11	American Conservative Union - Lifetime Score	76	64
	American Conservative Union - Positions	76	72
	Eagle Forum - Positions	53	61
	Heritage Action for America - Positions (House Only)	47	50
	The Club for Growth - Positions	47	59
	Gun Owners of America	75	70
	NumbersUSA - Positions	93	93
Critz/Rothfus 12	American Conservative Union - Positions	16	84
party change	Concerned Women for America - Positions	33	92
	Eagle Forum - Positions	46	93
	Heritage Action for America - Positions (House Only)	0	79
	The Club for Growth - Positions	12	81
	Gun Owners of America	25	80
	NumbersUSA - Positions	57	83
Schwartz/Boyle 13	American Conservative Union - Positions	0	9
	American Conservative Union - Lifetime Score	3	8
	Eagle Forum - Positions	7	14
	Heritage Action for America - Positions (House Only)	10	14
	The Club for Growth - Positions	6	0
	Gun Owners of America	0	70
	NumbersUSA - Positions	29	1
Doyle 14	American Conservative Union - Positions	8	15
	American Conservative Union - Lifetime Score	17	0
	Eagle Forum - Positions	23	13
	Heritage Action for America - Positions (House Only)	0	14
	The Club for Growth - Positions	12	0
	Gun Owners of America	0	10
	NumbersUSA - Positions	21	10
Table continued			

Table A.1. Conservative Interest Group Scorecards or Ratings for the Pennsylvania Delegation in 2011 and 2016 (continued)			
Dent 15	American Conservative Union - Lifetime Score	63	59
	American Conservative Union - Positions	52	40
	Eagle Forum - Positions	46	85
	Heritage Action for America - Positions (House Only)	38	29
	The Club for Growth - Positions	46	59
	Gun Owners of America	75	70
	NumbersUSA - Positions	57	8
Pitts 16	American Conservative Union - Lifetime Score	96	96
	American Conservative Union - Positions	84	93
	Eagle Forum - Positions	100	53
	Heritage Action for America - Positions (House Only)	90	65
	The Club for Growth - Positions	76	89
	Gun Owners of America	100	80
	NumbersUSA - Positions	57	30
Holden/Cartwright 17	American Conservative Union - Positions	37	4
	American Conservative Union - Lifetime Score	28	7
	Eagle Forum - Positions	45	13
	Heritage Action for America - Positions (House Only)	43	12
	The Club for Growth - Positions	8	0
	Gun Owners of America	0	10
	NumbersUSA - Positions	57	10
Murphy 18	American Conservative Union - Lifetime Score	73	70
	American Conservative Union - Positions	76	76
	Eagle Forum - Positions	53	60
	Heritage Action for America - Positions (House Only)	61	46
	The Club for Growth - Positions	69	10
	Gun Owners of America	75	80
	NumbersUSA - Positions	79	13
Sources: Project Vote Smart and Group Websites.			
Notes: Several members left Congress at the end of 2016, including Pitts, Fitzpatrick and Schwartz. Fattah and Murphy have recently resigned their seats. Fitzpatrick's seat is now occupied by his brother.			