

THE 2016 AND 2020 PRESIDENTIAL ELECTIONS IN HISTORICAL AND THEORETICAL PERSPECTIVE

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Overview

- My chapter on “Election Inversions by the U.S. Electoral College”, in Dan S. Felsenthal and Moshé Machover, eds., *Electoral Systems: Paradoxes, Assumptions, and Procedures*, Springer, 2012,
 - examines the phenomenon of election inversions, and
 - reviews the history of presidential elections through 2008 under the Electoral College with respect to
 - the popular vote-electoral vote (PVEV) function of each
 - and the *inversion interval* it entails.
- This presentation
 - extends the examination through the 2020 election, and
 - broadens the focus to include the (proposed) “District” and “Proportional” variants of the Electoral College.

Miller (2012) is available at https://userpages.umbc.edu/~nmiller/RESEARCH/218103_1_En_4.pdf

The 2016 Presidential Election Inversion

- The 2016 U.S. presidential election was surprising [shocking?] in many ways.
- One way was that the Electoral College produced
 - the second “election inversion” within five elections, but
 - only the fourth such inversion in U.S. electoral history.
- The Electoral College produces an *election inversion* when
 - the presidential candidate who wins the most popular votes nationwide nevertheless
 - fails to win the most electoral votes, and therefore loses the election.
- Terms such as ‘reversal of winners,’ ‘wrong winner,’ ‘divided verdict,’ and ‘misfire’ (among others) are also used to describe this phenomenon.
 - The terms ‘compound majority paradox’ and ‘referendum paradox’ are commonly used in European political science and social choice theory.
- The same phenomenon occurs in FPTP parliamentary systems such as
 - U.K. (e.g., 1951) and
 - Canada (e.g., 2019),when the party whose candidates poll the most votes nationwide fails to win the greatest number of parliamentary seats.
 - Also in elections for the U.S. House or Representatives (e.g., 2012) and state legislatures.

Historical Overview of Electoral College Inversions

<i>Electoral College Inversions</i>	<i>Popular Vote Percent</i>	<i>Two-Party Popular Vote Percent</i>	<i>Electoral Vote</i>	<i>Electoral Vote Percent</i>
1876: Hayes (R) vs Tilden (D)	47.92 vs. 50.92	48.47 vs. 51.53	185 vs. 184	50.14 vs. 49.86
1888: Harrison (R) vs. Cleveland (D)	47.80 vs. 48.63	49.59 vs. 50.41	233 vs. 168	58.10 vs. 41.90
2000: Bush (R) vs. Gore (D)	47.87 vs. 48.38	49.73 vs. 50.27	271 vs. 267	50.37 vs. 49.63
2016: Trump (R) vs. Clinton (D)	48.02 vs. 45.93	48.89 vs. 51.11	305 vs. 233	56.69 vs. 43.31
Counterfactual 1860: Lincoln (R) vs. United Opposition	39.82 vs. (29.46 + 18.09 + 12.61)	39.82 vs. 60.16	169 vs. 134	55.78 vs. 44.22

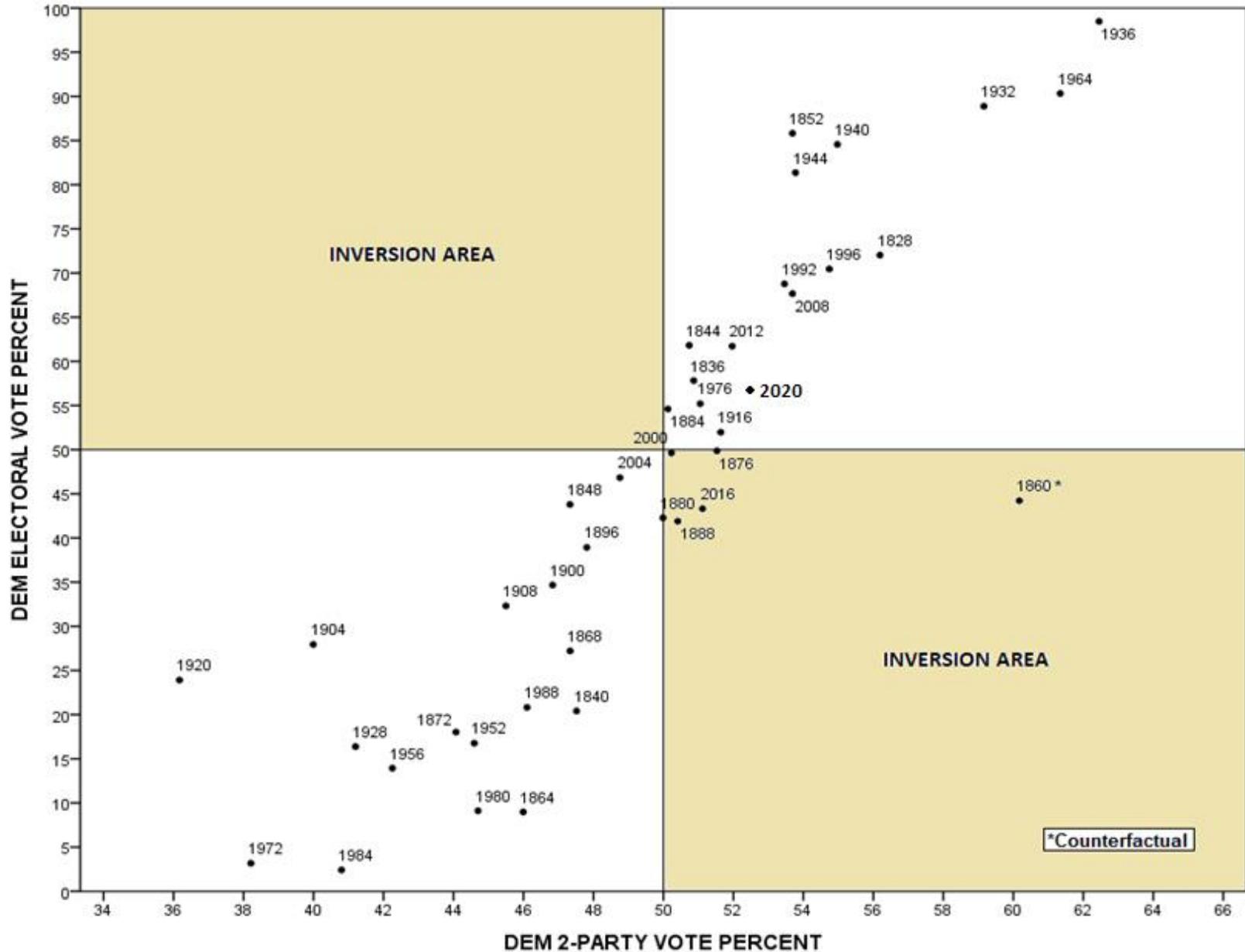
Note: Electoral vote totals shown here and throughout are based on the “standard operation” of the Electoral College (in particular, winner-take-all in every state and no faithless electors).

- While the 1824 election is sometimes counted as an inversion, this is a misclassification.
 - In a multi-candidate election, no candidate was had an electoral vote majority and the election went to the House of Representatives,
 - which elected Adams, though Jackson had popular and electoral vote pluralities.
- What was distinctive about the 2016 inversion is that
 - Clinton won the popular vote by more than a bare margin (>2%), while
 - at the same time Trump won a substantial electoral vote majority.

Historical Analysis

- Miller (2012) begins with 1828, which was the first election in which electors
 - in all states except SC were popularly elected (so that there was a “popular vote” in each state and nationally), and
 - were almost always elected at-large, so that states typically cast electoral votes on a winner-take-all basis.
- Throughout everything is done on a strictly two-party basis.
 - In particular, all elections in which a third candidate carried one or more states and thereby won electoral votes are excluded,
 - namely 1832, 1856, 1860, 1892, 1912, 1924, 1948, 1960, 1968.
 - However, 1948, 1960, and 1968 are included in the “inversion interval” chart below.
- Moreover, throughout it is assumed that the Electoral College operates in its now “standard” manner, in particular that
 - electoral votes are cast on a winner-take-all basis (even in ME and NE),
 - electoral votes cast by “faithless electors” are counted as if they had been faithful, and
 - DC is treated as if it were a state.

Historical Overview: Standard Electoral College



The Probability of Election Inversions: Historical Estimates

- Number of Inversions/Number of elections (since 1828)
 $4/49 = .0816$
- Clearly an important determinant of the probability of an election inversion is the probability of a close division of the popular vote.
 - Note that the 2000-2020 and 1876-1888 periods both are characterized by unusually close elections.
- Considering only elections in which the winner's popular vote margin was no greater than 3 percentage points, the frequency of inversions has been considerably higher, namely
 $4/13 = .3077$
- All historical inversions have favored the Republican party.
 - More generally, the historical scattergram suggests a bit of of a Republican bias in the long-term popular vote-electoral vote relationship.
- However, in each of the periods 2000-2020 and 1876-1888, Republicans won the popular vote only once:
 - 2004 (by 2.5%)
 - 1880 (by less than 0.1%)
 - making it unlikely that inversions could favor Democrats.

Extracting More information from the Historical Record

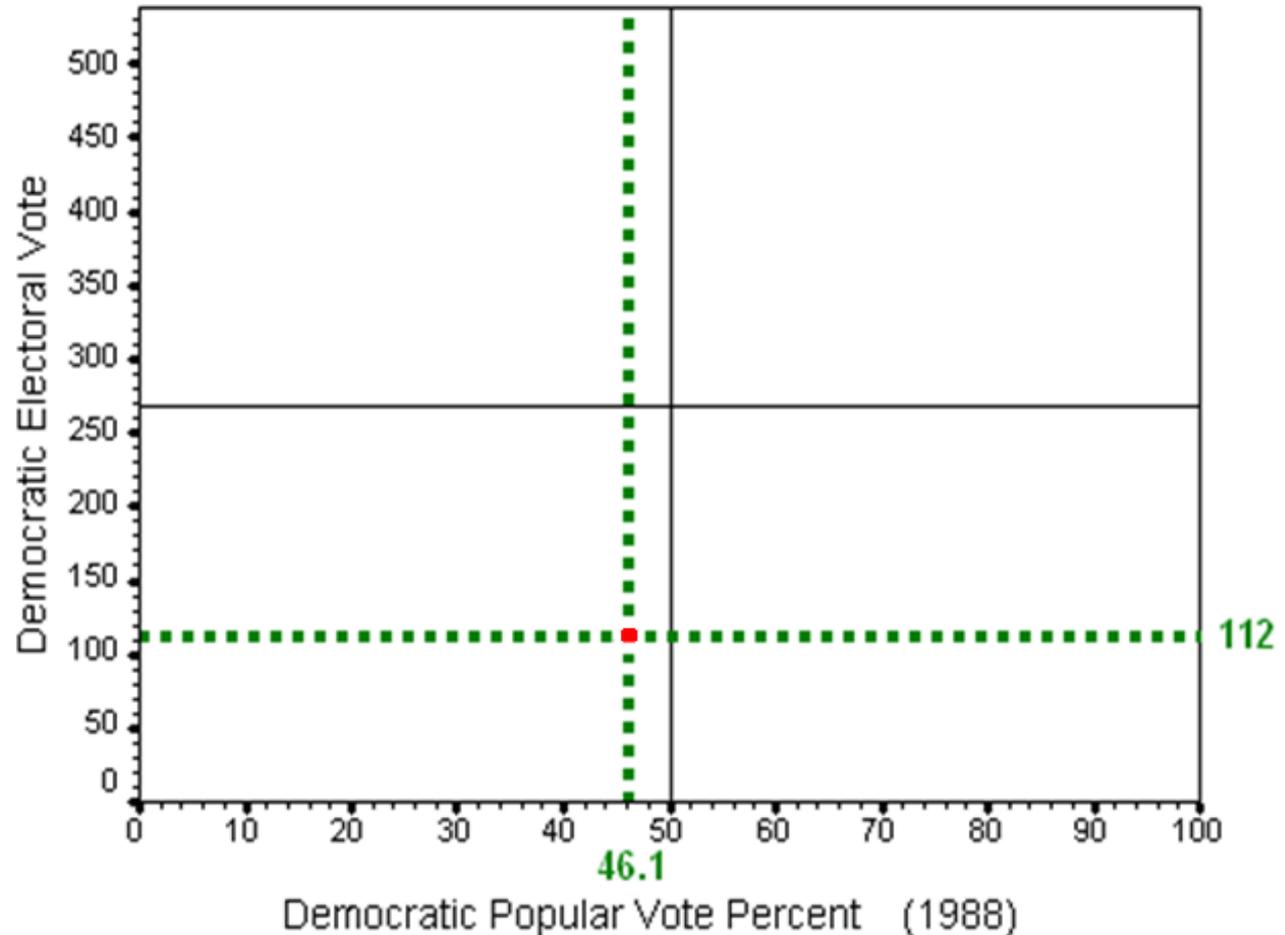
- Looking only at the national popular and electoral votes, we can classify elections only as inversions or non-inversions.
- By using *state-by-state popular vote percentages* (together with the apportionment of electoral votes), we can produce a more informative historical analysis of the propensity of the EC to produce inversions.
- Every presidential election generates an *inversion interval*.
 - Such intervals vary magnitude and are either pro-Rep or pro-Dem in direction.
- In each election, if the popular vote percent had fallen (or actually did fall) within this interval, an election inversion would (or actually did) occur.

The PVEV Step Function

- The first step is to produce the Popular Vote-Electoral Vote (*PVEV*) *step function* (essentially an unsmoothed votes-seats curve) for each election,
 - which shows the number of electoral votes a candidate would have won as a function of varying popular vote percentages, given the “electoral landscape/alignment” that characterized that election.
 - The *electoral landscape/alignment* is specified by the cardinal ranking of the states in terms of the differences among them with respect to their (Democratic) two-party popular vote percentages.
- The PVEV employs the kind of *uniform swing analysis* pioneered by Butler (1951) and Brookes (1960),
- The PVEV function
 - is a *cumulative distribution function* and is therefore (weakly) monotonic, and
 - is a *step function* because, while the independent variable (PV) is essentially continuous, the dependent variable (EV) is discrete (taking on only whole number values and jumping up in relatively large discrete steps).

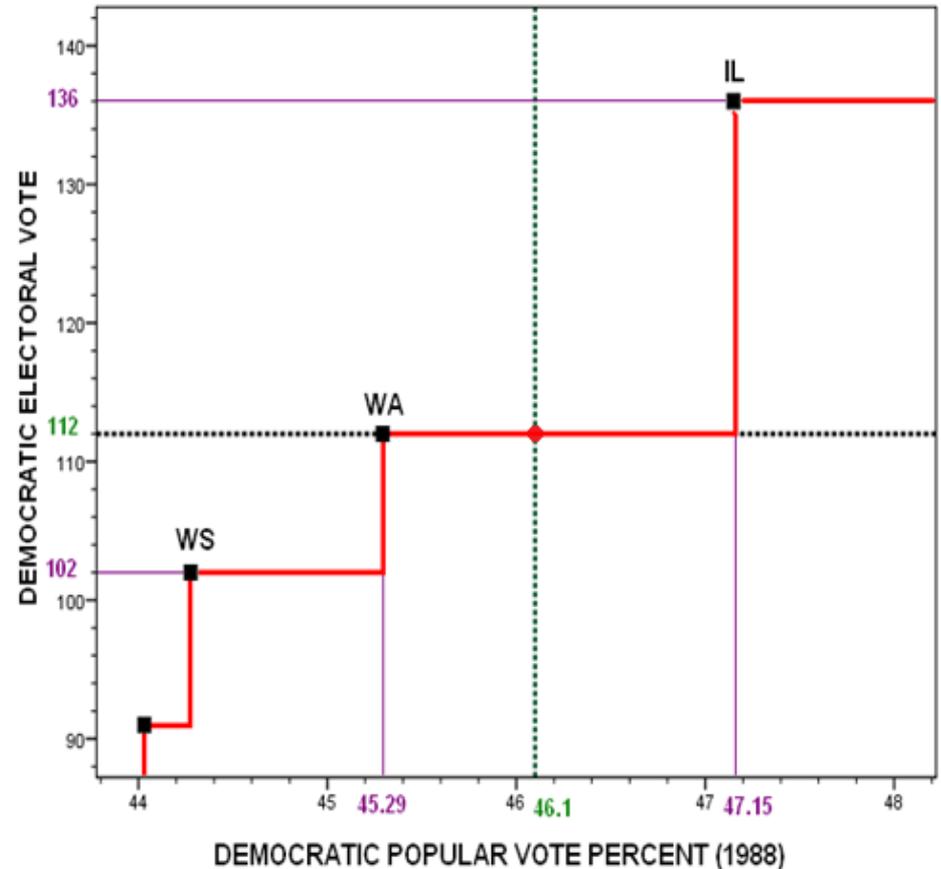
The PVEV Step-Function: 1988 as an Example

- In 1988, Dukakis received 46.10% of the two-party national popular vote and won 112 electoral votes (though one was lost to a “faithless elector”).

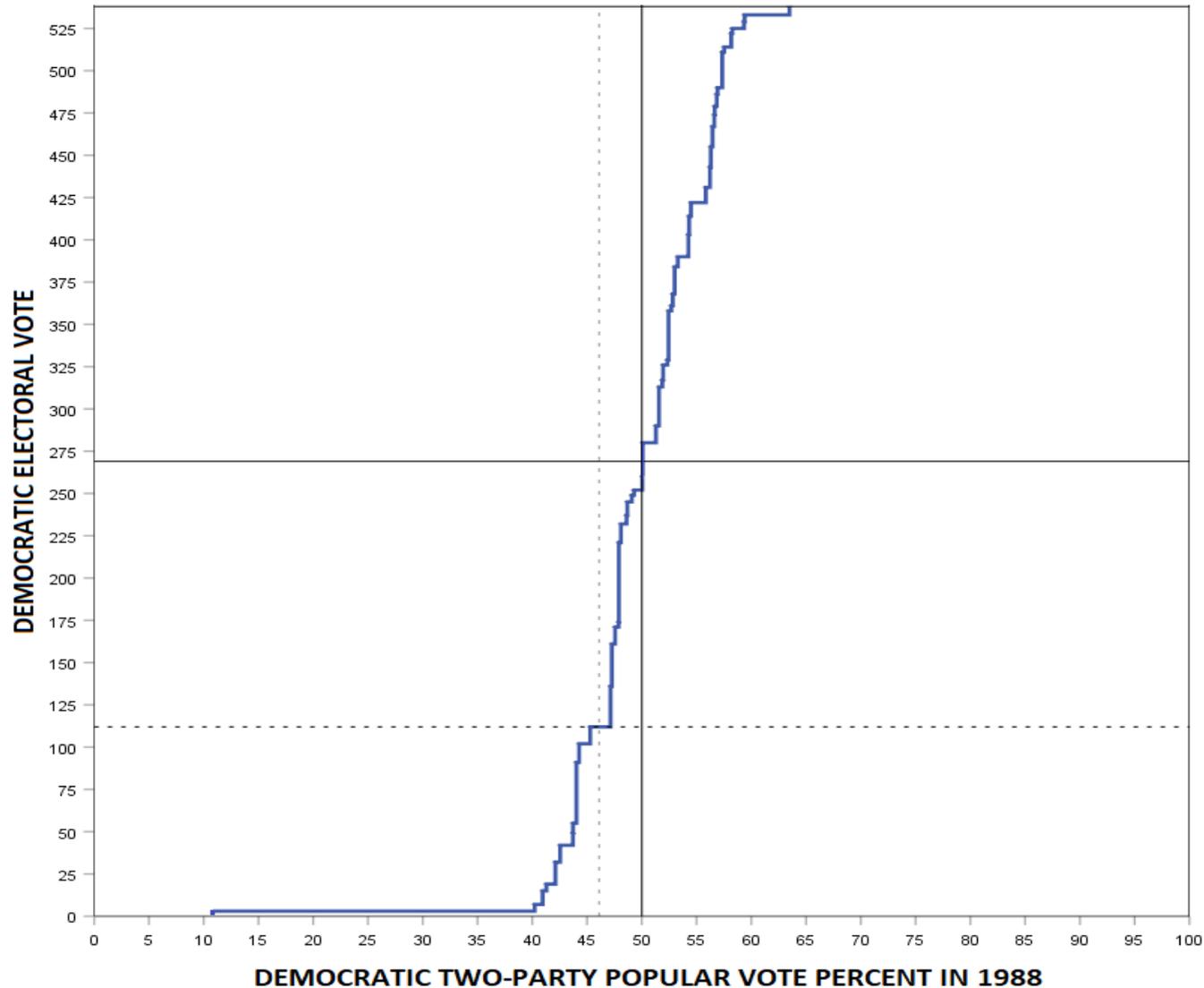


1988 Example (cont.)

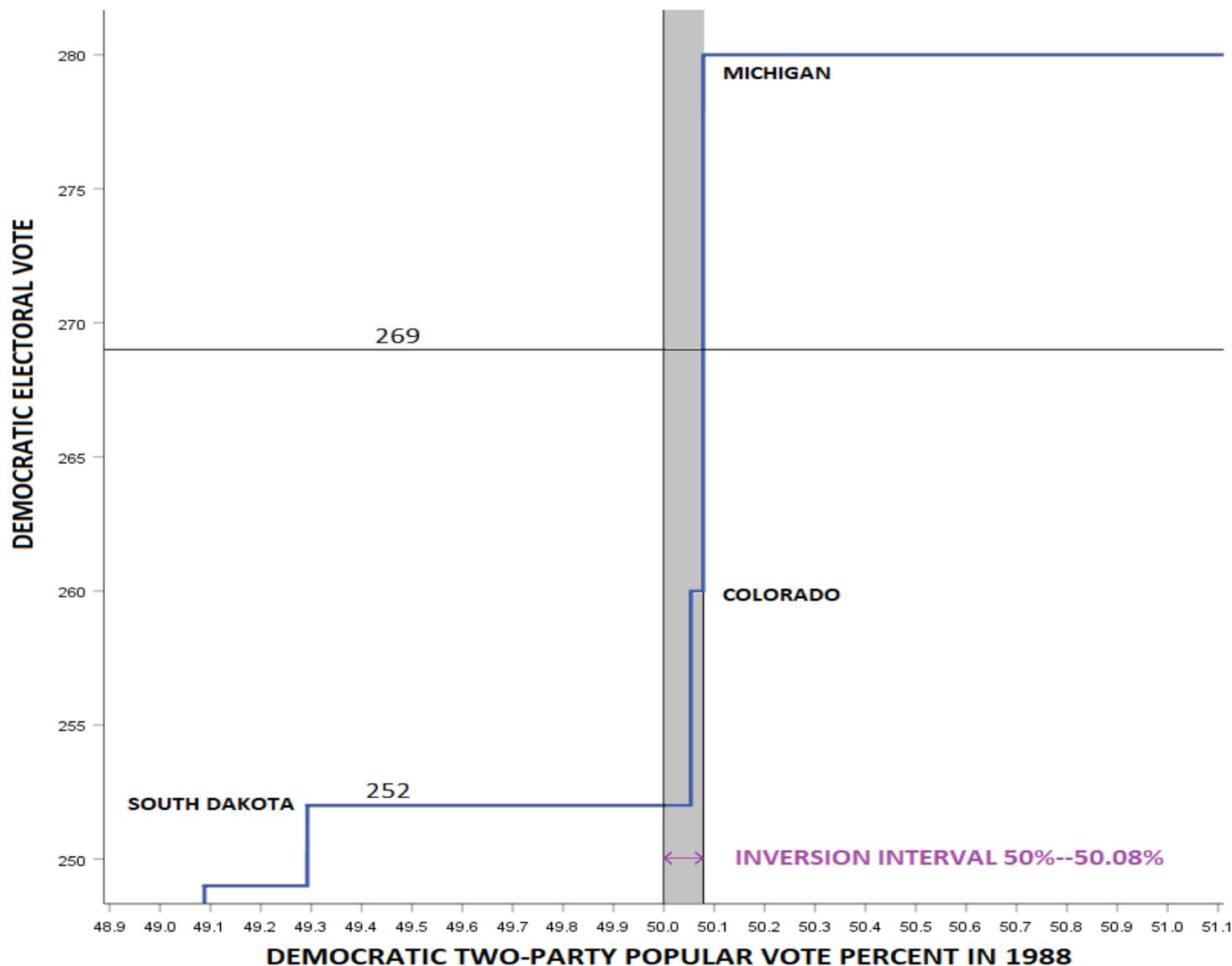
- Of all the states that Dukakis carried, he carried Washington (10 EV) by the smallest margin (50.81%).
 - If the Dukakis national popular vote of 46.10% were to *decline uniformly across all states*, his EV total would remain at 112 until it falls by 0.81 percentage points to 45.29% when WA would tip out of his column (reducing his EV to 102).
- Of all the states that Dukakis failed to carry, he failed to carry Illinois (24 EV) by the smallest margin (48.95%).
 - If the Dukakis popular vote of 46.10% were to *increase uniformly across all states*, his EV total would remain 112 until increases by 1.05 percentage points to 47.15% when IL would tip into his column (increasing his EV to 136).



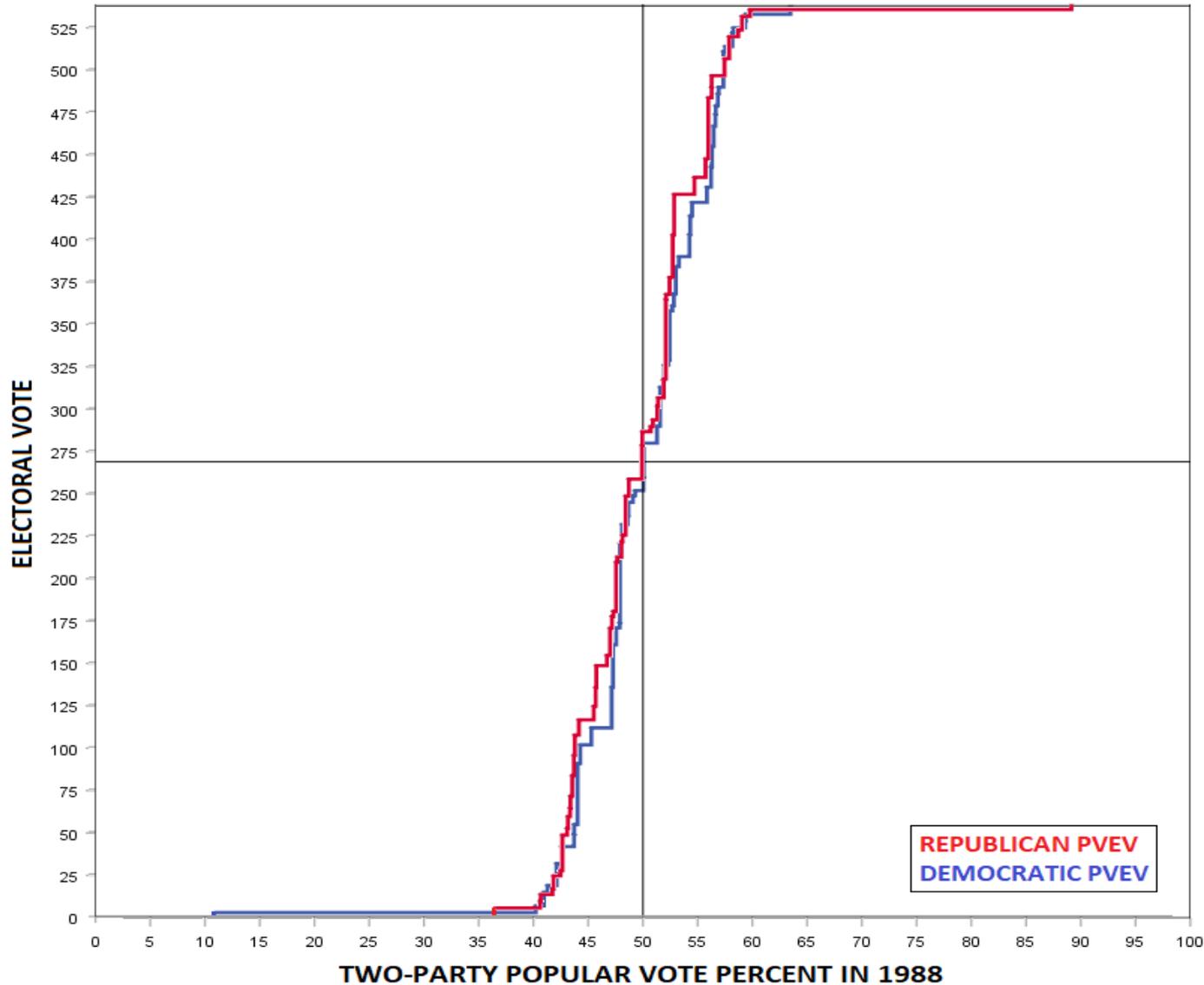
The Full PVEV for 1988 Is Highly Responsive and Appears To Go Through the Perfect-Tie Point



But If We Zoom in on $PV \approx 50\%$, We Find a Small Pro-Republican *Inversion Interval* 0.08% Wide

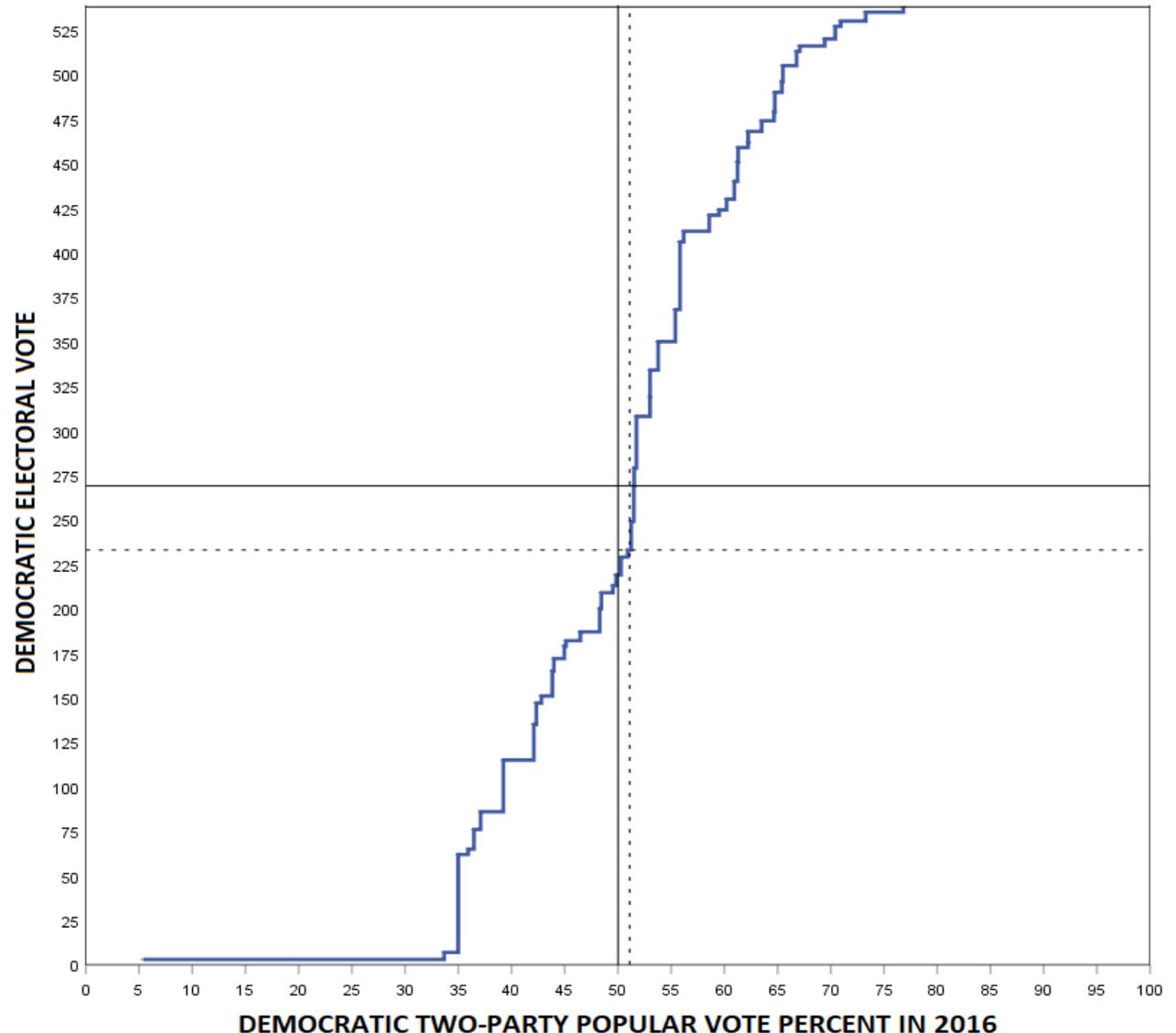


The 1988 PVEV Exhibits a High Degree of *Partisan Symmetry*



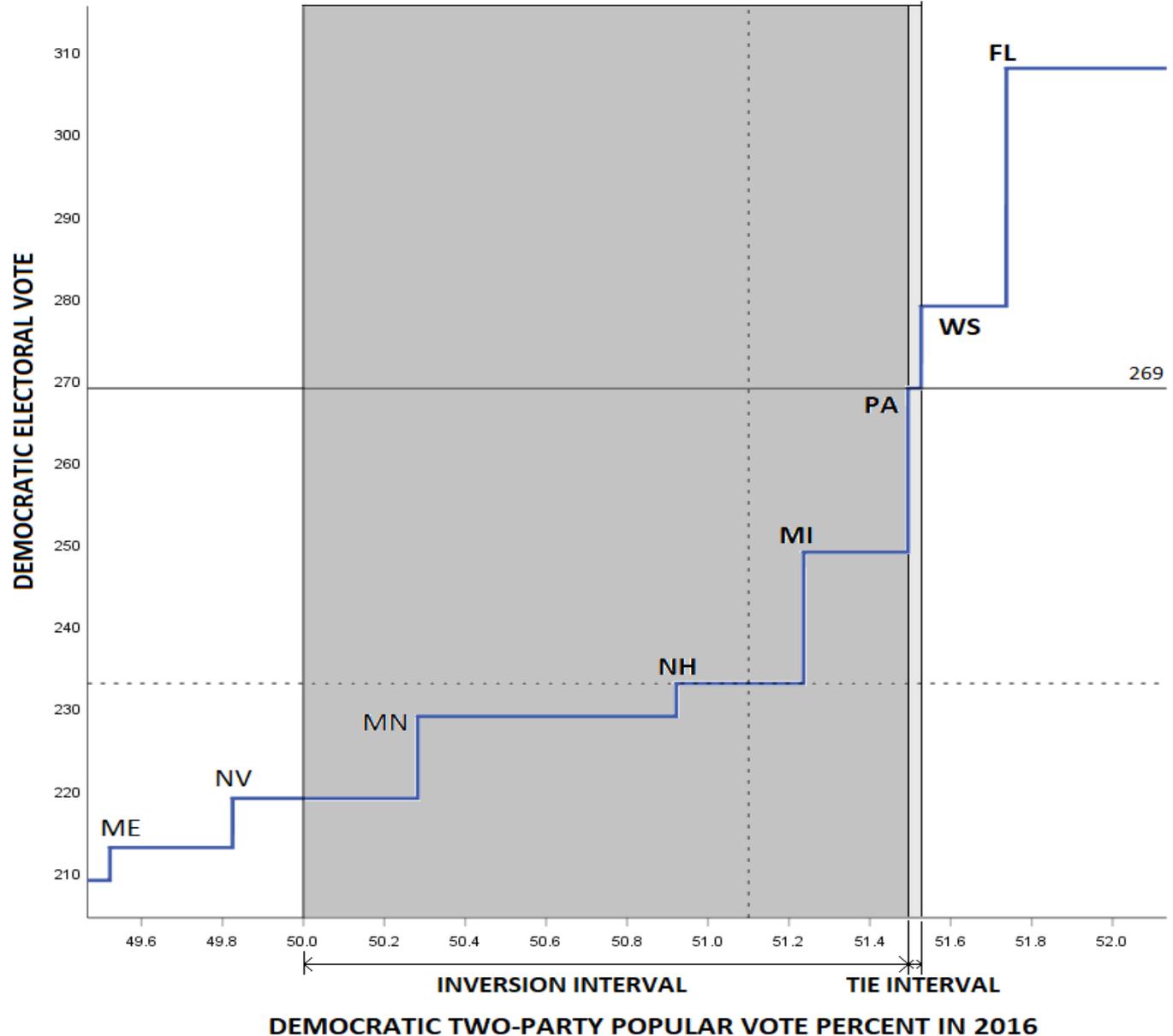
The Democratic PVEV in 2016

- It is less responsive than in 1988 (reflecting increasing polarization of “red” vs. “blue” states).
- Even without zooming in, we can see that there is a substantial inversion interval within which the actual PV falls
- The Dem PVEV “sags” below its general trend in the vicinity of PV = 50%.

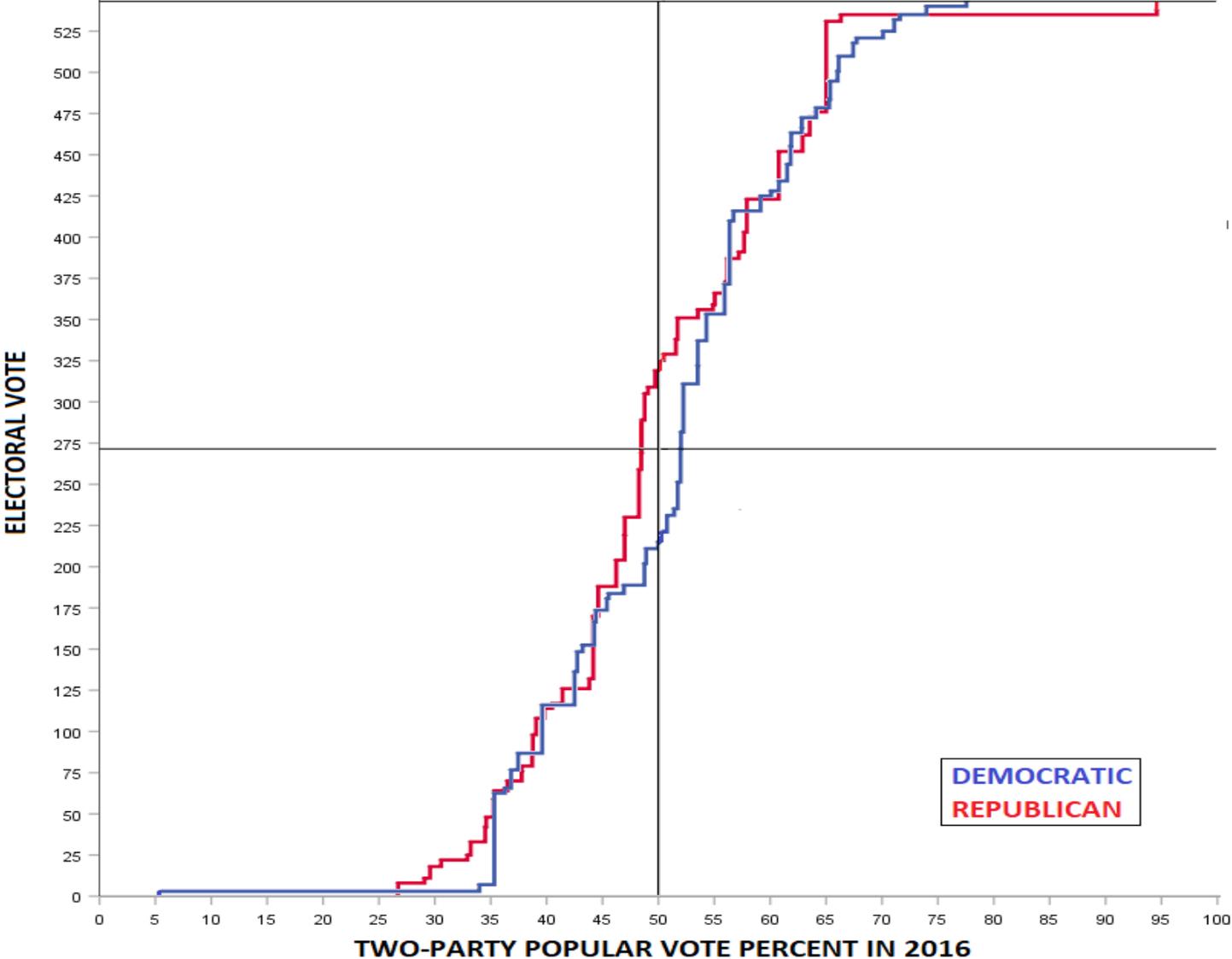


Zooming In on the 2016 Inversion Interval

- The “inversion or tie” interval was 1.53% wide (almost 20 times wider than in 1988).
- Since Clinton lost one CD in Maine, there actually was no tie interval.

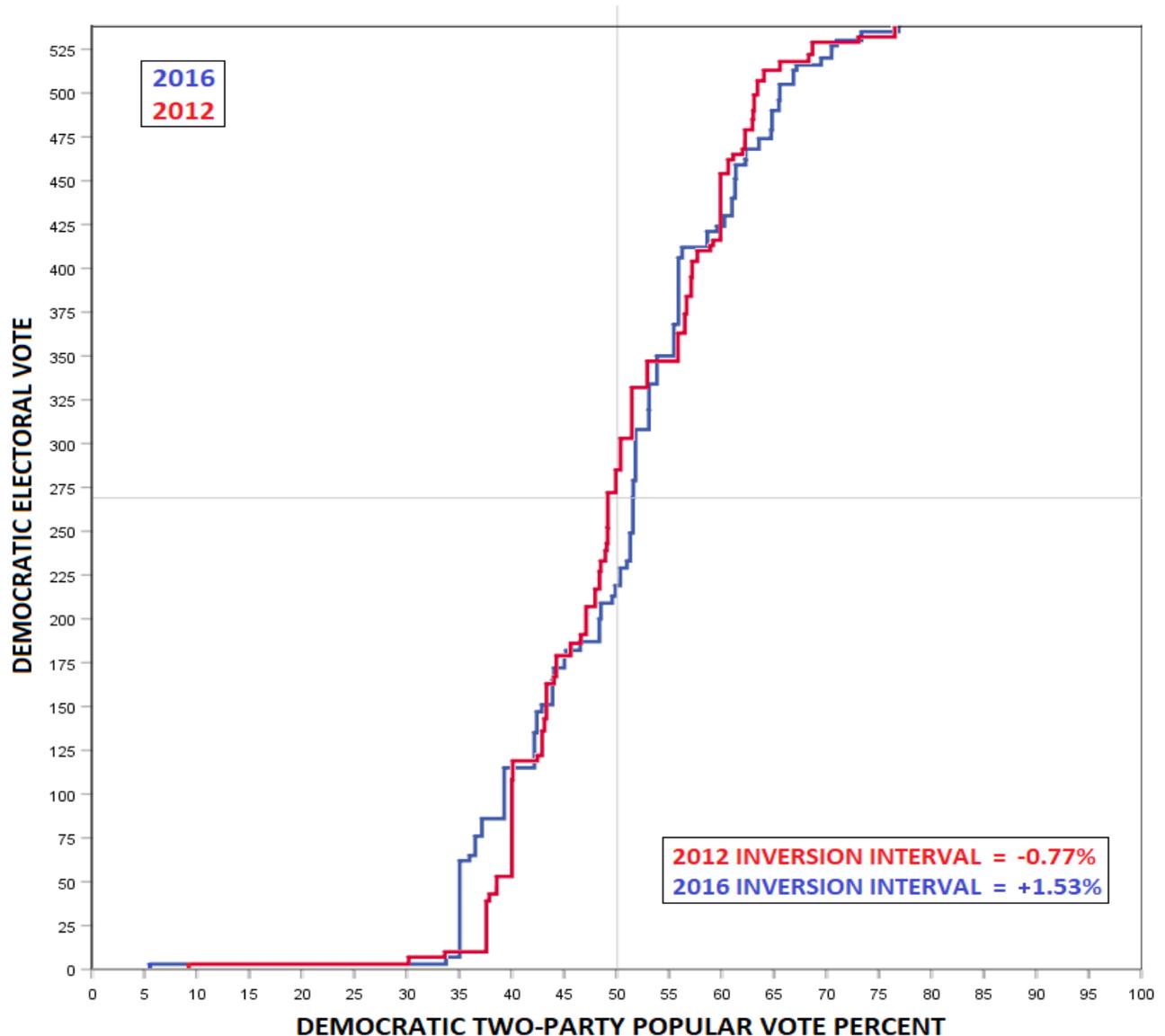


Democratic vs. Republican PVEVs in 2016

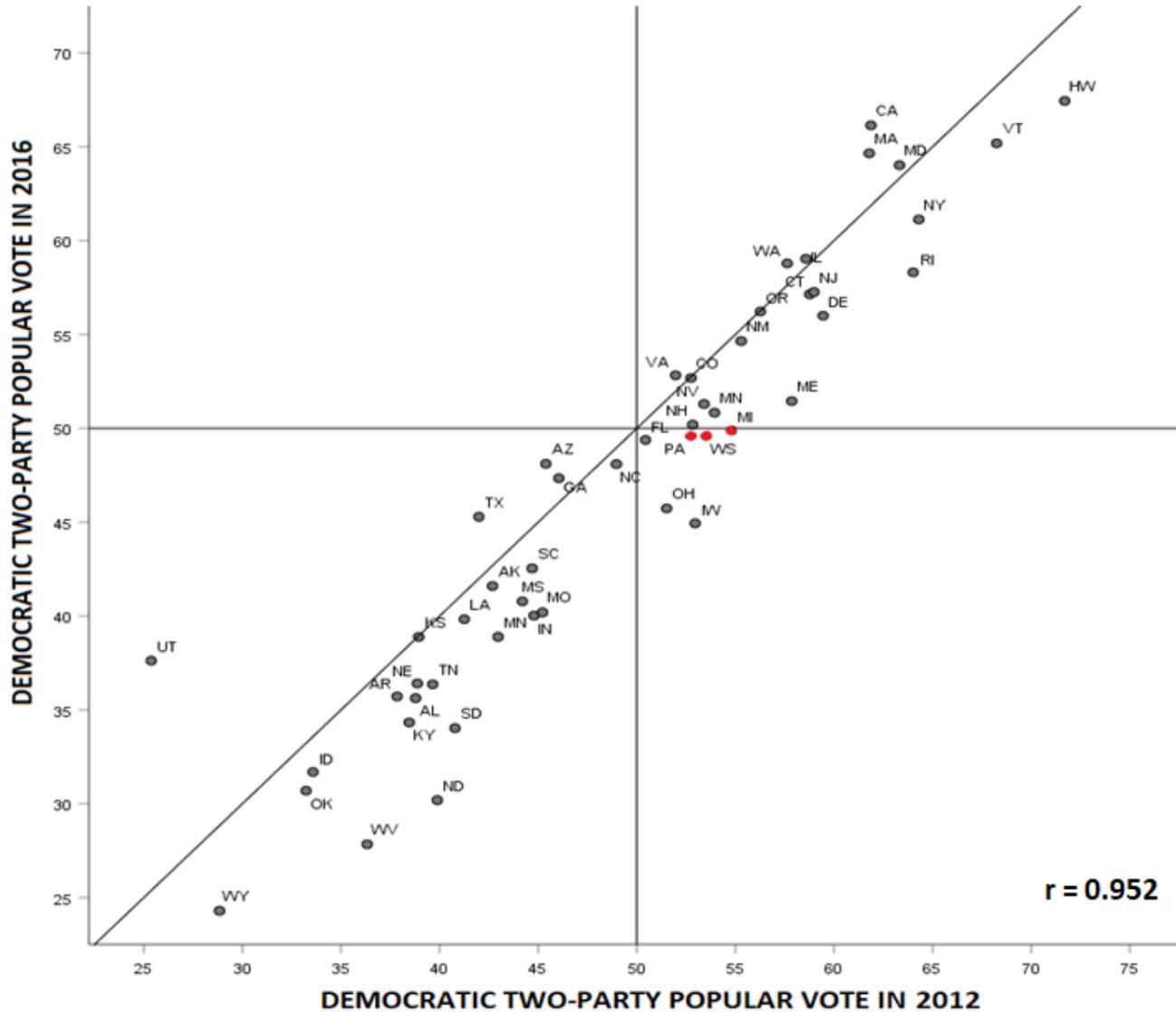


Democratic PVEVs in 2016 vs. 2012

- Note this convention:
- Charts are Democratic-oriented.
- 50% + Inversion Interval = PV% required for Democratic EV majority.

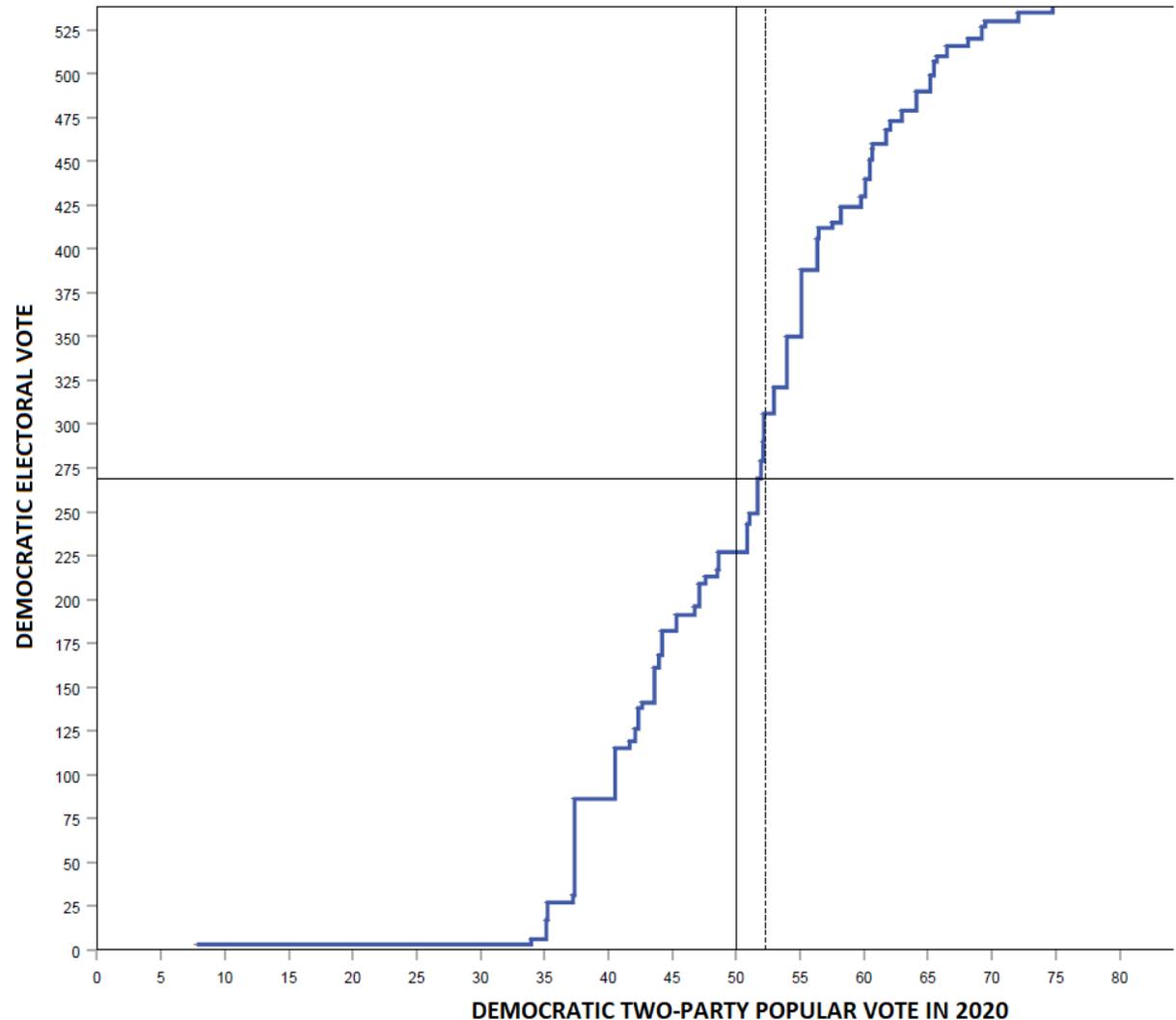


2016 vs. 2012

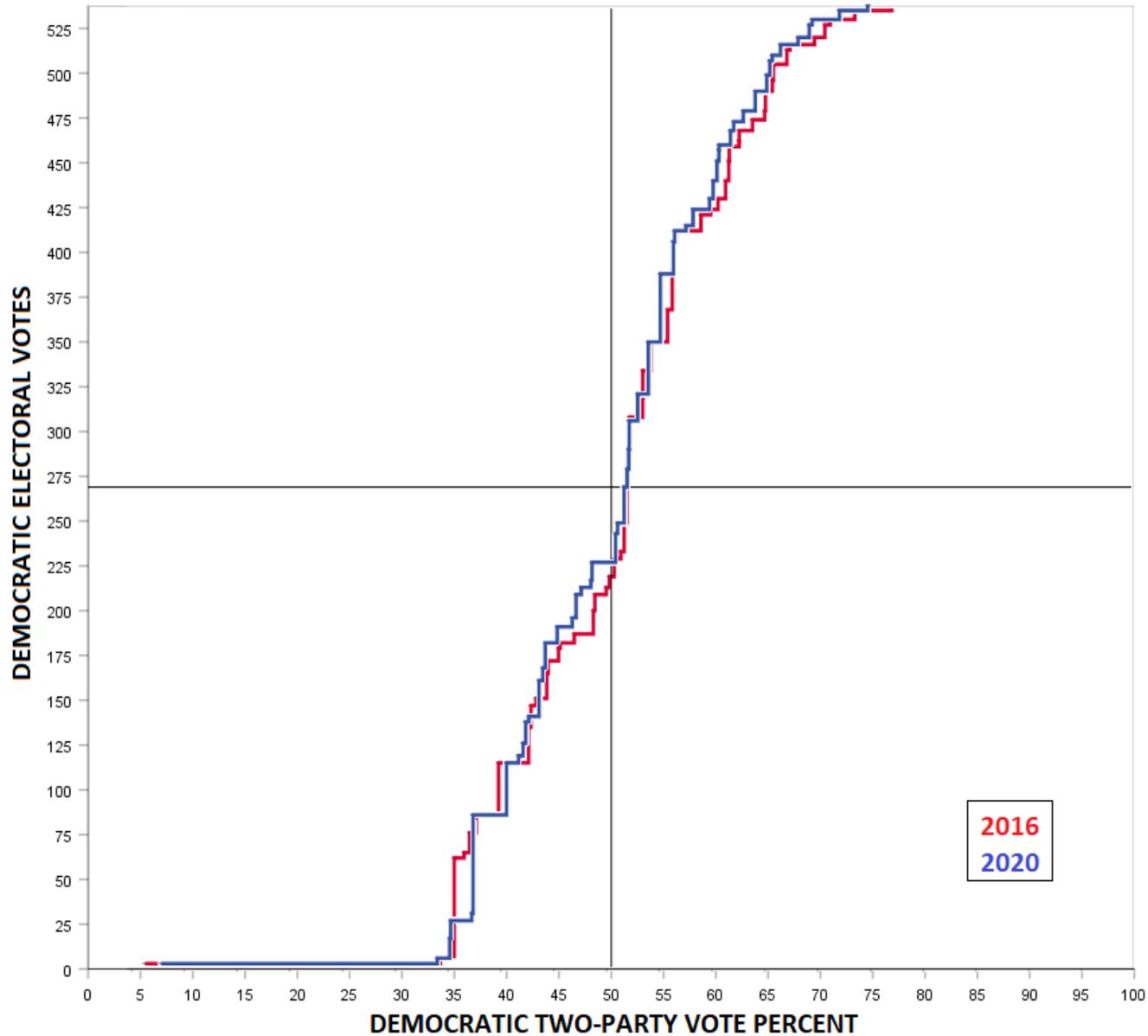


The Democratic PVEV in 2020

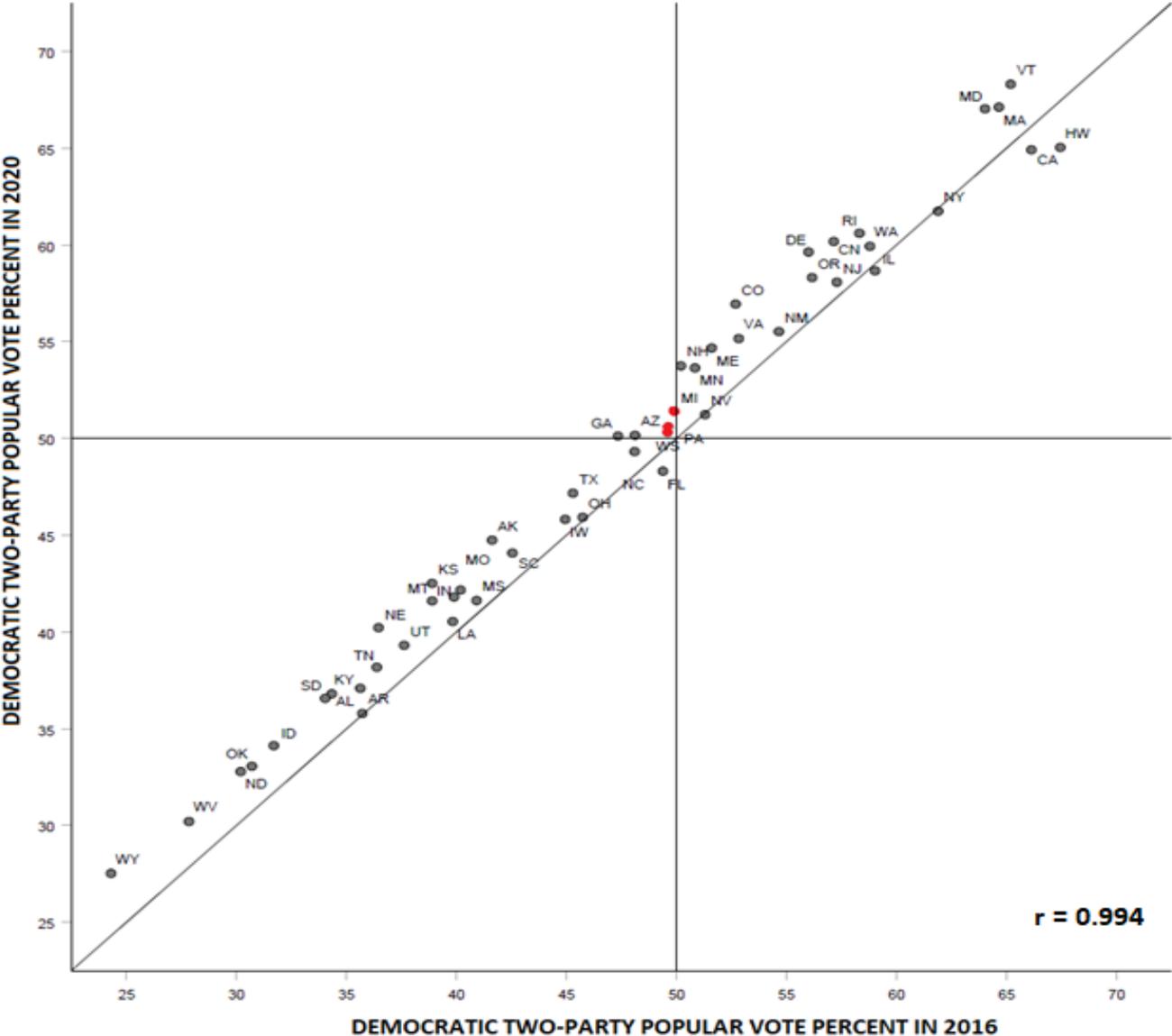
The 2020 election was a close replica of the 2016 election, except that the Democratic 2-party popular vote percent increased by about 1.16 percentage points (from 51.11% to 52.27%).



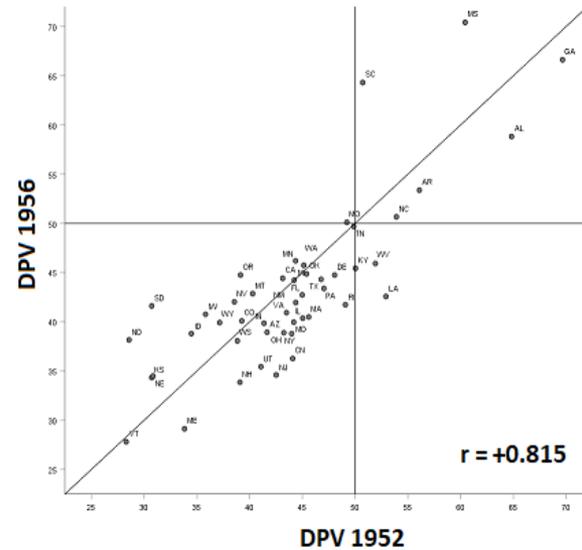
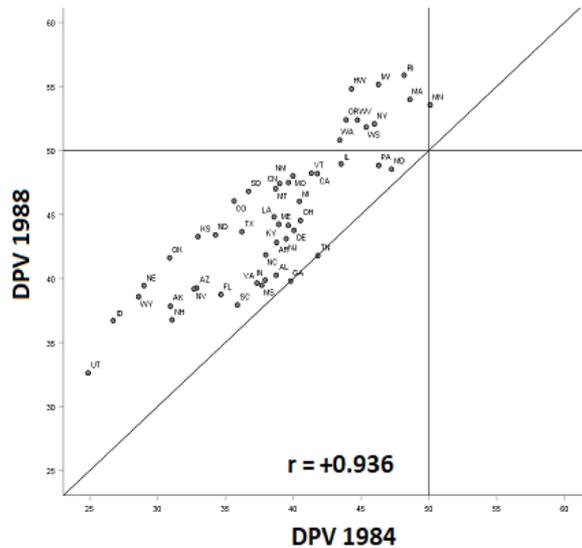
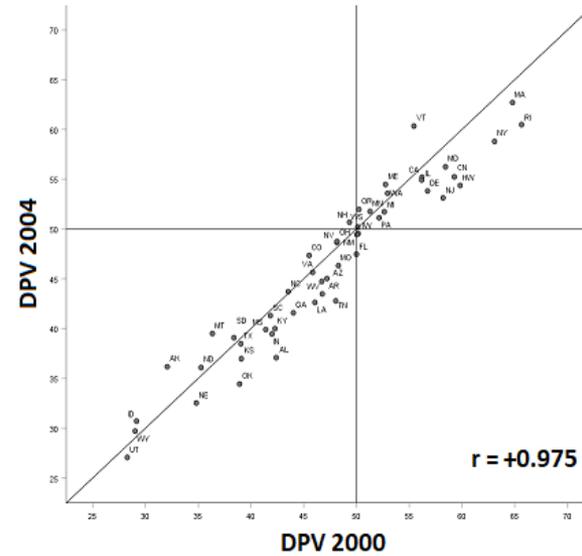
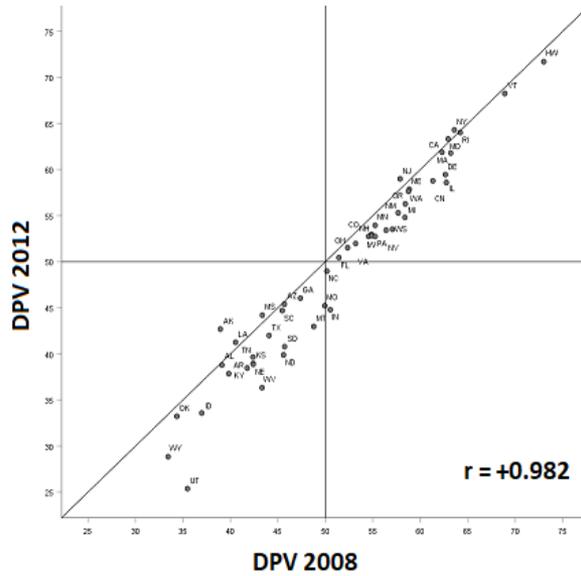
2020 and 2016 PVEVs Compared



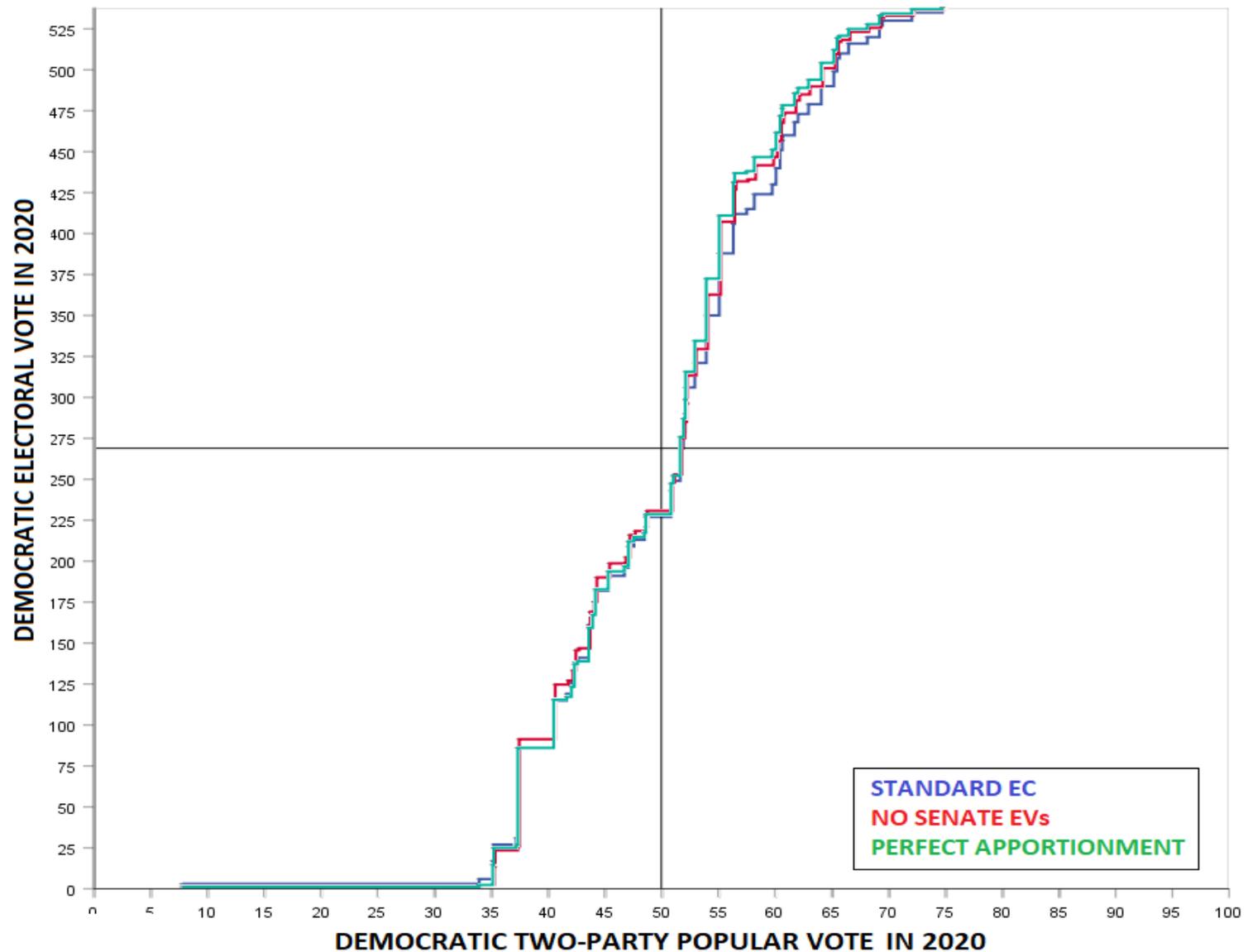
2020 vs. 2016



Scattergrams and Correlations for Earlier Election Pairs



Alternate PVEVs in 2020



2020 and 2016 Compared

<i>Comparing the 2016 and 2020 PVEV ("Landscapes")</i>	2016			2020		
	Standard EC	No Senate EVs	Perfect Apportionment	Standard EC	No Senate EVs	Perfect Apportionment
Democratic Inversion Interval	51.49% (T) 51.53% (W)	51.49%	51.49%	51.67% (T) 51.95% (W)	51.67%	51.67%
Democratic EV at PV=50%	219	223.24	217.89	227	230.75	228.60
Democratic EV at PV=51.12%	233	235.68	232.03	249	252.96	252.22
Democratic EV at PV=52.27%	308	319.36	325.39	306	314.32	315.70

Note 1. The basic analysis assumes the "standard" (i.e., winner-take-all) Electoral College system. Since Clinton lost one CD in Maine, a Democratic popular vote percent within the 2016 tie (T) interval would have actually produced a Trump win. Biden also lost one CD in Maine but won one CD in Nebraska, so the winner-take-all tie interval in 2020 was also an actual tie interval.

Note 2. In the "No Senate EVs" column, electoral votes entries are scaled up by a factor of $538/436 = 1.23394$ to make them comparable to the EV entries in other columns.

Note 3. "Perfect Apportionment" as defined in Miller (2012), i.e., state electoral votes proportional to state (two-party) popular votes.

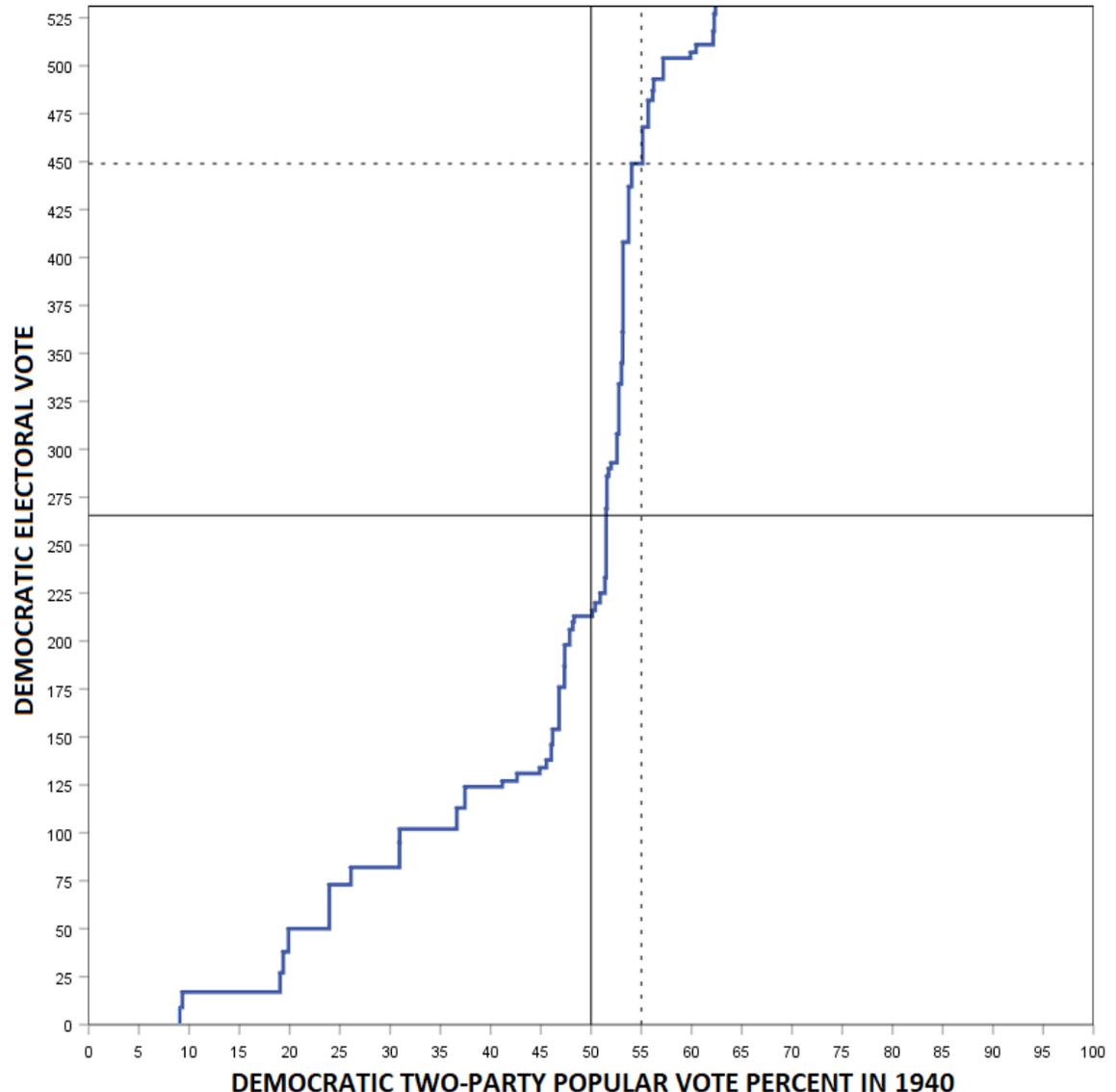
Random Shocks to a Given PVEV Landscape

- Each PVEV is deterministic: a given PV translates into a precise EV.
- Consider that a given PVEV might repeatedly be “jiggled” a bit.
- Specifically, suppose that each state vote PV% is subject to independent random shocks = $RN(0,1\%)$
- The table to the right shows the resulting distribution of EVs in 64,000 simulated elections.
- Only about a dozen states ever tip back and forth between parties but (presumably) all combinations occur in 64K trials.

Year (DPV%)	2016 (51.11%)	2020 (52.27%)
<i>Mode</i>	249	290
<i>Median</i>	253	290
<i>Mean</i>	254.736	287.819
<i>Minimum</i>	200	227
<i>25th Percentile</i>	239	276
<i>75th Percentile</i>	268	299
<i>Maximum</i>	339	372
<i>Standard Deviation</i>	19.407	17.239

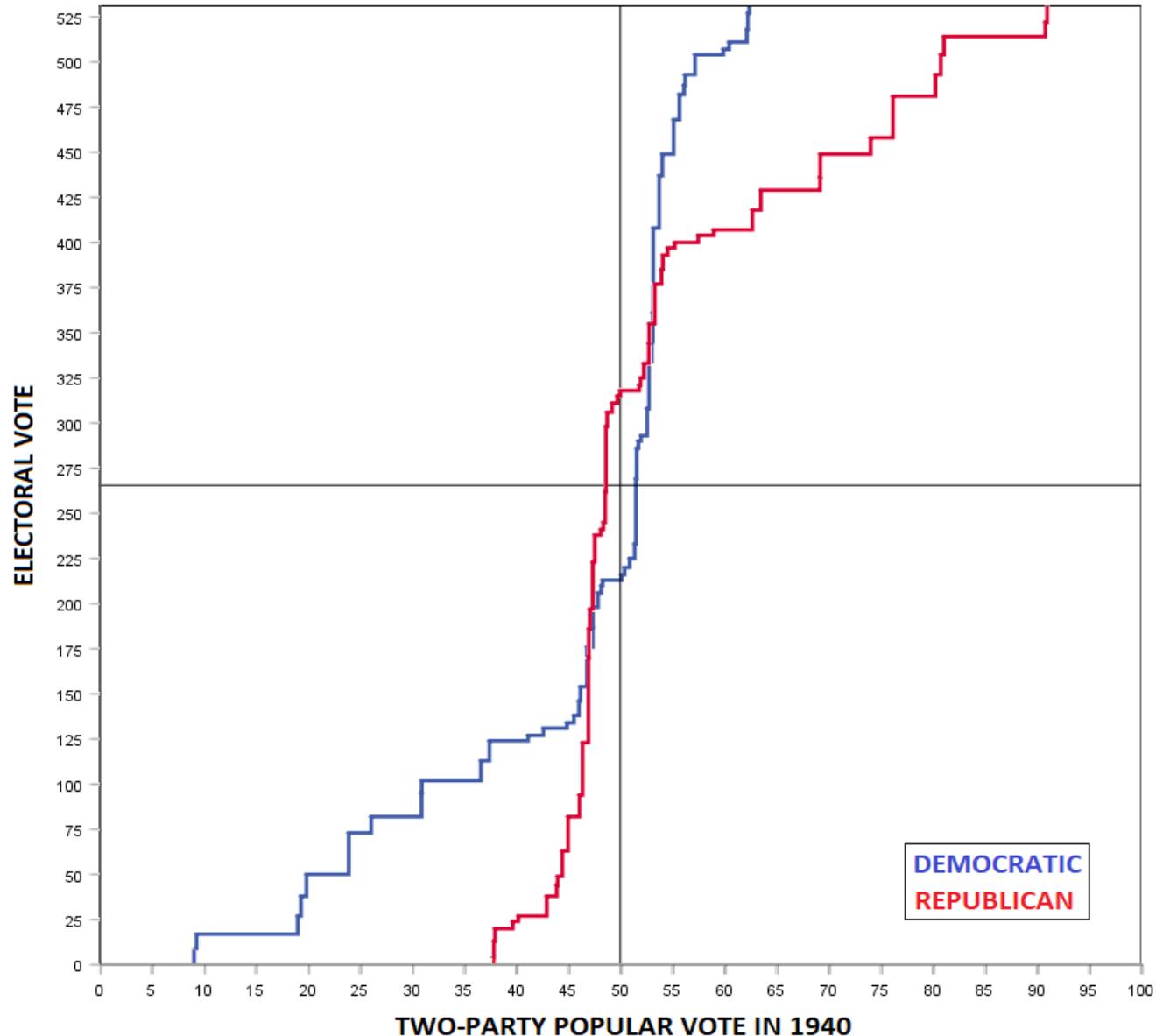
The PVEV in 1940

- While the 2016 pro-Rep inversion interval was unusually wide at +1.53%, it certainly was not unprecedented.
- For example, in 1940 the inversion interval was +1.51%.
- But the actual popular vote was well outside the inversion interval.
- Moreover the shape of the PVEV was quite different.



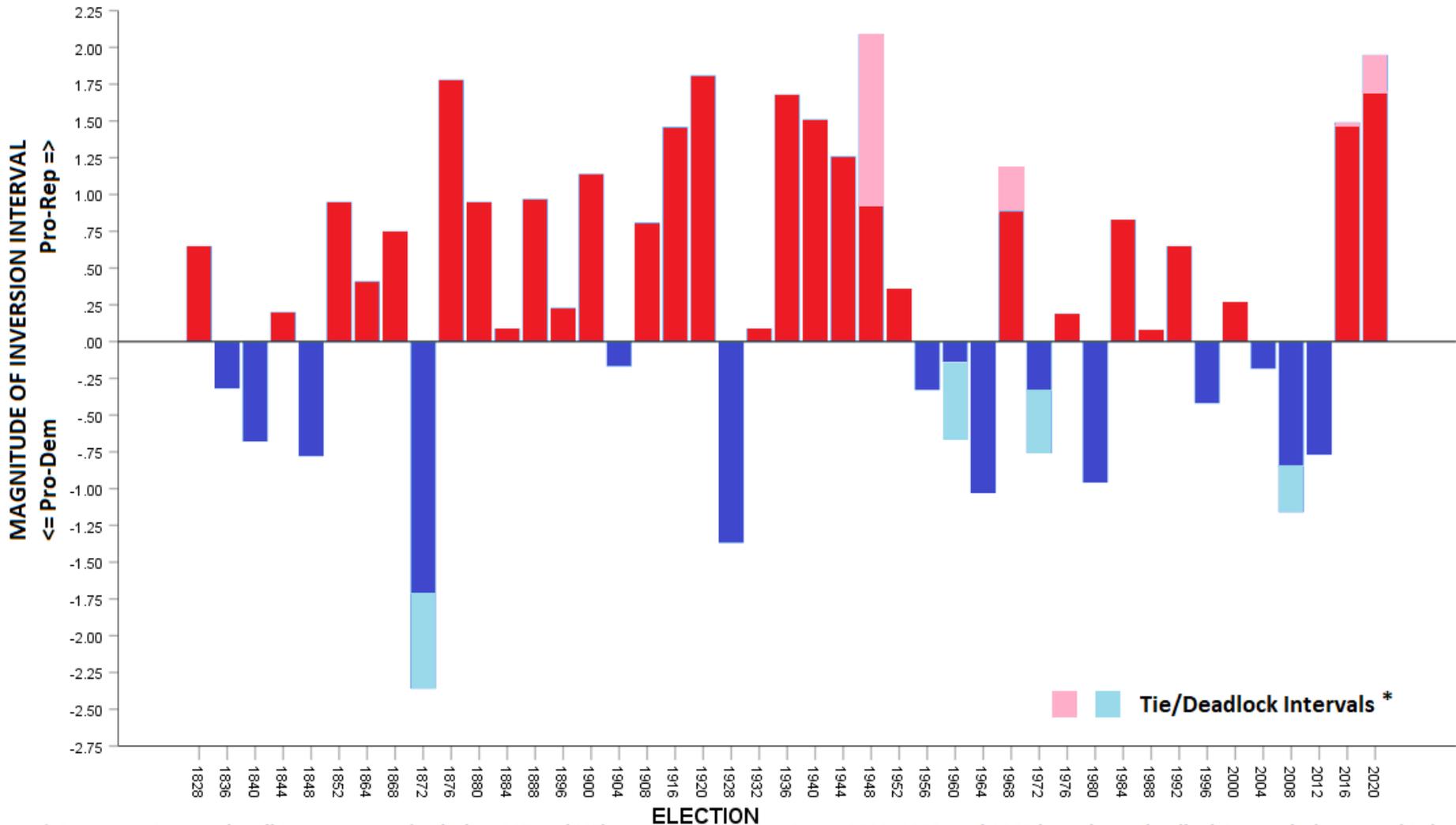
Dramatic Partisan Asymmetry in 1940

- Is this PVEV “biased” in favor of Dems or Reps?
- The Dem PVEV lies above the Rep PVEV over almost all of the PV range.
- But the Rep PVEV lies above the Dem PVEV where it rally matters (especially in presidential elections).



Magnitude and Direction of Inversion (and Tie/Deadlock)

Intervals: 1828-2020 (includes 1948, 1960, and 1968)



* Assumes winner-take-all in every state (including ME and NE)

Note: 1948, 1960, and 1968 have large deadlock intervals, because third candidates won electoral vote.

Magnitude and Direction of Inversion (and Tie/Deadlock) Intervals: 1828-2020 (cont.)

- This is the basic story:
- From 1876 to the mid-20th Century, inversion intervals:
 - were often quite large (absolute intervals averaging about 1%), and
 - almost always (14/16) favored Republicans.
 - Overall, actual (positive and negative) intervals averaged about +0.85%.
- From 1952 through 2012 inversion intervals:
 - have been substantially smaller (absolute intervals averaging about 0.6% wide)
 - did not consistently favored either party (9/15 pro-Dem).
 - Overall, actual intervals averaged about -0.1%.
- However, 2016 and 2020 have very large pro-Rep inversion intervals,
 - comparable to those in the earlier period.
- For the record, the inversion interval in the counterfactual 1860 election was about +12.0%
- *The following charts have not been revised to include 2020 or 1948, 1960, and 1948.*

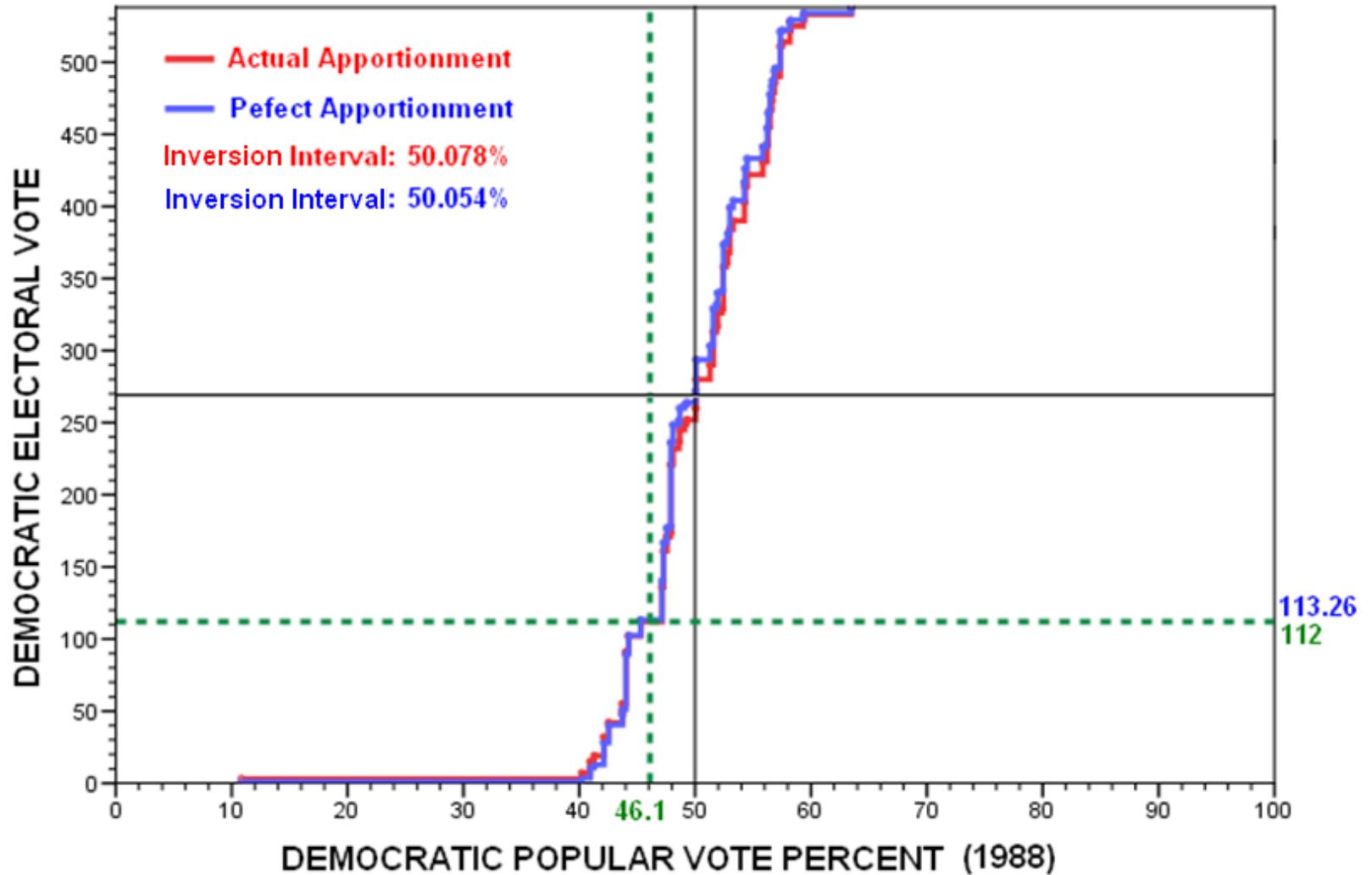
Apportionment vs. Distribution Effects on the PVEV

- The asymmetry or bias in a PVEV that may produce large inversion intervals results from either or both of two distinct effects:
 - *apportionment effects*, and
 - *distribution effects*.
- Apportionment effects result from the fact state electoral votes are not perfectly proportional to their respective popular votes.
 - This is true for a variety of reasons,
 - the most commented upon being the small-state advantage resulting from the Senate (or “equal two”) contribution to Electoral vote apportionment.
- Distribution effects result from the fact that the votes of one candidate/party may be more efficiently distributed than those of the other.
- Either effect alone can produce bias and election inversions.
- In combination, they can either reinforce or counterbalance each other.
 - It turns out that they typically counterbalance each other,
 - but distribution effects are more powerful (especially in the present era).

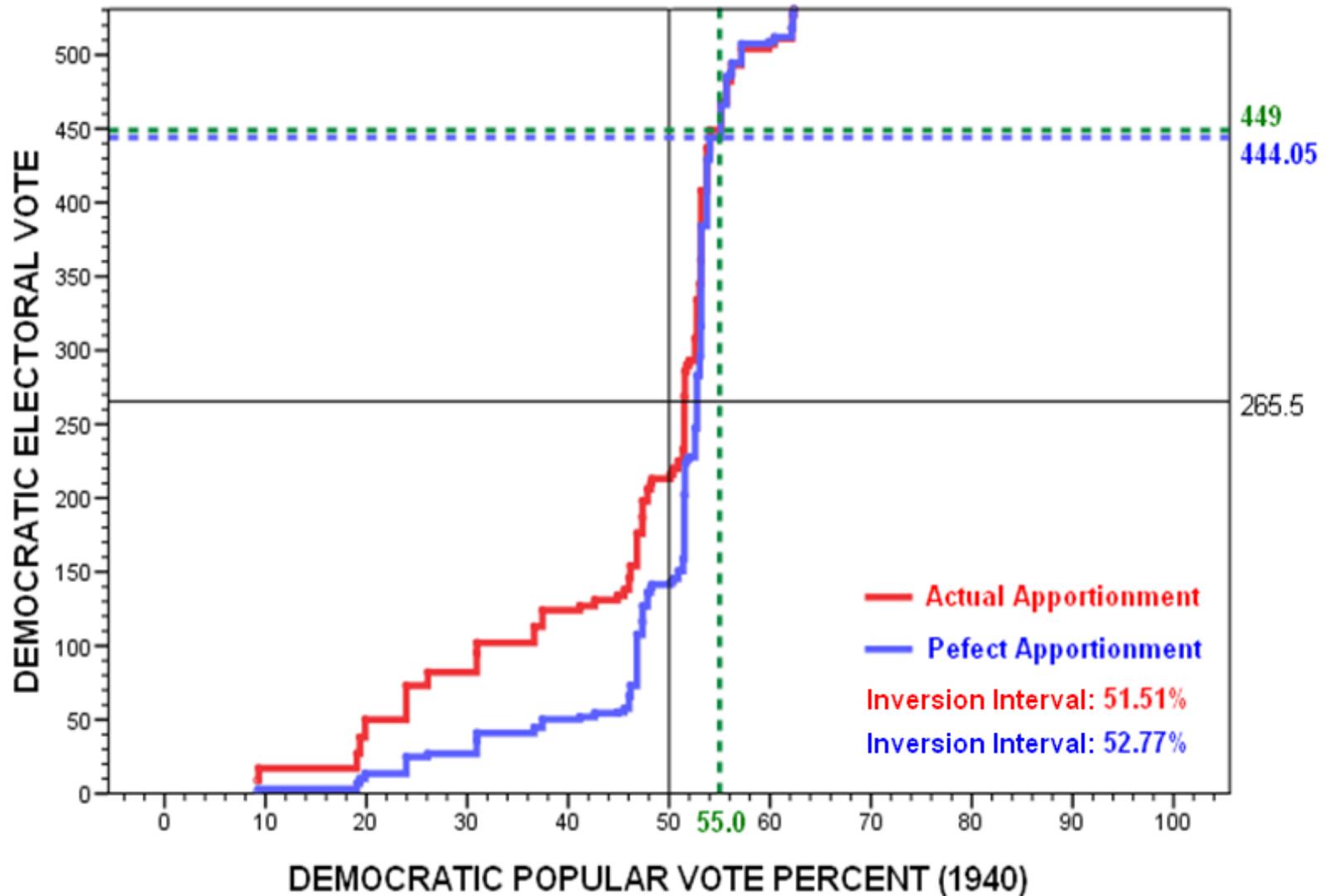
Perfect Apportionment and Apportionment Effects

- A PVEV under *perfect apportionment* can be produced by reapportioning electoral votes (fractionally) among the states,
 - so that they are precisely proportional to the total (two-party) popular vote cast within each state.
- *Apportionment effects* refer to the net effects of the actual (imperfect) apportionment on the PVEV and the inversion interval.
- Imperfect apportionment may or may not create bias in the PVEV function.
 - This depends on the extent to which state (dis)advantages with respect to apportionment are correlated with their support for the candidates/parties.
- We can separate apportionment effects from distribution effects by plotting the PVEV function given perfect apportionment.
 - Any remaining bias in the PVEV function must be due to distribution effects.
 - If the PVEV under actual and perfect apportionment PVEVs are more or less similar, apportionment effects are minimal and any substantial inversion interval must be due to distribution effects.

In 1988 Apportionment Effects Were Minimal



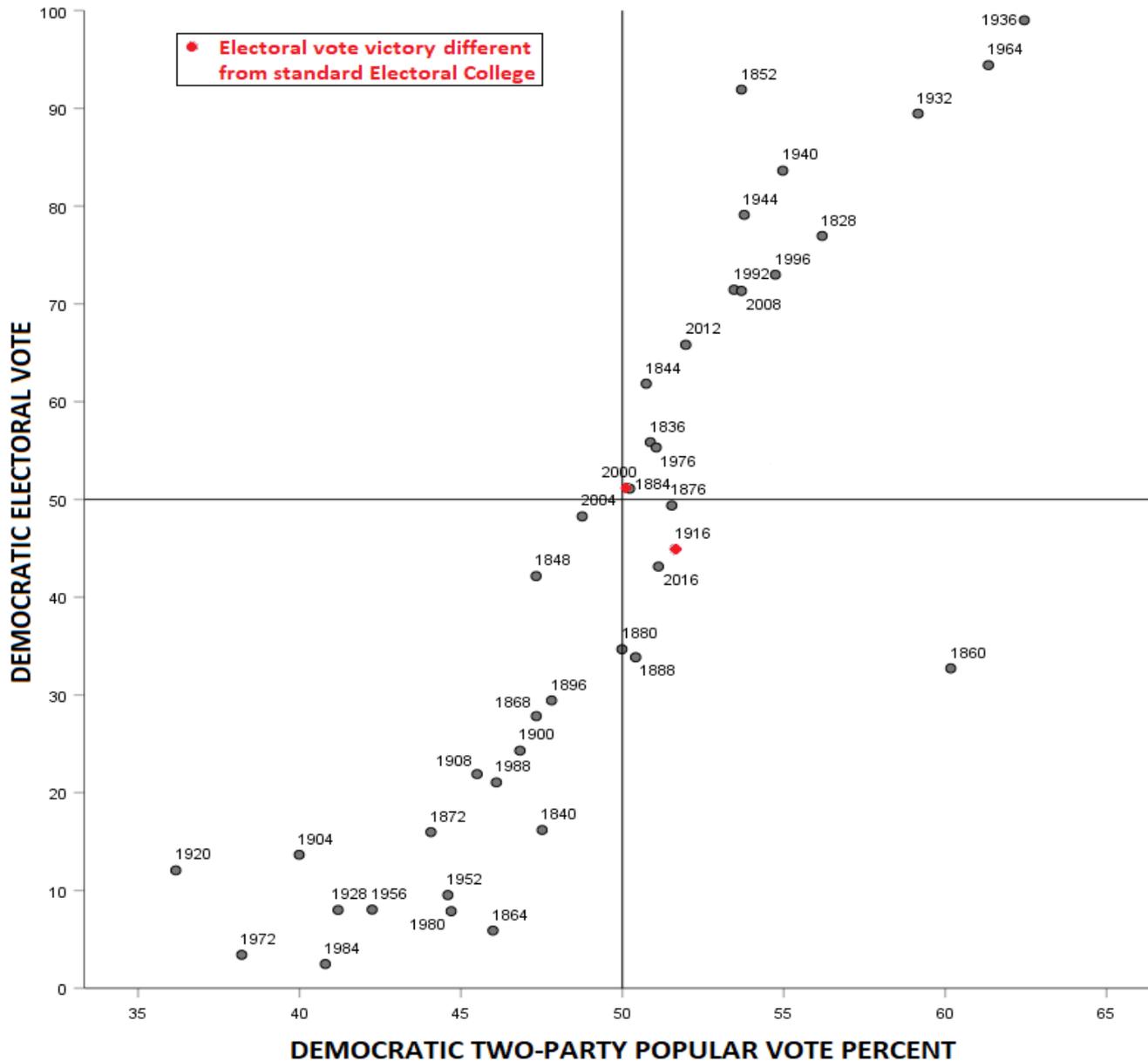
In 1940 Apportionment Effects Were Quite Substantial



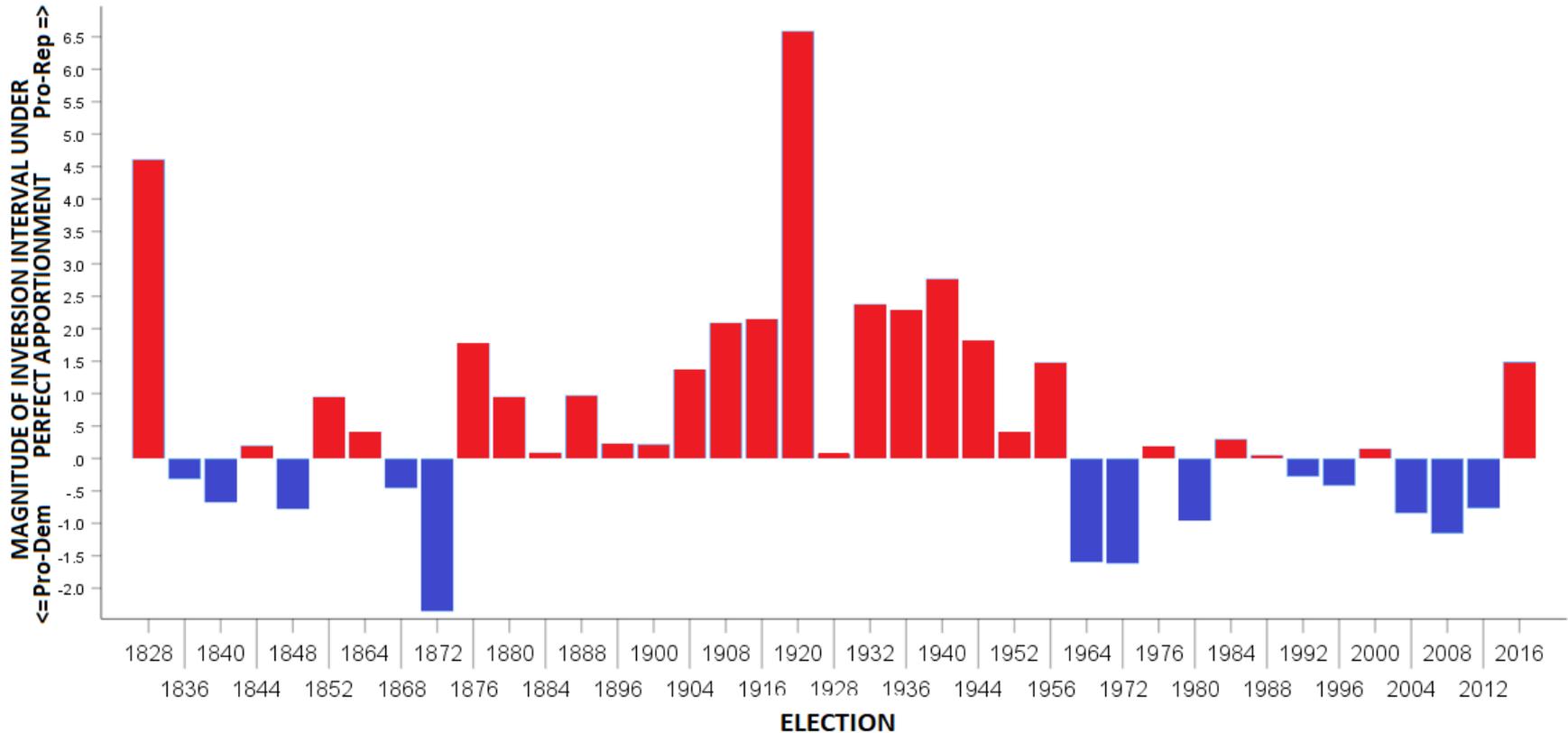
Apportionment Effects (cont.)

- We might expect that perfect apportionment would greatly reduce
 - the frequency of historical election inversions and
 - the average magnitude of inversion intervals.
- In fact, perfect apportionment does not reduce the frequency of historical inversions,
 - though it does reclassify two elections:
 - it “corrects” the 2000 inversion, but
 - it creates a new inversion in 1916.
- Moreover, perfect apportionment actually increases Republican bias on average (so in this respect 1940 is typical), and as a consequence
 - it increases the average magnitude of absolute inversion intervals.

Historical Overview: Perfect Apportionment

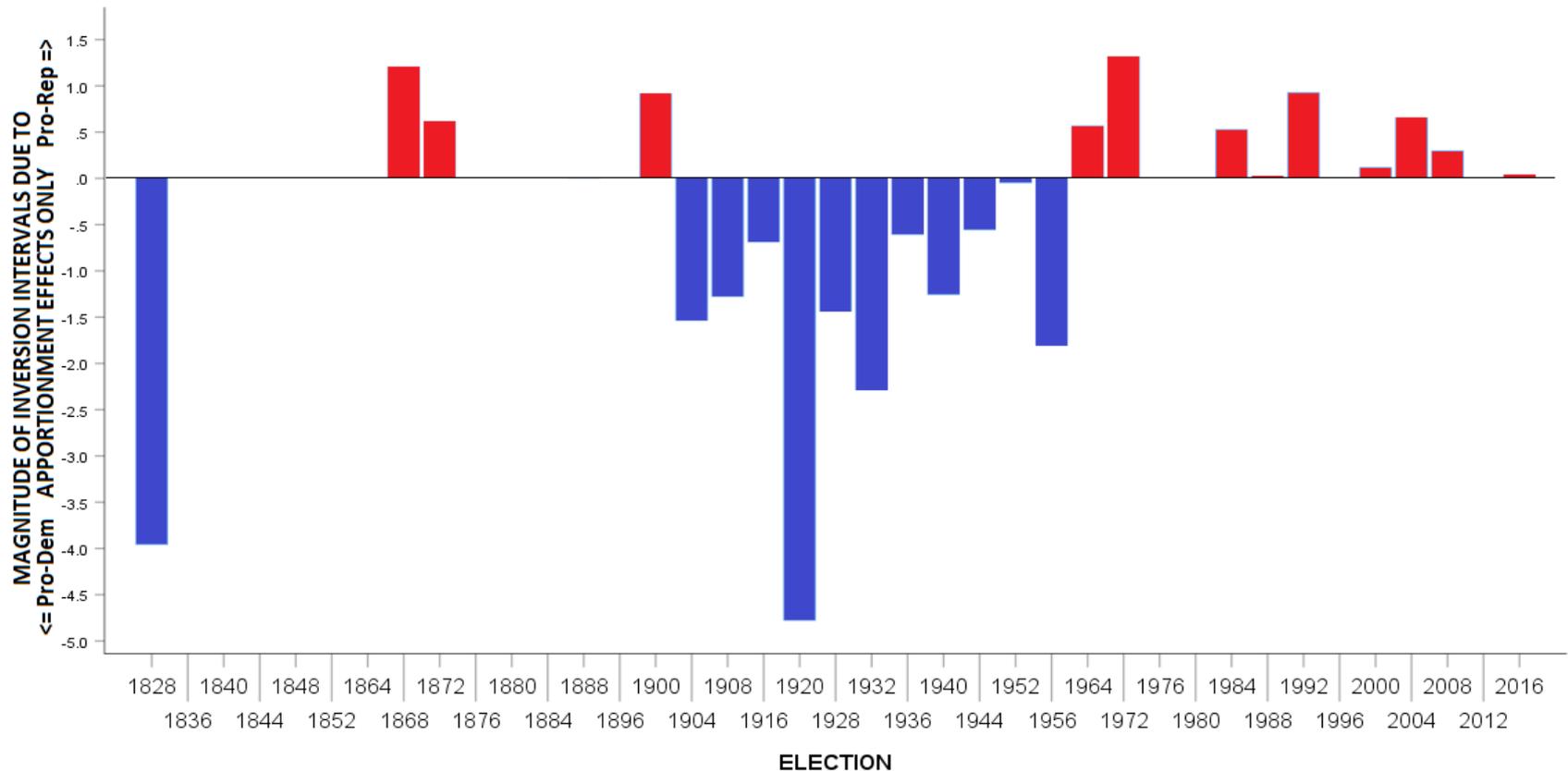


Inversion Intervals under Perfect Apportionment (and Due to Distribution Effects Only)



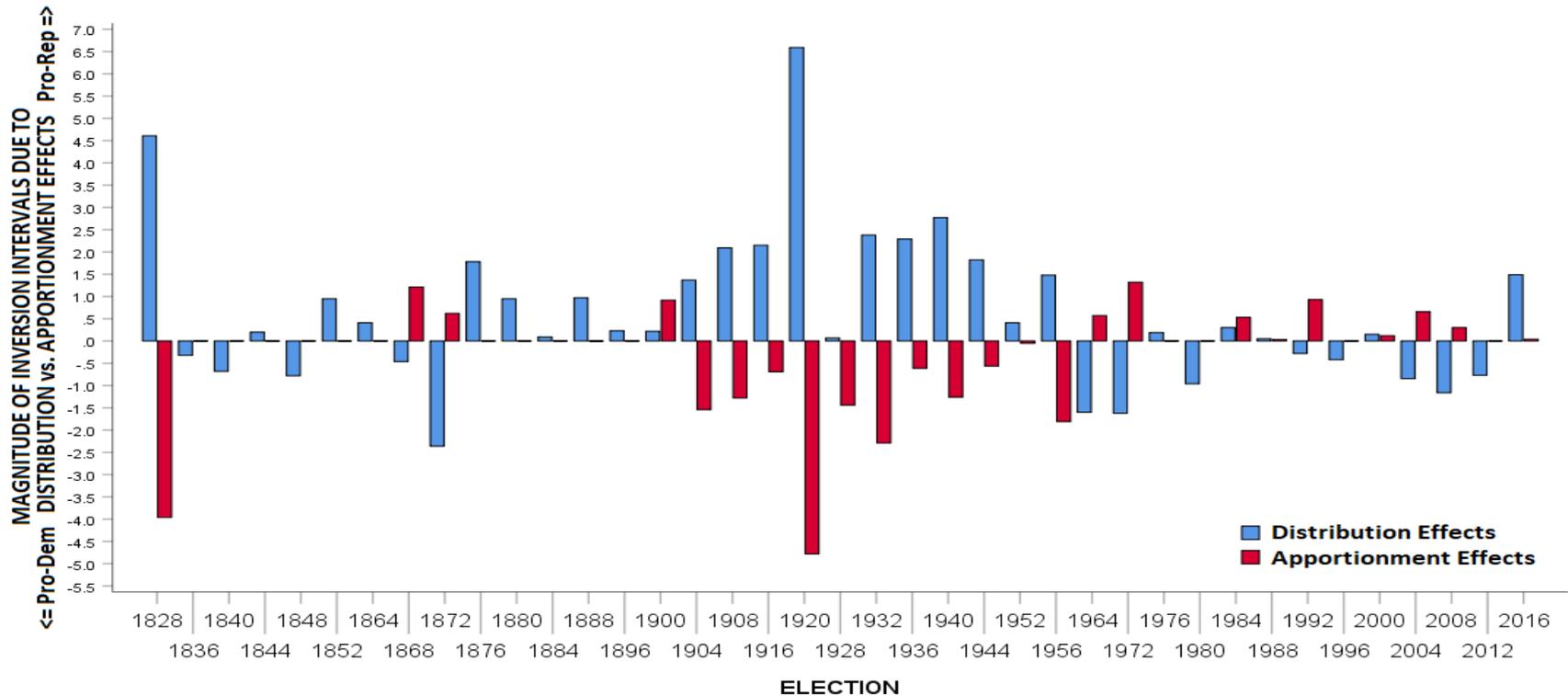
- Given perfect apportionment, the inversion intervals depicted above are due to distribution effects only.
- In the 1876-1956 period, they invariably favored Republicans,
 - though by greatly varying magnitudes.
- Since then they have mostly but modestly favored Democrats,
 - with the notable exceptions of 2016 and 2020.

Inversion Intervals Due to Apportionment Effects Only



- Apportionment effects quite often have no effect on the inversion interval.
- From 1904 through 1956, apportionment effects invariably favored Democrats but since then never have.

Combining Distribution and Apportionment Effects



- “Adding together” the two (usually countervailing) effects for each election gives the earlier graph showing overall inversion intervals.
- It can be observed that distribution and apportionment effects have typically worked in opposition to each other,
 - moderating the overall magnitude of inversion intervals.

Historical Summary

- Over the entire period, apportionment effects have generally favored Democrats and distribution have generally favored Republicans, with the latter effects being somewhat stronger than the former, producing a pro-Republican bias.
- However, throughout the 19th Century, there is no consistent pattern,
 - evidently reflecting relatively loose party ties in the early party systems followed by the disruptive events leading to and following the Civil War.
- The overall pattern is especially clear from 1908 through 1944 (except 1928), reflecting the peculiar character of the Democratic “Solid South” of that era,
 - where Democrats won overwhelming (and thus “inefficient”) popular vote margins (producing very strong pro-Rep distribution effects)
 - but on the basis of very low turnout (producing moderately strong pro-Dem apportionment effects).

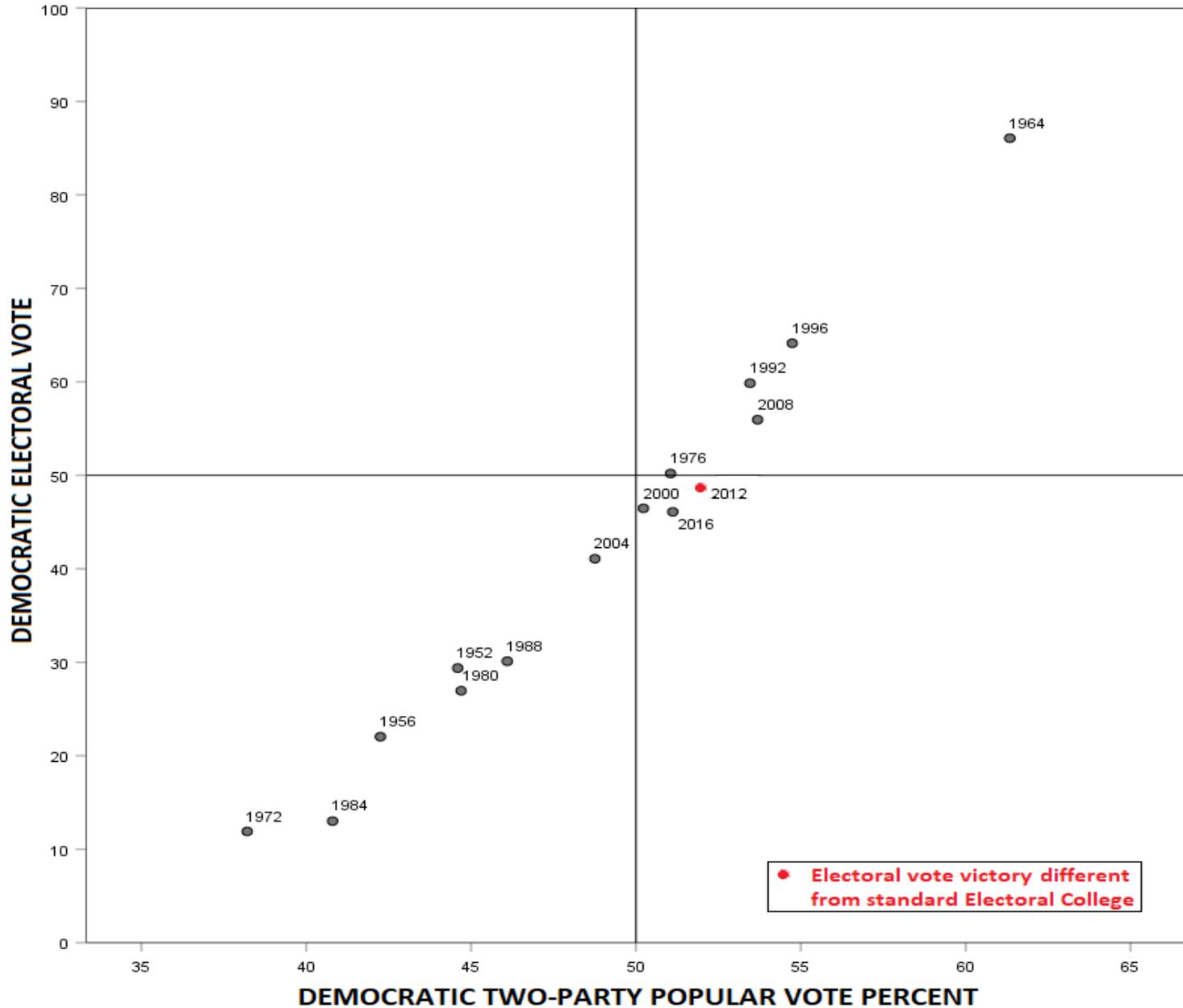
Historical Summary (cont.)

- From 1952 through 1960, the outer South became more Republican, so the partisan impact of the two effects was reduced.
- Beginning in 1964, the heretofore Democratic “Solid South” began to switch party sides, so the partisan impact of the two effects was reversed.
- As as the Voting Rights Act took effect,
 - (especially black) turnout increased in the South,
 - which provides the basis for a substantial (but rarely winning) DPV% in Southern states.
- Thus both apportionment and distribution effects become relatively small.

The Modified District Plan

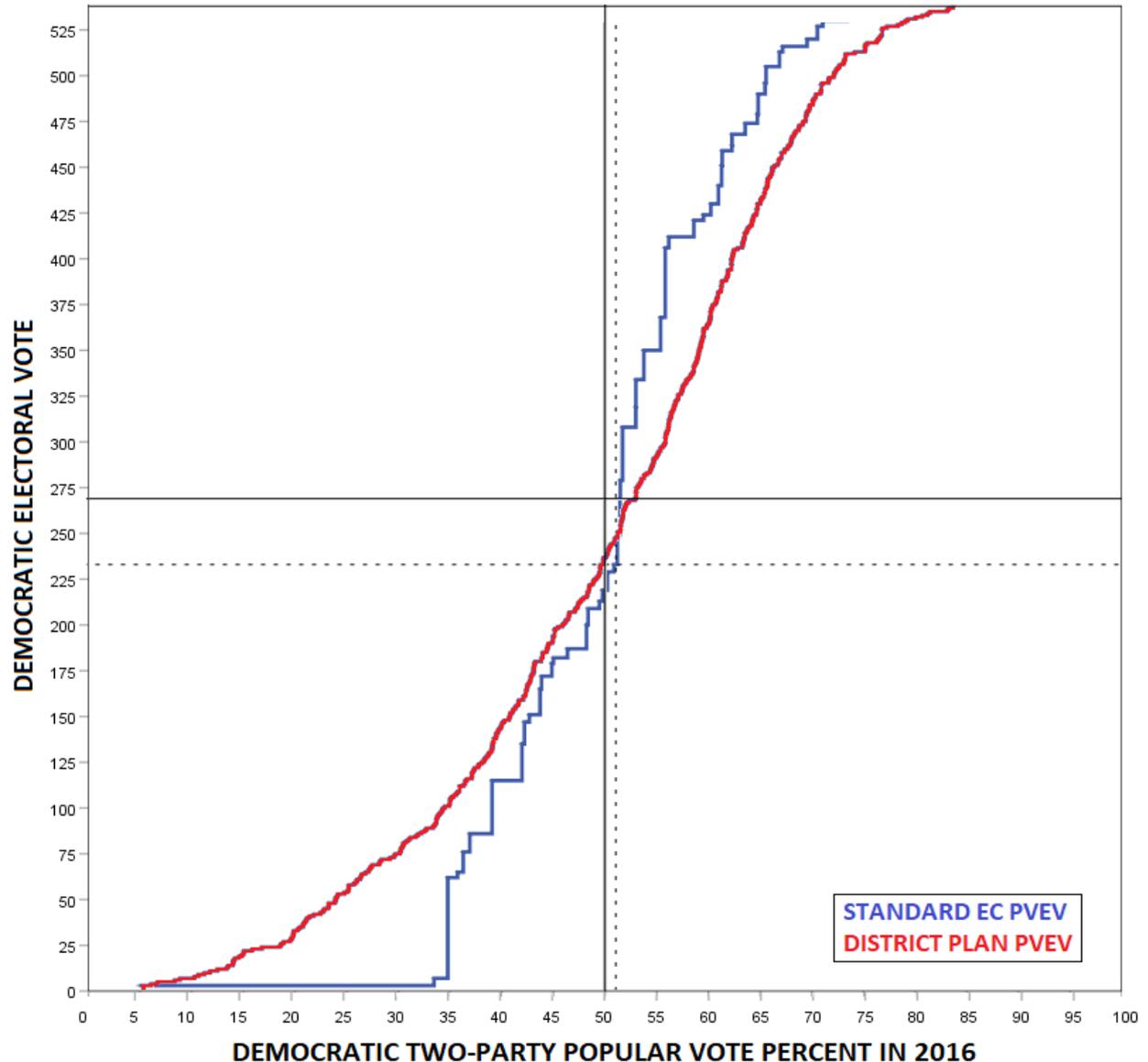
- Data (i.e., presidential vote by CD) needed to examine the district plan in historical elections evidently exists only back to 1952 (and the 2020 is not yet available),
 - and some of the of the earlier data may be somewhat problematic.
- Over the period for which data exists, the District Plan produces a more “proportional” PVEV than the standard EC,
 - and an even higher national PV-EV correlation (+0.992 vs. +0.969),
 - but the relationship exhibits a considerable pro-Rep bias.

Historical Overview: Modified District Plan

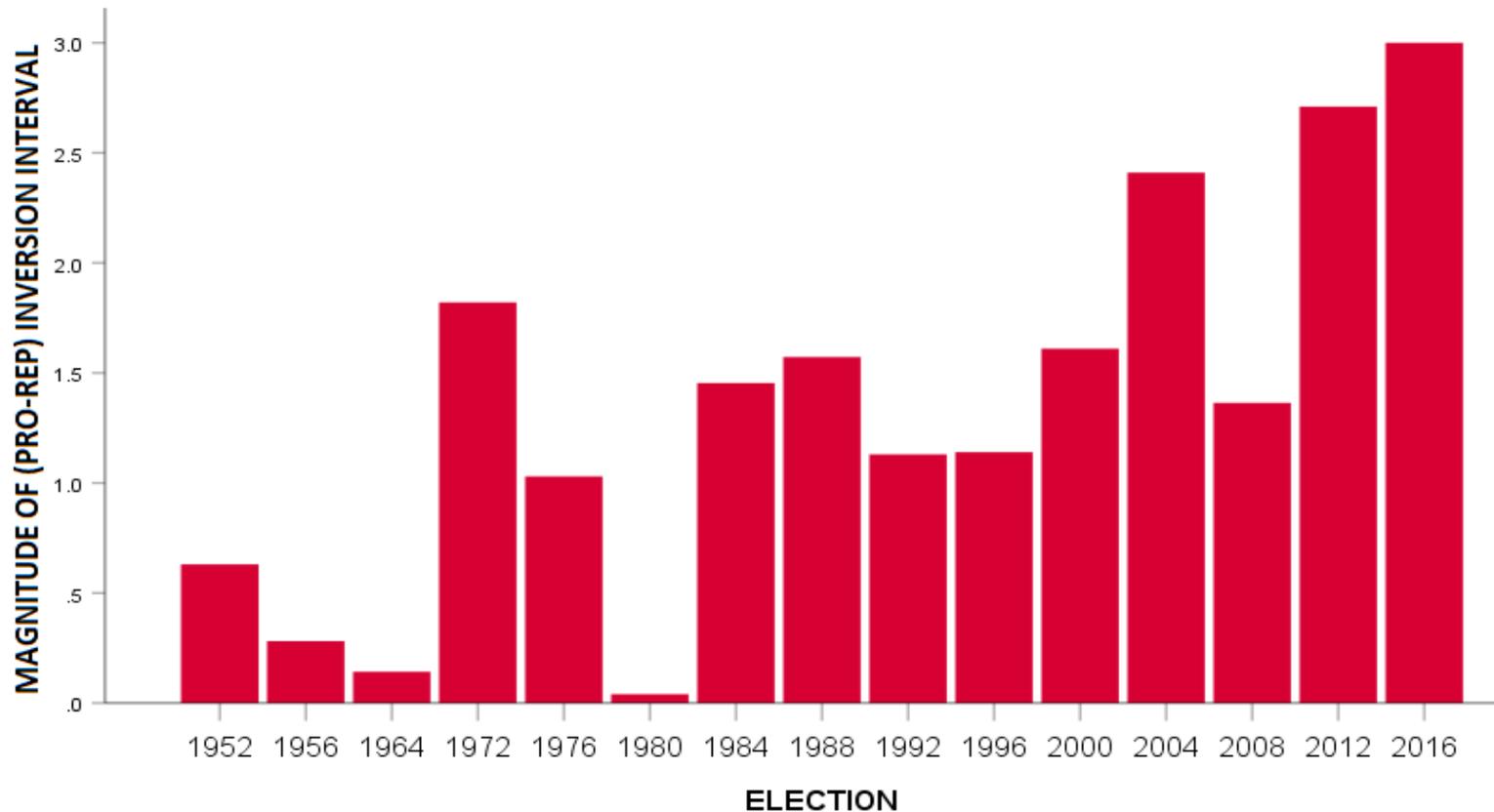


2016: Regular EC vs. District Plan PVEVs

Clinton would have won more EVs at PV=50% (237 vs. 219), and more EVs at the actual PV=51.1% (248 vs. 233); nevertheless, the inversion interval would have been much wider (+3.0% vs. +1.5%)



Inversion Intervals under Modified District Plan: 1952-1956

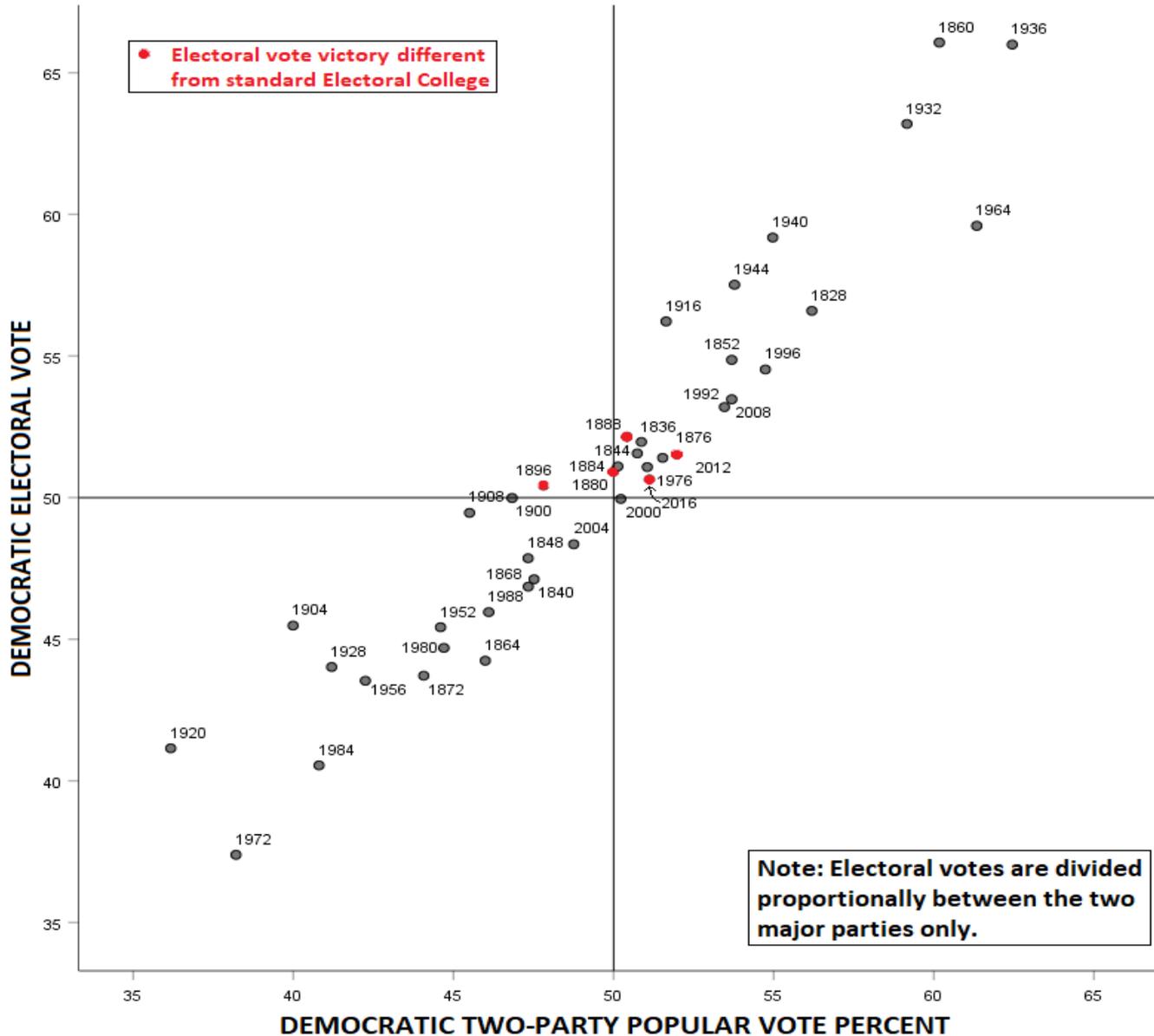


- Since 1952 (though probably not earlier), the Modified District Plan has had a consistent pro-Rep bias,
 - which has increased over time and
 - has become very pronounced recently,
 - presumably because of extensive Republican gerrymandering of CDs in 2010.

The Proportional Plan

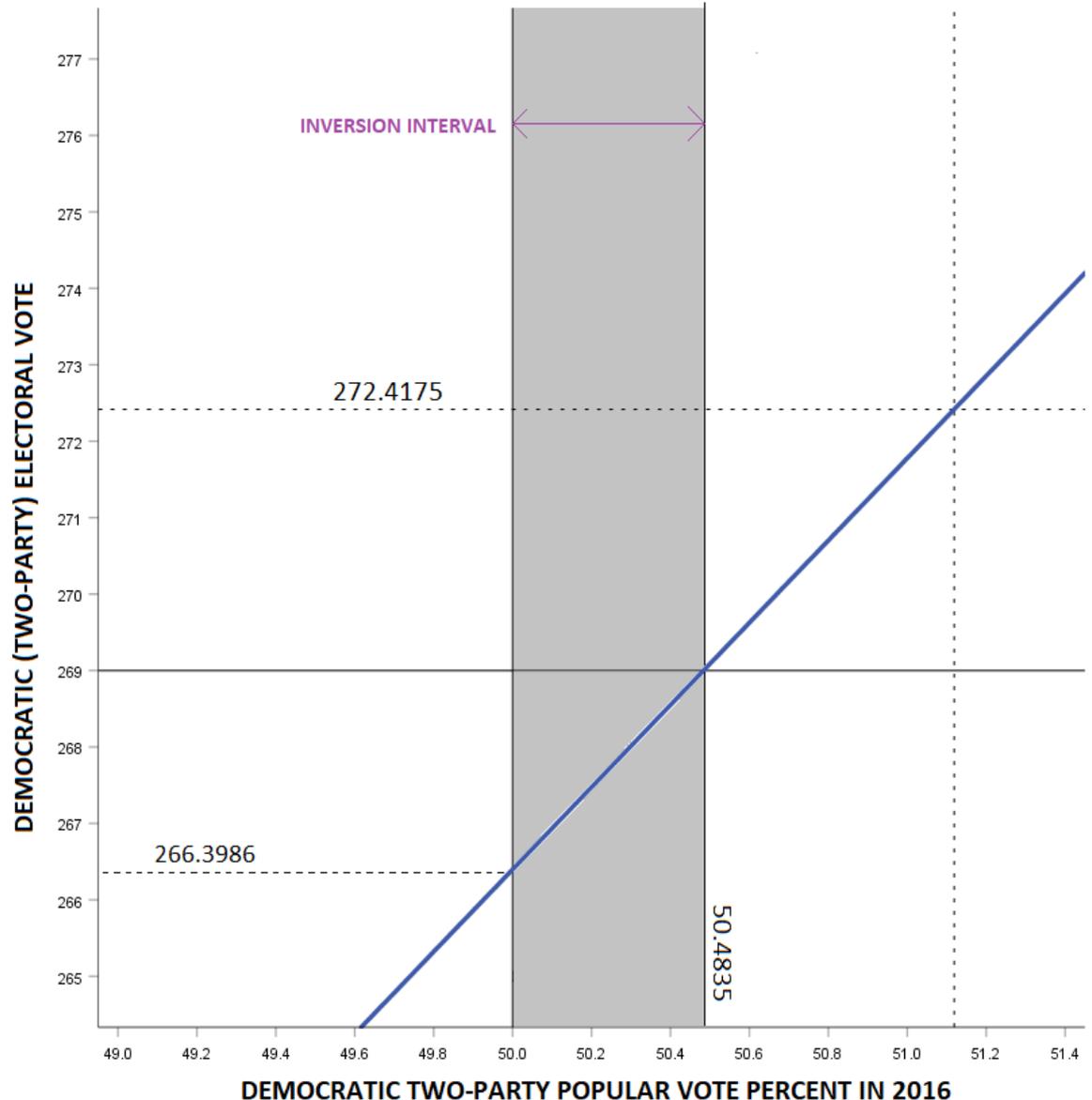
- *Note*: this analysis continues to be done on a strictly two-party basis.
 - In particular, electoral votes are proportionately divided between the two major parties only,
 - in contrast to the proposed [Lodge-Gossett] constitutional amendment and its various reinventions.
- Over the whole period, the proportional plan
 - unsurprisingly produces a highly proportional PVEV, and
 - the correlation is much higher (+0.948 vs. +0.785) than under the standard EC, and
 - if anything there is pro-Democratic bias.
- Examining the relationship separately for the 1896-1944 and 1952-2016 periods
 - increases the correlation further (to +0.994 in the earlier period and +0.995 in the latter), but
 - shows that there was huge pro-Dem bias in the earlier and a small pro-Rep bias in the latter period.

Historical Overview: Proportional Plan



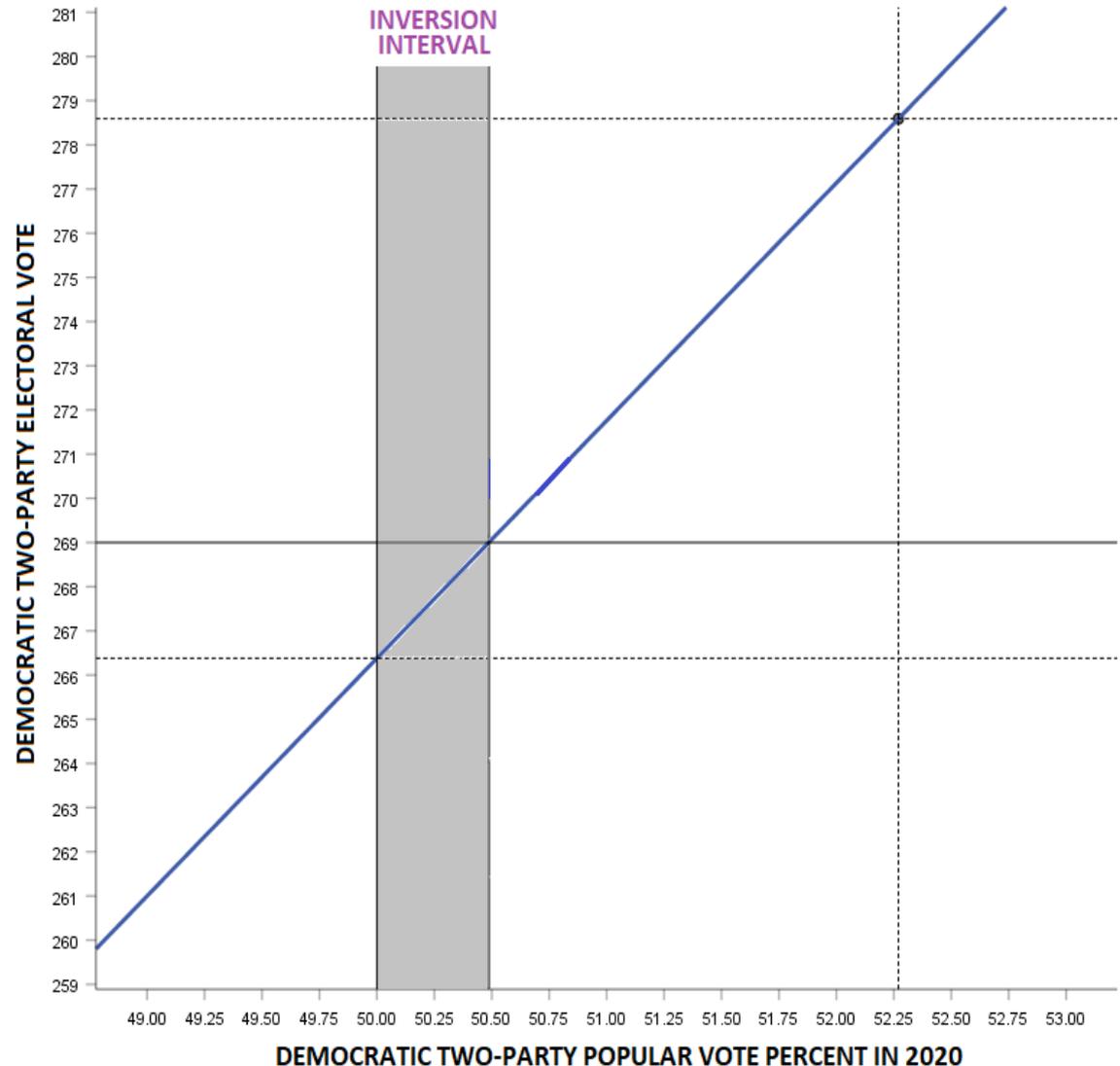
Proportional Plan: PVEV in 2016 (Zoom In)

- Clinton would have won about 266.4 EVs at DPV = 50%.
- Clinton would have needed about 50.5% of the PV to win an EV majority.
- Clinton would have won about 272.4 EVs with her actual PV.

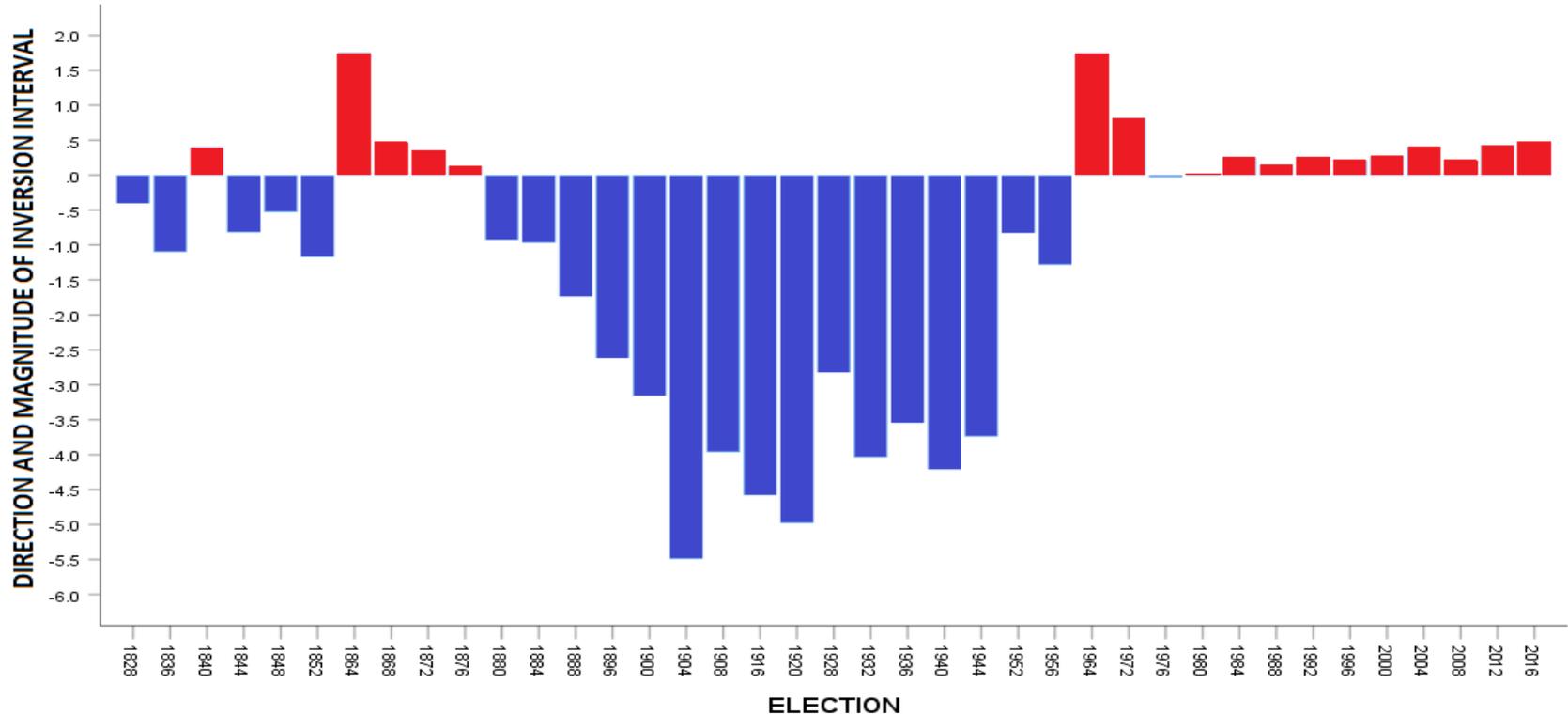


Proportional Plan PVEV in 2020 (Zoom In)

- Biden would have won about 266.4 EVs at PV = 50%.
- Biden would have needed about 50.5% of the PV to win an EV majority.
- Biden would have won about 278.7 Evs with his actual PV.



Inversion Intervals under Proportional Plan



- The Proportional Plan produces
 - a huge and consistent pro-Dem bias in the 1880-1956 period
 - that resulting from elimination of distribution effects and preservation of apportionment effects, and
 - a modest but consistent pro-Rep bias since then.