

California's Top-two Primary: A Successful Reform III

Charles T. Munger, Jr.
(Dated: February 22, 2019)

This paper is the third of three, *California's Top-two Primary: A Successful Reform I, II, and III*, but it can be read independently.

The paper presents a table of all the candidates elected in a same-party general election in California from 2012 through 2016, and reports how often a candidate who had trailed in the primary won the general election. The paper examines whether voters who vote a general-election ballot and face, either in a statewide race or in a district race, two candidates of a party not their own, vote in that race or skip it; tallies the amount of money spent in same-party general elections, as a quantifiable measure of their competitiveness and interest; examines whether the top-two primary, in creating some general election races from which one or other major party is excluded, has denied that excluded party a significant chance of electing one of their candidates; and compares the number of general election races in California, either resulting from the system of partisan primaries or from the top-two, that end with both a Democrat and a Republican on the ballot, to the number in the other states. The conclusions drawn from all three papers appear together at the end of this one.

Section I presents a table of all the candidates elected in a same-party general election in California from 2012 through 2016, and reports how often a candidate who trailed in the primary won the general election. Section II examines whether voters who vote a general-election ballot and face, either in a statewide race or in a district race, two candidates of a party not their own, vote in that race or skip it. Section III tallies the amount of money spent in same-party general elections, as a quantifiable measure of their competitiveness and interest. Section IV examines whether the top-two primary, in creating some general election races from which one or other major party is excluded, has denied that excluded party a significant chance of electing one of their candidates. Section V compares the number of general-election legislative races in California from 2002 through 2016, either resulting from the system of partisan primaries or from the top-two, that end with both a Democrat and a Republican on the ballot, to the number in the other states.

Occasional references to *I* and to *II* are to the accompanying papers of the same title. The conclusions drawn from all three papers appear at the end of this one.

I. WERE THE RIGHT CANDIDATES ELECTED?

A judgement on the worth of the top-two has to rest heavily on the relative merits of the candidates who win and who lose its same-party general elections. The complete list [1], [2] of same-party, general-election candidates from 2012 through 2016, together with their election year and district; who won; whether an incumbent was in the race; and if there was an incumbent in the race, whether the race was a real fight, appears in Table I, II, or III, respectively for the Assembly, state Senate, and the U.S. House. The reader may judge.

Of the 80 same-party races, 20, or 25%, were won by the candidate who had trailed in the primary. If one excludes the elections where an incumbent had run, and had run against token opposition (defined as those in which an incumbent ran, had raised or had spent on his behalf more than 9 times the money that his opponent had, and where the incumbent won), there remain 54 elections, the (potentially) real fights; of those the candidate who had trailed in the primary won 19, or 35%.

The conclusion we draw is that the system of partisan primaries, in districts dominated by one party and where there was any real contest for an office, had of the two leading candidates been eliminating (more than) a third of the time in the dominant party's primary the candidate who, in a head-to-head general election, would have won. From 2002 through 2010, when essentially all the legislative (and U.S. House) districts had been gerrymandered to be dominated by one party, that would imply that a third of the legislature were made up of candidates who did not belong there: if we assume that whenever term limits created an incumbent-free seat a real contest followed; and if we agree that it is preferable that those in the legislature (or the U.S. House) should represent a majority of the general election voters and not a plurality in the dominant party's primary. Assuming that a partisan primary, in a district where there was a real contest, always identified the two leading candidates of the dominant party, that primary got the choice between them right about 65% of the time; a figure which is not particularly impressive given that a coin-toss would have got the choice right 50% of the time.

It may be objected that such a conclusion about partisan primaries is unwarranted, because in a district where one party is dominant the dynamics of a partisan primary, and of a top-two primary, are different. In such a district with a partisan primary, everyone knows that the primary of the dominant party entirely determines who will serve in office, and who will not; the two leading can-

didates in that primary may be expected to strain every sinew, to go after every last primary vote, so that their relative outcome measures as well as anything could the full abilities of the leading candidates. In such a district with a top-two primary, however, it may be argued that once the polling indicates which two candidates of the dominant party will make the top-two, then both can relax, saving their resources and energies for the general election, which is where the decisive battle will be fought. That the candidates might relax would be particularly likely if only two candidates of the dominant party even ran in the primary. The leading candidates' relative outcome in a top-two primary would then not really measure either leading candidate's true strength; therefore that some candidates win the ensuing top-two, same-party election having trailed in the primary is only to be expected; and that they do so tells nothing about whether partisan primaries were or were not eliminating candidates who would have won a head-to-head general election.

Most incumbent-free, safe districts attract, however, many more than two candidates of the dominant party, and it is unlikely that in a complex field of candidates any polling information is available to the candidates so reliable that on the strength of it they would let themselves relax. In a field of three such candidates, it might well be that two candidates will belong to one faction of a party, splitting that faction's vote, and one candidate to another; then who leads in the primary's plurality vote may have more to do with the accident of how many of each faction chose to run, than with the actual relative merit of the two leading candidates.

True, a single candidate challenging an incumbent of his party might be in a position to relax, if his only goal in the primary was to enter the general election; but having trailed badly in the primary is not a good place from which to recruit volunteers or donors, or win for the general election the intangibles of repute and momentum, both of which a challenger taking on an incumbent of his party badly needs; and from the standpoint of preparing to win that general election, it is harder to get a voter who has already voted for your opponent in a primary to transfer his vote to you in the general, than it is to hold a voter in the general who has already voted for you in the primary.

Finally while in the primary there might be from the dominant party only the incumbent and his challenger, another candidate from the other major party may also run. The challenger has to at least beat that other candidate to qualify for the top-two general election, with his party's vote split.

We conclude that such a challenger can rarely afford to relax. It is more likely the incumbent, who will almost invariably lead the vote total in the primary due to name recognition and to already holding the office, who could save his energy and warchest for the general election; but if that is a tactic that is used and is effective, it becomes more remarkable, not less, that under the top two system

as many incumbents lose in the general election as they do.

We do not believe that any supposed relaxation, and a consequent misidentification in a top-two primary of who is really the stronger of two candidates, is what leads under the top-two to the candidate with the lower total vote in the primary so often prevailing in the general election. We adhere to the simpler explanation, that the candidate who can prevail before the small electorate in a partisan primary is different from the candidate who can prevail before the much larger and more diverse electorate in a general election; and the candidate who can prevail in a head-to-head matchup is often different from the candidate who can win a plurality of the primary vote in a field of more than two candidates.

II. VOTING BEHAVIOR IN SAME-PARTY GENERAL ELECTIONS

A. Voter behavior in a same-party, statewide general election:

The 2016 Harris-Sanchez U.S. Senate Election

The 2016 election between Democrats Kamela Harris and Loretta Sanchez for U.S. Senate in California was the first, and before 2018 the only, top-two statewide general election in California between two candidates of the same party. No Republican appeared on the general election ballot. We ask two questions: (1) did Republican voters vote in that race, when there were only two Democrats to choose between, or skip the race when filling out their ballots; and (2) what effect had Republican voters on the outcome of the general election?

We illustrate the technique we shall use to answer these questions by examining the passage of Proposition 54 (the *California Government Transparency Act* in the same general election. Then we shall examine the Senate race.

California's Assembly districts divide the state's electorate into 80 samples in which voters' ballots are tallied separately. Figure 1 shows as solid circles a scatterplot of data for each of California's 80 Assembly districts; the horizontal axis is the advantage the Republican party had over the Democratic party, as a percentage of the voters registered in each district, in percent; and the vertical axis is the percentage of the total vote cast in favor of Proposition 54. Open circles show a scatterplot where the vertical axis is the ratio (in percent) of the number of ballots cast in the district for or against Proposition 54 to the number of ballots cast for U.S. President, in percent.

One can see in Figure 1 a slight but consistent tendency that the higher the advantage in Republican voter registration in an Assembly district, the higher the proposition's winning percentage, and the higher the fraction of the ballots cast for or against the proposition. The lines are linear fits (weighted least squares, with the districts weighted by the total number of their registered voters)

TABLE I. Shown are the candidates for the same-party top-two general elections in 2012, 2014, and 2016 for the California state Assembly. The second column is the number of the Assembly District; the third column is the party common to the two candidates; the fourth is the name of the winner; and the fifth the name of the loser. A name is shown in italics if the candidate was a current member of the Assembly while running.

year	AD	party	Winner	Loser
2012	1	R	Brian Dahle	Rick Bosetti
	2	D	<i>Wesly Chesbro</i>	Tom Lynch ^b
	5	R	Frank Bigelow ^a	Thomas Oller
	6	R	<i>Beth Gaines</i>	Andy Pugno
	10	D	Marc Levine ^a	<i>Michael Allen</i>
	18	D	Rob Bonta	Abel Guillen
	19	D	Phil Ting	Michael Breyer
	20	D	Bill Quirk	Jennifer Ong
	23	R	Jim Patterson	Bob Whalen
	39	D	Raul Bocanegra	Richard Alarcon
	47	D	Cheryl Brown ^a	Joe Baca, Jr.
	50	D	Richard Bloom ^a	<i>Betsy Butler</i>
	51	D	Jimmy Gomez	Luis Lopez
	59	D	R. Jones-Sawyer	Rodney Robinson
	62	D	<i>Steve Bradford</i>	Mervin Evans ^b
	67	R	Melissa Melendez ^a	Phil Paule
	72	R	Travis Allen ^a	Troy Edgar
76	R	Rocky Chavez	Sherry Hodges	
2014	7	D	Kevin McCarty	Steve Cohn
	9	D	Jim Cooper	Darrell R. Fong
	15	D	Tony Thurmond ^a	Elizabeth Echols
	17	D	David Chiu	David Campos
	26	R	Devon Mathis ^{ac}	Rudy Mendoza
	39	D	Patty Lopez ^a	<i>Raul Bocanegra</i>
	47	D	<i>Cheryl R. Brown</i>	Gil Navarro ^b
	53	D	Miguel Santiago	Sandra Mendoza
	64	D	Mike Gipson	Prophet Walker
	71	R	<i>Brian W. Jones</i>	Tony Teora ^b
	74	R	Matthew Harper ^a	Keith D. Curry
76	R	<i>Rocky Chavez</i>	Thomas Krouse ^b	
2016	10	D	<i>Marc Levine</i>	Veronica Jacobi ^b
	12	R	Heath Flora ^a	Ken Vogel
	14	D	Tim Grayson ^a	Mae Torlakson
	23	R	<i>Jim Patterson</i>	Gwen Morris ^b
	24	D	Marc Berman	Vicki Veenker
	27	D	Ash Kalra ^a	Madison Nguyen
	30	D	Anna Caballero	Karina Alejo
	39	D	Raul Bocanegra	<i>Patty Lopez</i>
	43	D	Laura Friedman	Ardy Kassakhian
	46	D	<i>Adrin Nazarian</i>	Angela Rupert ^b
	47	D	Eloise Reyes ^a	<i>Cheryl Brown</i>
	52	D	<i>Freddie Rodriguez</i>	Paul Avila ^b
	53	D	<i>Miguel Santiago</i>	Sandra Mendoza ^b
	71	R	Randy Voepel	Leo Hamel
	76	R	<i>Rocky Chavez</i>	Thomas Krouse ^b

^a Of the 45 winners in same-party Assembly general elections, only these 14 candidates were second in their primary.

^b In these 11 same-party races there was an incumbent in the race, the money raised by the incumbent or spent on his behalf was more than 9 times that of his opponent, and the incumbent won. The remaining 34 races are defined as the real fights.

^c We note that in this one district, incumbent-free, that when the money raised by candidates and spent by independent expenditure committees is totaled, the *winner* of the general election was outraised more than 9 to 1.

to the data. The lines can be extrapolated to give an outcome in a hypothetical district that is all Republican (voter registration advantage +100%) or all Democrat (voter registration advantage -100%), and so to give the behavior of an average Republican or an average Democratic voter. The result: a Republican voted on Proposition 54 essentially 100% of the time, and a Democrat 89% of the time; and a Republican who voted on Proposition 54 voted yes 71% of the time, while a Democrat who voted on Proposition 54 voted yes 61% of the time.

This is to be sure a very simple model of voter behavior whose assumptions can be isolated and challenged.

In isolating the behavior of the Republican or Democratic voter, the model makes the implicit assumptions that all Republican voters have a common probability of voting on the proposition, and a common probability of voting in its favor; that all Democratic voters share another pair of common probabilities; and that all voters who are registered with neither the Republican nor the Democratic party have their behavior described as being identical to that of a Republican or a Democratic voter, with the numbers of each in each district being in proportion to the actual Republican and Democratic voting registration in the district. Thus in a hypothetical district with a Republican fraction of registered voters of 35% and a Democratic fraction of registered voters of 45%, the 20% of voters registered with neither party are assumed to vote on the proposition as if a frac-

TABLE II. Shown are the candidates for the same-party top-two general elections in 2012, 2014, and 2016 for the California state Senate. The second column is the number of the Senate District; the third column is the party common to the two candidates; the fourth is the name of the winner; and the fifth the name of the loser. A name is shown in italics if the candidate was a current member of the state Senate while running.

year	SD	party	Winner	Loser
2012	13	D	Jerry Hill	Sally J. Lieber
	15	D	Jim Beall	Joe Coto
2014	6	D	Richard Pan ^a	Roger Dickinson
	24	D	<i>Kevin de León</i>	Peter Choi ^b
	26	D	Ben Allen	Sandra Fluke
	28	R	Jeff Stone	Bonnie Gracia
	30	D	<i>Holly J. Mitchell</i>	Isidro Armenta ^b
2016	40	D	<i>Ben Hueso</i>	Rafael Estrada ^b
	3	D	Bill Dodd	Mariko Yamada
	9	D	Nancy Skinner	Sandre R. Swanson
	11	D	Scott Weiner ^a	Jane Kim
	15	D	<i>Jim Beall</i>	Nora Campos
	35	D	Steven Bradford	Warren T. Furutani

^a Of the 13 winners in same-party state Senate general elections, only these 2 candidates were second in their primary.

^b In these 3 same-party races there was an incumbent in the race, the money raised by the incumbent or spent on his behalf was more than 9 times that of his opponent, and the incumbent won. The remaining 10 races are defined as the real fights.

tion 35/(35+45) were Republicans and 45/(35+45) were Democrats.

The assumption is not that voters registered with neither party are politically in the middle; the assumption is consistent with some such voters being to the right of the Republican party and some such voters being to the left of the Democratic party, as long as their net voting behavior is as assumed. Nor is the assumption that such voters vote the same way as do Republicans or as do Democrats on every issue: only on the single contest being examined. So the assumption is consistent with a wider range of voter behavior than might initially appear.

A consequence of our assumptions is that the ecological inference problems, that is, statistical fallacies in inferring the behavior of individuals statistical averages, do not arise within our model [3].

Another assumption is that counting the number of ballots cast for U.S. President is a useful measure of the

TABLE III. Shown are the candidates for the same-party top-two general elections in California in 2012, 2014, and 2016 for the U.S. House of Representatives. The second column is the number of the Congressional District; the third column is the party common to the two candidates; the fourth is the name of the winner; and the fifth the name of the loser. A name is shown in italics if the candidate was a current member of the U.S. House while running.

year	CD	party	Winner	Loser
2012	8	R	Paul Cook ^a	Gregg Imus
	15	D	Eric Swalwell ^a	<i>Pete Stark</i>
	30	D	<i>Brad Sherman</i> ^c	<i>Howard Berman</i> ^c
	31	R	Gary Miller	Bob Dutton
	35	D	Gloria N. McLeod	<i>Joe Baca</i>
	40	D	<i>Louis Roybal-Allard</i>	David Sanchez ^b
	43	D	<i>Maxine Waters</i>	Ben Flores ^b
	44	D	Janice Hahn	<i>Laura Richardson</i>
2014	4	R	<i>Tom McClintock</i>	Art Moore
	17	D	<i>Mike Honda</i>	Ro Khanna
	19	D	<i>Zoe Lofgren</i>	Robert Murray ^b
	25	R	Stephen Knight ^a	Tony Strickland
	34	D	<i>Xavier Becerra</i>	Adrienne Edwards ^b
	35	D	Norma Torres	Christina Gagnier
	40	D	<i>Lucille Allard</i>	David Sanchez ^b
2016	17	D	Ro Khanna	<i>Mike Honda</i>
	29	D	<i>Tony Cardenas</i>	Richard Alarcon ^b
	32	D	<i>Grace Napolitano</i>	Roger Hernandez
	34	D	<i>Xavier Becerra</i>	Adrienne N. Edwards ^b
	37	D	<i>Karen Bass</i>	Chris Blake Wiggins ^b
	44	D	Nanette Barragan ^a	Isadore Hall
	46	D	Lou Correa	Bao Nguyen

^a Of the 22 winners in same-party Congressional general elections, only these 4 candidates were second in their primary.

^b In these 8 same-party races there was an incumbent in the race, the money raised by the incumbent or spent on his behalf was more than 9 times that of his opponent, and the incumbent won. The remaining 14 races are defined as the real fights.

^c Both Sherman and Berman were indeed both members of Congress during this race.

number of ballots actually cast. That is certainly not quite true, though the fraction of all ballots cast in the general election of 2016 that include a vote for U.S. President was high (as we shall see, 97%). One consequence is that it is possible for the calculated ratio of voters who cast a ballot on an issue, to the number who cast a ballot for the office of U.S. President, to exceed 100% when that ratio is expressed as a percent; all that would need to happen is for more voters to file ballots with the decision for U.S. President skipped, than the decision for or against the issue (this curiosity actually happens; see for example Figure 4.)

One can ask if that 97% figure holds across Republican and Democratic voters uniformly. The number of ballots actually cast in California are not tabulated by Assembly district, but they are by county. Figure 2 plots for each county the fraction of the general election ballots cast in 2016 that include a vote for the office of U.S. President; fitting a line (by weighted least squares) shows that the fraction is indeed 97% and is essentially uniform across Democratic and Republican voters.

The method and its limits being established, we apply it to the Harris-Sanchez general election. See Figure 3. Here the fraction of ballots cast for U.S. President that are also cast for the Senate contest, and the percentage of the vote captured by Harris, both decline as the advantage that the Republican party has over the Democratic party in voter registration in a district increases. The fit indicates that essentially 100% of Democrats who voted for U.S. President also voted in the Democrat-on-Democrat Senate contest, with Harris getting 76% of those votes; Republicans who voted for U.S. President in contrast voted in the Senate race 68% of the time, with Harris getting but 41% of those votes. Harris' winning percentage statewide was 62%. That Republicans split 59% to 41% in favor of Sanchez decreased the margin of victory for Harris by 14%, compared to the result extrapolated to a hypothetical all-Democrat state in which no Republican voted in the race at all.

The larger vertical scatter of the points in Figure 3 about the fit lines, compared the vertical scatter in Figure 1, makes it clear that there is more going on in the Harris vs. Sanchez contest than in the Proposition 54 contest. Describing voter behavior as belonging to but two classes labeled "Republican" or "Democrat" is too simple; for example, voters might divide on ethnic rather than party lines [4]

, with districts with large concentrations of some ethnicities leaning toward Harris and those with large concentrations of other ethnicities leaning toward Sanchez; or there might be a regional or class split in support, and so on. Such considerations lie outside the scope of our model.

What is clear however is that voters who cast a ballot for U.S. President, and who were not of the party represented in the same-party Senate general election, nonetheless voted in that Senate election 68% of the time, and their participation swung the outcome by 14%,

though Republican support for Sanchez (59% to 41%) was not overwhelming.

B. Voter behavior in same-party district races

The questions arise: what percentage of the time did a voter, casting a general-election ballot for U.S. President in 2016, skip voting in a down-ticket Assembly, state Senate, or U.S. House race; and did that percentage depend on whether the down-ticket race had two candidates of different parties, or two candidates of the same party (in practice, either two Republicans or two Democrats).

Were the vote totals and the registration by party reported in each district in a convenient grid of 80 equal-population areas, a grid the Assembly districts provided in looking at the statewide Harris-Sanchez Senate race, we could apply the previous method in each separate district. They are not. We can however by another method extract the behavior of what a Democratic or a Republican voter did on average in such districts.

Figure 4 plots, separately for the general elections for the Assembly, state Senate, and the U.S. House, and separately in 2012, 2014, and 2016, the ratio of the number of votes cast in the district race, to the number of votes cast in that district for the office at the top of the ticket (either for U.S. President or for Governor). The districts are grouped, in dark or light colors, according to whether the ballot had two candidates of different parties, or two candidates of the same party. Figure 4 shows that those groups had different averages. About 95% of the voters who voted for the top of the ticket also voted in a down-ticket race in which the two candidates of different parties; and about 88% in down-ticket races in which the two candidates were of the same party. The same averages hold whether the down-ticket race was for the state Assembly, state Senate, or for the U.S. House. The difference of about 7%, which holds over all three election cycles, is consistent with the figure of 8% obtained for the 2012 cycle in a study in 2014 by McGhee [5] who used a different method.

Is there a difference between the top-two system and the partisan primary system in the rate at which those voters who cast a vote for the top of the ticket in a general election, vote in district races, when those districts offer a choice between candidates of different parties?

We examine this question by looking at the races for the state Assembly. Ignore the handful of districts in which under either system only one candidate was on the general election ballot, and examine the rest, which we will call the poly-candidate districts.

Under the top-two, a poly-candidate district can have a general election between just two candidates, and therefore can offer a choice between candidates belonging to at most two political parties; and sometimes will offer a choice between candidates belonging to the same party. Under the system of partisan primaries, a district can have a poly-candidate general election between candi-

dates belonging to more than two political parties, and will never have fewer than two different parties represented [6]. Figure 5 shows that, despite these differences, voters who cast a ballot for the top of the ticket voted in poly-candidate district races with the same 95% frequency in each of the three top-two general elections in 2012 through 2016, as voters did in each of the five partisan-primary regular elections in 2002 through 2010.

Under the top-two, does a voter skip a same-party district race more often if the two candidates are not of the same party as the voter, than if they are? In contrast to the result for the statewide, D vs. D, Harris-Sanchez race, which Republicans skipped 32% of the time, but Democrats essentially 0% of the time, we find the answer to be a qualified no.

Suppose the answer had been yes. Then voter participation overall in a D vs. D contest in a Democrat-dominated district that had a large minority of Republican voter registration, would be lower than the participation overall in a district in which the minority of Republican registration was small; similarly the voter participation overall in an R vs. R contest in a Republican-dominated district that had a large minority of Democratic voter registration, would be lower than the participation overall in a district in which the minority of Democratic registration was small. There would therefore be a dip in the participation overall in same-party, general-election district races where the registrations of the parties were comparable, compared to such races in which one party's registration greatly dominated the other.

Figure 6 combines the points plotted in Figure 4, for the district races with same-party general elections for the Assembly, state Senate, and U.S. House, into a single plot of all districts in a given election year. No dip in participation is obvious in any year. Shown is a least-squares fit to the data for each year of a model in which a Republican voter facing a Democrat vs. Democrat general election, or a Democratic voter facing a Republican vs. Republican general election, each vote one fraction of the time; and a Republican or a Democrat, facing a Republican vs. Democrat general election, each vote another fraction of the time. The fits when extrapolated into hypothetical all-Republican or all-Democrat districts give the results tabulated in Table IV.

Over the three elections, the largest difference between the fraction of the time a voter cast a ballot in a district race between candidates of his party, and in a district race between candidates of another party, occurred in 2014; and was but 14.3%. That is less than half (0.44) of the difference recorded in the Harris-Sanchez statewide race in 2016, which was 32%. We note that large difference in a statewide race was recorded in the same 2016 election as where the difference in the district races was very small, just 2%.

We repeat, even in the same election in which Republicans skipped voting in a statewide, D vs. D general election 32% of the time, while Democrats skipped voting in it essentially 0% of the time (a difference of 32%),

Republicans skipped voting in district D vs. D general elections 13% of the time, while Democrats skipped voting in these 11% of the time (a difference of only 2%). Evidently voter participation in a same-party statewide race is an unreliable guide to voter participation in the same-party district races, even in the same election.

In 2012 the top-of-the-ticket race on the general election ballot was the presidential contest Romney vs. Obama; in 2014, it was the gubernatorial contest of Kashkari vs. Brown; in 2016, it was the presidential contest of Trump vs. Clinton. All of these were R vs. D contests, so we cannot address the question of whether the voters of a party excluded from the top-of-the-ticket race would vote less often in district races. We can say, however, that the D vs. D, Harris vs. Sanchez contest for U.S. Senate in 2014 did not induce those Republican voters who chose to vote in the general election for the gubernatorial race to skip voting in same-party district races.

A candidate seeking to win a top-two general election in a district race against a candidate of his own party can therefore count on voters belonging to the other party who cast any ballot at all also to cast one in the candidate's race more than 80% of the time, and not, as might have been supposed from the results of the Harris-Sanchez race, less than 70% of the time; and possibly, judging from the results of 2016, as much as 87% of the time; and possibly also as often as do voters of the candidates own party.

We conclude that under the top-two, in a same-party, general election in a district where the race within the dominant party is fairly close, the voters not belonging to that party do in fact vote in the district race sufficiently often that their opinion can be decisive.

III. MONEY SPENT IN COMPETITIVE SAME-PARTY GENERAL ELECTIONS

The elections in California in 2012, 2014, and 2016 provide, for the Assembly, state Senate, and for the U.S. House combined, a total of 459 races, some of which ended in general election contests between two candidates

TABLE IV. From Figure 3 and Figure 6, the results of the fit to the data giving the fraction of the time a model Republican or Democratic voter, who cast a ballot either for U.S. President or for Governor, also voted in a same-party, general election in a district, depending on whether the voter belonged to the same party as the candidates in the general election, or to the other party.

Year	Race	Same Party	Other Party	Same—other
2012	all districts	88.5%	79.7%	8.8%
2014	all districts	95.3%	81.0%	14.3%
2016	all districts	88.7%	86.7%	2.0%
2016	U.S. Senate	100. %	68. %	32. %

of the same party. One quantifiable measure that there were significant differences between the two candidates in these races, and that each candidate had a colorable shot at winning, is the amount of money employed in each race [7]. Were there are no differences of significance, we would suppose there would be nothing to fight over, and predict little money would be employed; and even where there were significant differences, if one candidate had little chance of winning, again, we would predict little money would be employed. Conversely, if a lot of money was employed, one would surmise that there were differences *someone* thought were worth fighting over and where that someone thought the chance of winning was worth the investment.

A lot of money was indeed employed. Shown in Figures 7, 8, and 9 are scatter plots, for each of the same-party contests in the Assembly, state Senate, and U.S. House, of the money employed, defined as the amount of money raised by the candidates in the general election, plus that spent in that race by political parties or by Independent Expenditure Committees (a category that includes Political Action Committees, or PACs). The horizontal axis in each figure measures the difference between the Republican percentage of registered voters in the district and the Democratic percentage.

The total amount of money spent in these same-party races is summarized in the top half of Table V. The sum over all these races is \$228.9 million.

It may be argued that not all that money really represents money directed to genuinely competitive races. Even under the era of partisan primaries it was not uncommon for an incumbent to raise substantial sums even when facing only token opposition in a general election from a candidate of another party, these sums being directed not to winning the incumbent's general election but to assisting other candidates to win theirs; or to building a war chest to scare off potential challengers or to support the incumbent in a future bid for higher office; or just to defray office and staff expenses. Such sums continue to be raised for the same purposes in the era of the top-two primary, when the token opposition is from a candidate of the incumbent's own party.

We define the races with such token same-party opposition as those in which an incumbent ran, the incumbent had raised or had spent on his behalf more than nine times what his opponent had on his behalf, and that the incumbent won. Those races are identified in Figures 7 and 8 and 9. We can then sum only the money directed towards all the other same-party races: the races we shall call the real fights.

The revised total amount of money spent is summarized in the bottom half of Table V, and is smaller than the initial estimate by 11%. The revised sum, over only the real fights, is \$204.7 million.

There were in the elections of 2012, 2014, and 2016 a total of 34 same-party real fights for the Assembly (Table I), 10 for the state Senate (Table II), and 14 for the U.S. House (Table III), a combined total of 58. The av-

TABLE V. Money spent in all California Assembly, state Senate, and U.S. House races with same-party general elections, defined as the sum of the money raised by the candidates, and spent by political parties and Independent Expenditure Committees. Money in millions of dollars. Real fights form a subset of these races, defined as those in which there was an incumbent in the race; the money raised by the incumbent or spent on his behalf was more than 9 times that of his opponent; and the incumbent won. Values are summed and then rounded before being set in the table, so totals given may not exactly match the sum of the rounded values presented in the table.

D vs. D same-party total cash					R vs. R same-party total cash				
Year	Assembly	Senate	U.S House	Total	Year	Assembly	Senate	U.S House	Total
2012	21.3	3.8	26.7	51.8	2012	8.4	0.0	6.3	14.6
2014	23.9	18.9	11.5	54.3	2014	3.2	6.2	4.4	13.8
2016	49.4	23.3	18.7	91.5	2016	2.8	0.0	0.0	2.8
Totals	94.6	46.0	57.0	197.6	Totals	14.3	6.2	10.7	31.3

D vs. D same-party Real Fights, only					R vs. R same-party Real Fights, only				
Year	Assembly	Senate	U.S House	Total	Year	Assembly	Senate	U.S House	Total
2012	20.1	3.8	25.4	49.3	2012	8.4	0.0	4.3	12.6
2014	23.0	13.9	8.1	43.0	2014	1.8	6.2	4.4	12.5
2016	45.7	23.3	14.6	80.5	2016	1.8	0.0	0.0	1.8
Totals	88.7	41.0	48.1	177.8	Totals	12.0	6.2	8.7	26.9

average sum spent on each real fight was therefore \$3.53 million.

Is that average sum to be judged to represent a large or a small amount of interest in a race? We examine that question by looking at races for the U.S. House.

The sums spent on all U.S. House races nationwide, including spending by political action committees, over the same election years have been tabulated by the Center for Responsive Politics [8]; their methodology [9] is compatible with what we have used to compute the money spent on the U.S. House races in California. The sums spent on the U.S. House races in 2012, 2014, and 2016 are listed in Table VI. From these we compute that the amount of money spent on each of the U.S. House elections (including special elections [10], a small correction) averaged over the three election cycles 2011 through 2012, and 2013 through 2014, and 2015 through 2016, was \$2.26 million.

In the 22 same-party races in California for the U.S. House over those same three election cycles, whether a race was a real fight or not, a total of \$67.7 million was spent, or an average of \$3.08 million on each. Judging from the money spent, the same-party races in California for the U.S. House attracted on average more (36% more), rather than less, interest than the average race for the U.S. House nationwide.

If one examines only the same-party real fights in California, a total of \$56.8 million was spent on 14 U.S. House races, for a higher average of \$4.06 million each. In effect, the top-two has created 14 active general elections for the U.S. House where there would not have been any, at the price of making one election that would have been competitive between the parties, albeit one where one party would be favored, into a same-party general election for the other party (Miller vs. Dutton, in 2012); a result which was corrected, if it needed to be, in the next

election cycle. In this author's opinion, a desirable trade.

The most expensive same-party race for the U.S. House in California between 2012 and 2016 was Sherman vs. Berman in CD 30 in 2012. In Table VII we reproduce [11] a listing, from most to least expensive, of the most expensive U.S House races nationwide in 2012, as measured by spending by candidates who were in the general election and outside groups who spent on their behalf. The Sherman-Berman race was not only ranked as the #4 most expensive races nationally, the #3 and #5 races were also in California, and both were races in which incumbent members of the U.S. House were defeated and a seat changed parties. The interest in the Sherman-Berman race has to be assessed as very high.

If one totals the amount of money in the same-party, real fights for the Assembly, state Senate, and U.S. House shown in Figures 7, 8, and 9, one finds that in the three election cycles in 2012, 2014, and 2016 a total of \$177.8 million was spent in D vs. D races, and \$26.9 million in R vs. R. The ratio is 6.6 to 1. This large ratio is the inevitable consequence of the Republican decline in voter registration since 2006: in the limit that the Republican party were in effect to vanish, there would be zero R vs. R general elections, and every single general election would be D vs. D, so the ratio of spending in D vs. D general elections to R vs. R general elections would become infinite. And were that to happen, the top-two would still provide a primary in which every voter could participate.

IV. IN SAME-PARTY GENERAL ELECTIONS, WAS THE EXCLUDED MAJOR PARTY INJURED?

The top-two system, in creating in some districts general elections in which only members of the same major

party compete, has denied in those districts a place on the general election ballot to the other major party. How often has a candidate of that party, and have the voters who would have supported the candidate of that party, been denied a real chance of winning a general election?

We find the answer to be: once, out of 80 same-party general elections; and the defect was repaired in the next election cycle, two years later.

In analyzing this question we must avoid a logical fallacy, one that we illustrate by first posing another question.

Suppose there were in California a U.S. House district where the voter registration for the Republican and the Democratic party were exactly equal, and four equally strong candidates ran, two Republicans and two Democrats. Under a system of partisan primaries, one Republican would face one Democrat in the general election, and the chance either party would win the district would be equal.

California has the top-two system instead. Suppose that you are a citizen of another state who believes strongly that the welfare of the country demands that the U.S. House be majority Republican and minority Democrat (or the reverse); and suppose you learn that in this California district the candidates of the party you oppose took first and second place in the primary, so that the party you prefer has been excluded from the general election.

How much has California’s use of the top-two in this district injured you?

The immediate answer often given is, a lot. The correct answer is, not at all.

The chance of your favored party winning this particular district is exactly same under the top-two as it would have been under a system of partisan primaries. Most of the time the top-two yields in this district an ordinary R vs. D general election, which each party has an equal chance to win. Part of the time in this district the top-two yields a D vs. D general election, so no Republican wins; but an equal part of the time, it yields an R vs. R, so no Democrat wins [12]. So the chances that a Republican or a Democrat would win this district remain equal. No change in chances, and so no injury.

The logical fallacy is to suppose that under the top-two the mere fact that the candidates of a party were excluded from a general election which, had one of its candidates been in it, the party would have had a significant chance to win, necessarily constitutes an injury to that party. We must account for the risk *other* party ran of being excluded, so we can find out whether the *net* chance either party would win the district changed.

To summarize the next two sections of analysis: over the 80 same-party general elections that occurred for the Assembly, state Senate, and U.S. House in California over 2012, 2014, and 2016, in the few districts where the excluded party would under the system of partisan primaries have had in the general election a real, if small, chance of winning, in all but one district it turns out that

under the top-two the excluded party was compensated in practice by the real, if also small, chance that two of its candidates would have been the ones to make the top-two in the primary, despite the excluded party’s deficit in voter registration. In these races the excluded party has, race by individual race, suffered no injury. There remains however the one district where a party suffered an actual injury, mended in the next election cycle. In the other districts that under the top-two ended with same-party general elections, the excluded major party trailed so much in voter registration that its candidate’s chance of winning a general election, even had it been conducted under a system of partisan primaries, was negligible, and the excluded party again suffered no injury.

We split the analysis into two sections, the first in which we examine elections in which Republicans may have been denied a chance to win, and the second those in which Democrats may have been denied a chance to win.

A. Possible denials of chances to Republicans

We consider first the possibility of a chance being denied to Republican candidates. As displayed in Figures 7 and 8 and 9, the Democrat vs. Democrat general election in the district where the Republican party had the *least* disadvantage in voter registration had the Democratic party leading the Republicans by 15.7% in the Assembly, and 21.7% in the state Senate, and 21.7% in the U.S. House.

We have already noted in *I*, Figure 4 that in the Assembly races during the partisan primary era from 2002 through 2010, a 5% advantage of one party over the other in voter registration translated into a 7.5% advantage in votes in the November election; and in general an $X\%$ percentage advantage in voter registration typically yielded a 1.5-times- $X\%$ advantage in votes in the November election. Figure 10 shows, in the top-two district elections in 2012 through 2016 that ended with a Republican facing a Democrat, that the ratio of general election winning percentage to percentage advantage in voter registration remained 1.5, whether the district was for the Assembly, the state Senate, or the U.S. House.

Had, therefore, any of the Democrat vs. Democrat

TABLE VI. Total money spent on U.S. House races nationwide in each election cycle, including both the regular primary and regular general elections for the 435 seats in the U.S. House, and also the special elections for those seats over the cycle.

Election Cycle	Special Elections	Regular Elections	Total Spent
2011-2012	10	435	\$1,079,542,358
2013-2014	11	435	\$ 966,578,627
2015-2016	7	435	\$ 971,524,520

general elections in 2012 through 2016 been run instead as Democrat vs. Republican, that Republican would be expected to lose that general election not by the margin of the voting registration, but by 1.5 times as much; a 20% advantage in registration would have translated to a 30% advantage in votes in the general election, and so to an election day rout, 65% to 35%.

We conclude that the chance that a Republican candidate could have won *any* of these district elections is negligible.

Looking into the details of these races reinforces that conclusion. Races with so slim a chance of general election victory tend, whether under a partisan primary system or under the top-two, to draw no candidate of the trailing party at all. Indeed, for those the D vs. D Assembly, Senate, and U.S House races where any Republican actually filed for the primary ballot and was defeated, the least Republican disadvantage in voter registration was larger yet: 23.5% for the state Senate, and 25.8% for the U.S. House. And for the Assembly, after the lone race where the disadvantage in voter registration was 15.7%, in the next Assembly race where a Republican filed in the primary and was defeated the least disadvantage in

TABLE VII. The 10 most expensive of the 435 Congressional races nationwide in 2012, ranked from most to least expensive, together with the dollars spent by the leading two candidates in the general election, spent by outside groups supporting those candidates, and with the total dollars spent in millions. The name of the winning candidate is first, and of the losing candidate, second. Names of candidates appear with their political party, R for Republican, and D for Democrat. A candidate's name is italicized if he was an incumbent member of the House when running; because of redistricting, some races feature two incumbents. The money spent in the same-party race Sherman vs. Berman in California ranks 4th in the nation in 2012 in the list of competitive House races.

District	Winner	Loser	\$OG ^a	\$C ^b	\$Total
1 FL 18	Murphy(D)	<i>West</i> (R)	22.3	6.5	29.5
- OH 08 ^c	<i>Boehner</i> (R)	...	21.2	0.0	21.2
2 OH 16	<i>Renacci</i> (R)	<i>Sutton</i> (D)	5.8	10.0	15.9
3 CA 52	Peters(D)	<i>Bilbray</i> (R)	7.1	8.5	15.6
4 CA 30	<i>Sherman</i> (D)	<i>Berman</i> (D)	11.9	3.5	15.5
5 CA 07	Bera(D)	<i>Lungren</i> (R)	6.2	8.5	14.7
6 PA 12	Rothfus(R)	<i>Critz</i> (D)	4.6	10.0	14.6
7 MN 06	<i>Bachman</i> (R)	Graves(D)	14.2	0.2	14.4
8 IL 11	Foster(D)	<i>Biggert</i> (R)	6.8	7.5	14.3
9 IL 10	Schneider(D)	<i>Dold</i> (R)	7.6	6.6	14.2

^a Money spent by outside groups, that is, money spent to win the race but not by either candidate.

^b Money spent by the two candidates.

^c John Boehner, Speaker of the House of Representatives, ran essentially unopposed in his district, getting within rounding error 100.0% of the general election vote; the large sums spent by the candidate were not spent winning his race, but to support other candidates. While the funds spent by the candidate in this district would rank it as #2 in total funds spent, we do not include this race in a list of the 9 most expensive actual races.

voter registration rose to 23.1%.

Examination of the primary election [13] for that lone Assembly race shows that three Democrats and two Republicans ran in that Democrat-leaning district; see Table VIII. Whatever slight chance the Republican party had in winning this particular district that it was denied, by having two Democrats place in the top-two, is necessarily offset to some degree by another slight chance: the Democratic vote being split between three candidates, the top-two primary might have ended with two Republican candidates, only, on the general election ballot.

Suppose the election in that Assembly district were repeated; what would one estimate as the chance of ending with two Republican candidates? The actual vote totals in the primary were 68.3% for all the Democrats, and 31.0% for all the Republicans. To have a chance of getting two Republicans in the top-two, the vote total for the two Republicans would have had to have risen to at least 40%; call p the probability that rise would have occurred had the election been repeated. The five candidates being then presumed to be on an essentially equal footing, that it would be the two Republicans out of the five candidates whose vote totals fluctuated up instead of down is a combinatorial probability [14] equal to $1/10$. The net probability of two Republicans making it into the top two would be roughly $p/10$. The probability p is hard to estimate, but is surely small; it may be that the slight chance $p/10$ is about equal to the chance, also slight, that a Republican candidate could win in a district with a disadvantage in voting registration of 15.6%. If so, there was no change in the chance a Republican would win this district and so no injury. The reader may judge.

B. Possible denial of chances to Democrats

We consider next the possibility of a chance being denied to Democratic candidates.

In the Assembly, the least disadvantage in registration the Democratic party had in a race in which a Democrat filed in the primary, but no Democrat made it into the top two, is 5.1%. As is shown in Table IX, three Democrats ran in that primary against two Republicans. This is

TABLE VIII. Candidates, their party and vote total, and their percentage of the total vote in the 2014 primary in AD 9, where the Democratic party had an advantage of 15.6% over the Republican party in voter registration. No incumbent ran in this seat. Data from [13].

Candidate	party	vote	percentage
Jim Cooper	D	18923	31.1
Darell Fong	D	17752	29.2
Diana Rodriguez-Suruiki	D	5080	8.4
Tim Gorsulowski	R	10938	18.0
Manuel Martin	R	8111	13.3

an exact complement to the Assembly race analyzed in subsection IV A, with the roles of the parties exchanged, with the difference that the minority party, which fielded two candidates to the majority party’s three, here indeed got exactly 40% of the primary vote. If the election were repeated with the same split between the parties, the five candidates being assumed to be on an equal footing, there would ensue a general election with two Democrats, only, on the ballot with a probability of 1/10. If this roughly equals the chance a candidate could win a district in which his party had disadvantage in voting registration of 5.1%, there would have been no change in the chance a Democrat would win this district, and so no injury. The reader may judge.

For the state Senate, there was but one R vs. R general election, for which the candidates and primary vote totals are displayed in Table X. Six candidates ran; if all six candidates had received an equal share of the vote, each would have received 16.7%; the Democratic share would have been twice that, or 33.4%, which is quite close to that party’s actual share of 33.8%. In a race between six candidates presumed equal, one would expect a D vs. D. general election to ensue 1 time in 15 [15]. In this race, therefore, the Democratic party was given 1 chance in 15 of winning the district in the primary, to compensate it for its forfeited chance of one of its candidates prevailing in a general election in a district where the Republicans had a 9.1% advantage in voter registration. If those chances are equal, the Democratic party has in this district suffered no injury; the reader may judge.

For the U.S. House from 2012 through 2016 there occurred four R vs. R general elections, all four of which we shall examine. There is one race, the particulars of which are shown in Table XI, where the top-two primary gave an R vs. R general election in a district where the Democrats had a substantial *advantage* in voter registration. That this is a legitimate denial of some chance to win in 2012 is confirmed by the subsequent history: Miller, the multi-term Republican incumbent who won the R vs. R contest in 2012, chose not to run for re-election in 2014; and Aguillar, the Democrat who led the primary among Democrats in 2012, ran again and won in 2014, and was re-elected in 2016.

What then was the net harm to the Democratic party

in 2012? It is too simple to assume, a seat. If the chance of Aguillar beating Miller in a general election were 50%, then the harm to the Democratic party by being denied that opportunity would be at most half a seat, on average. Let us explore an assumption much more favorable to Aguillar, that in a general election Aguillar would have beaten Miller 90% of the time. Would then the harm to the Democratic party been 0.9 of a seat? Not quite; it is necessary to account for the chance that the top-two primary would have excluded both Republicans running, a chance which is finite because while four Democrats ran, still the Democratic party had an advantage in registration in the district (of 6.2%); that chance, had it materialized, would have spared the Democratic party the assumed 10% chance that in a general election Miller would have beat Aguillar. The net harm to the Democratic party would therefore be less than 0.9 of a seat; in this case, not by much. We will be conservative and assume however the cost to the Democratic party was the full seat, on average.

The Democratic party won this seat in the next election, two years later. We may compare that interval to how, on average, might one have to wait for a system of partisan primaries to remove a weak incumbent, against his will, from a seat safe for his party. As is shown in Figure 11, absent the decennial shake-ups caused by the reapportioning of House districts among the states, and the redrawing of the House districts within each state, only somewhere between 2 and 3 House incumbents, nationwide, are removed from office each election cycle by being defeated in a primary election. At that rate, it would take 200 years to remove the weak incumbent [16].

All primary systems must produce irregular results some of the time; in choosing a primary system, one should weigh not only number and severity of such results, but also how long each such result takes to repair itself; and 2 years is a lot better than 200.

In the next race, shown in Table XII, the Democratic party had a slight (0.5%) advantage in registration over the Republican party. The Republican, Knight, who won the R vs. R general election was re-elected in 2016, so the chance the Democrats had of beating him in 2014 had the

TABLE IX. Candidates, their party and vote total, and their percentage of the total vote in the 2016 primary in AD 12, where the Republican party had an advantage of 5.1% over the Democratic party in voter registration. No incumbent ran in this seat. Data from [13].

Candidate	party	vote	percentage
Virginia Madueno	D	19764	21.4
Haringer Grewal	D	17245	18.6
Ken Vogel	R	23678	25.6
Cindy Marks	R	10397	11.2
Heath Flora	R	21484	23.2

TABLE X. Candidates, their party and vote total, and their percentage of the total vote in the 2014 primary in SD 28. The Republican party had an advantage of 9.1% over the Democratic party in voter registration. No incumbent ran in this seat. Stone was re-elected in 2016 and so the seat remained Republican. Data from [13].

Candidate	party	vote	percentage
Anna Nevenic	D	14444	15.2
Philip Drucker	D	17635	18.6
Bonnie Garcia	R	18884	19.9
Jeff Stone	R	20807	21.9
Glenn Miller	R	18435	19.4
William Karns	R	4,834	5.1

general election been R vs. D. was not great. Knight did however lose in the Democrat-wave election of 2018.

In the next race still, shown in Table XIII, the Republican advantage in registration was 8.8%. Cook, who won the R vs. R general election, was re-elected in both 2014 and 2016, so the chance of a Democrat beating him in this district in 2012 was likely small.

In the last of the four races, shown in Table XVI, the Republican advantage in registration of 16.0% made the chance of any Democrat winning the seat in 2014 essentially zero; in 2016, no Democrat even chose to run.

We conclude that from 2012 to 2016, over all the Assembly, state Senate, and U.S. House races in California, a total of 459, in just one did a same-party runoff occur where the other major party was denied what would otherwise have been the greater chance of winning the seat; and the seat duly changed parties in the next election.

Is the number of top-two same-party elections what might have been expected?

The Assembly elections of 2004 through 2008 form a sample under the partisan primary era when each Assembly district had three elections, one incumbent-free [17] as a result of the then-current term limit of 6 years in the Assembly. Similarly, the Senate elections of 2002 through 2008 form a sample when each Senate district had two elections, one incumbent-free [17] as a result of the then-current term limit of 8 years in the Senate. If in all those partisan primary elections, the votes given each candidate had not changed, but we chose candidates for the general election as if the top-two primary and not the system of partisan primaries had been in force, how many same-party general elections would have resulted?

It is straightforward to examine the vote totals for candidates in the Assembly and Senate races [18]; as an example, we consider in Table XIV the 2004 primary in Assembly District 50, which under the partisan primary rules then in force resulted in an R vs. D general election, but which under top-two rules would have ended with a D vs. D general election. The results over the whole sam-

TABLE XI. Candidates, their party and vote total, and their percentage of the total vote in the 2012 primary in CD 31. The Democratic party had an advantage of 6.2% over the Republican party in voter registration; nonetheless an R vs. R general election ensued. Aguilar, a Democrat, was defeated in this primary, but ran again and won this seat in 2014, and was re-elected in 2016. Data from [13].

Candidate	party	vote	percentage
Peter Aguilar	D	14181	22.6
Justin Kim	D	8487	13.5
Rita Ramirez-Dean	D	3546	5.7
Reana Wickman	D	4188	6.7
Bob Dutton	R	15557	24.8
Gary G. Miller ^a	R	16708	26.7

^a This candidate was an incumbent member of the U.S. House running in a newly drawn district.

ples are summarized in Table XV; we find there would have resulted 22 same-party general elections in the sample of Assembly elections, and 12 in the sample of Senate elections.

Had the top-two really had been in force before these primary elections, then the candidate, campaigns, and vote-totals would all have changed; assuming they would not have changed is but a crude way of estimating how many same-party, top-two outcomes are in some sense natural to California. Scaling these numbers in these samples to a common hypothetical 6-year interval, we get (again) 22 same-party races for the Assembly, and 9 same-party races in for the state Senate. In the actual six-year interval from 2012 to 2016, when the top-two was really in force, numbers of same-party races were respectively 45 and 13.

The actual numbers are twice as large for the Assembly, and 40% greater for the Senate, than we would have estimated. We attribute this increase in part to the decline in voter registration of the Republican party between the years of the partisan primary sample, 2002 through 2008, and the years the top-two has been in use, 2012 through 2016. In the limit that one major party's registration declined to zero, essentially all the races would end in same-party general elections between candidates of the other party, not just a fraction.

V. NUMBER OF R VS. D LEGISLATIVE ELECTIONS IN CALIFORNIA COMPARED TO OTHER STATES

One protest raised against the top-two is that it is somehow unnatural for a Republican candidate or a Democratic candidate to be absent from a general election for a seat in a state legislature. Sometimes this

TABLE XII. Candidates, their party and vote total, and their percentage of the vote in the 2014 primary in CD 25. The Democratic party had an advantage of 0.5% over the Republican party in voter registration; nonetheless, an R vs. R general election ensued. No incumbent ran in the primary. Knight, a Republican, was elected in 2014 and re-elected in 2016. Data from [13].

Candidate	party	vote	percentage
Lee Rogers	D	14315	22.2
Evan "Iva" Thomas	D	6149	9.5
Troy Castagna	R	3805	5.9
Steve Knight	R	18327	28.4
Navrau Singh	R	699	1.1
Tony Strickland	R	19090	29.6
David Koster Bruce	L ^a	1214	1.9
Michael Mussack	N ^b	933	1.4

^a Libertarian

^b No Party Preference, that is, registered with no qualified political party.

protest takes the form of an activist in either party stating that it is essential for their party to field a candidate in every such general election, and that the top-two is bad because it makes this impossible when no candidate of their party makes it into the top-two.

Figure 12 shows, however, that across the 46 states that have legislative elections in even-numbered years as California does, that a general election that featured both a Republican and a Democrat in the general election for a legislative seat, was in the elections of 2014 only somewhat more likely than not (61%). Moreover, that proportion of the legislative seats has been consistently less than 70% of the 46 states back at least as far as the study [19] has been done, to the elections of 2002.

Only 3 of those 46 states have a top-two primary, instead of a partisan primary; and the sample size is reported to be more than 5800 legislative district offices per election cycle. If an absence of an R vs. D general election is a problem, partisan primaries are not a cure.

In a partisan primary the only way to fail to get a Republican or a Democratic candidate into the general election for an office is to have no one file to represent the party in the primary. Therefore having a Republican or a Democratic candidate on the general election ballot in every race is simply something that, in almost every state, is not judged by a party to be either tactically or strategically useful—or, at least, not so useful as to justify the modest effort it would take persuade a candidate to file.

The figure further shows that California, while it had partisan primaries, maintained a much higher percentage (about 90%) of R-and-D general elections than the national average; and that under the top-two the both parties continue to appear together in about that same percentage of the primary elections for the legislature. While there was a system of partisan primaries in California, still in about 10% of the California legislative races either the Republican or the Democratic party failed to field a candidate, a figure which has hardly changed under the top-two.

TABLE XIII. Candidates, their party and vote total, and their percentage of the vote in the 2012 primary in CD8. The Republican party had an advantage of 8.8% over the Democratic party in voter registration. No incumbent ran in the primary. Cook, a Republican, was elected in 2012 and re-elected in 2014 and 2016. Data from [13].

Candidate	party	vote	percentage
Jackie Conaway	D	11674	14.3
John Pinkerton	D	7941	9.7
Phil Liberatore	R	12277	15.0
Paul Cook	R	12517	15.3
Gregg Imus	R	12754	15.6
Angela Valles	R	4924	6.0
Brad Mitzelfelt	R	8801	10.8
Ryan McEachron	R	3181	3.9

We note that the fraction of R vs. D general elections in California, even under the top-two, remains significantly higher than the national average; for example, in 2014 the fraction in California was 75%, while nationally it was 61%.

There remains to be considered the possibility that some particular system of partisan primaries, currently in force in several states, would give a larger number of R vs. D general elections in legislative races, the effect of this supposed system being lost in the average done in Figure 12 over 46 other states. Were this possibility realized, the top-two might produce fewer R vs. D general elections than that particular system. It is not, however.

Figure 13 shows for 2014 [20], and for each of all 50 states, the percentage of the state legislative races whose general election included both a Republican and a Democrat. The states are grouped by whether they had a partisan or a top-two primary system, and if a partisan system, what sort; the different sorts are those defined by the National Council of State Legislatures [21], repeated in Table XVIII. None of the partisan primary systems have, on average, any tendency to have a larger fraction of R vs. D general elections than about 60%, though the scatter above or below that average increases as the primary system becomes more open and less closed.

In Figure 12 the states are indicated in red, purple, or blue, respectively, depending on whether in 2014 the state legislature had both houses majority Republican, one house Republican and one Democrat, or both majority Democrat. There is no evidence that the primary system, whether the top-two or some variant of partisan primaries, tends to promote control of legislatures by one party rather than another. That the individuals from those parties who serve in a legislature, however, are those whom the general election voters, in their large numbers and diversity, would more often have chosen in a head-to-head, same-party matchup, instead of those whom the party-primary election voters, in their small

TABLE XIV. Candidates' vote totals in the 2004 primary election in Assembly District 50. Names of the primary winners are shown in italics. Mr. de la Torre won the Democratic primary, and Miller (R) in the general election. Had the top-two been in force, with these vote totals de la Torre would have faced Cachon in a D vs. D general election. We note that in this district, if in addition we imagine that the Republican vote had been unified behind a single candidate, that candidate (now with 5268 votes) would have beat Cachon to face Mr. de la Torre in an R vs. D general election. Data from [13].

Candidate	Party	Primary Votes
<i>de la Torre</i>	Democratic	12,053
Cachon	Democratic	4,540
Reyes	Democratic	1,913
<i>Miller</i>	Republican	3,117
Mendez	Republican	2,151

numbers and lack of diversity, would have nominated in a multicandidate party primary, is what is the strength of the top-two.

VI. SUMMARY AND CONCLUSIONS FOR PAPERS I, II, AND III

California, when it replaced partisan primaries with the top-two, greatly expanded the choices available to voters, without increasing the number of candidates running, by allowing every voter to vote for any candidate in any race; it secured the right of voters with no party preference, (as of May 21, 2018, now 25.5% of all registered voters, ahead of voters registered with the Republican party at 25.1% [22]) to cast ballots for candidates for state and federal offices; and it demolished an array of barriers that once inhibited a no-party-preference voter (or a voter registered with an unqualified political party) from voting in the party primary of his choice when in the partisan-primary elections of 2002–2010 that voter had the legal right to do so. It guaranteed that the two candidates with the best bid to represent a district, as measured by the number of votes a candidate received in the primary, came together before the large and representative, general electorate of a district, even if the two candidates were of the same party, instead of eliminating one in the primary; and it removed from the general

election ballot any candidates whom voters had weighed in the primary and found lacking, constraining their defeated supporters to support whomever was the best of the two remaining candidates, or abstain in the general election from voting in the race.

In the three elections of 2012, 2014, and 2016, this change led, among the races for the Assembly, state Senate, and the U.S. House, to 80 same-party general elections. Of these, 20, or 25%, were won by the candidate who had trailed in the primary. In the 58 of these 80 general elections where there was a real fight—meaning not those general elections where an incumbent ran, had raised or spent on his behalf more than 9 times what his opponent did, and where the incumbent won—the fraction of the general elections that were won by the candidate who had trailed in the primary is 35%. This is strong evidence that the system of partisan primaries, in districts that were safe for one or other party and where there was any kind of primary battle, the candidate of that party who would have won a head-to-head general election was being eliminated in the party’s partisan primary a third of the time. If the goal of a system of elections is to elect the candidate who would best represent the general-election electorate in that district, partisan primaries were getting that right only 65% of the time, whereas the flip of a coin between the two dominant candidates would have got that right 50% of the time.

Ten incumbents were defeated in those 80 same-party general elections in the three elections of 2012, 2014, and 2016, whereas only three incumbents were defeated in the partisan primaries for the same offices in the five elections of 2002–2010. The number of voters who cast a vote in the general election races in these 80 same-party districts was essentially double (1.9 times) the number who had cast a vote in them in the primary.

The \$228.9 million spent on these 80 same-party races indicate a high degree of human interest. If one totals what was spent on the 58 real fights, and drops the other 22 as races where incumbents are raising campaign cash against token opposition (if within their own party), then the sum falls by 11%, to \$204.7 million. The average sums spent in same-party general elections in California for the U.S. House exceed the average sums spent on U.S. House races nationwide; and the sum spent on the most

TABLE XV. Number of same-party general elections that would have ensued during the partisan primary era, had the top-two been in force and had each candidate’s vote total in the primary election not changed.

Year	Office	Ensuing same-party general elections ^a	net
2004	Assembly	1 + 2	3
2006	Assembly	11 + 0	11
2008	Assembly	8 + 0	8
TOTAL	Assembly	20 + 2	22
2002-4 ^b	state Senate	2 + 0	2
2006-8 ^c	state Senate	8 + 2	10
TOTAL	state Senate	10 + 2	12

^a We divide the ensuing same-party general elections into two classes: those that would occur even if all the vote given to candidates of the major party defeated in the primary had been given to a single one of its candidates; and those in which had that been done the defeated major party would have had a candidate in the general election. Thus for the state Senate over the elections years of 2006 and 2008 there would have been 8 of the first class, and 2 of the second, for a total of 10. We assume the votes given to each of the candidates of other partys do not change.

^b We present the results for the elections for 2002 and 2004 combined, so the figures represent one election in each state Senate district.

^c We present the results for the elections for 2006 and 2008 combined, so the figures represent one election in each state Senate district.

TABLE XVI. Candidates, their party and vote total, and their percentage of the vote in the 2014 primary in CD4. The Republican party had an advantage of 16.0% over the Democratic party in voter registration. The incumbent, McClintock, was elected, and re-elected in 2016. Data from [13].

Candidate	party	vote	percentage
Tom McClintock	R	80999	65.2
Arthur “Art” Moore	R	32855	22.8
Jeffrey D. Gerlach	N ^a	30300	21.0

^a No Party Preference, that is, registered with no qualified political party.

expensive such race in 2012 was essentially the same as what was spent on each of California’s most expensive different-party House races in 2012, both of which saw the defeat of incumbents. In the 58 real fights were the 10 incumbents defeated.

In a district safe for one party, the threshold for a challenger to knock out an incumbent of his party in the primary has been raised, while the threshold to force a same-party general election has been lowered. Incumbents must therefore answer more to the general election voter than to the primary election voters of their party for staying in office. In an Assembly district safe for one party but with no incumbent, the minimum block of voters required to win office was changed from 20,000-odd in the primary election, to the range of 60,000 to 80,000 in the general election.

The price of this new dynamism is that in one House Congressional race in one of the three election cycles, in 2012, the top-two candidates were both of one major party in a district where the other major party had an advantage in voting registration of 6.2%. The anomaly was corrected in the next election cycle. In contrast, the average time to wait for an incumbent member of the House to be upset in a primary and replaced by a challenger of his party is about 200 years.

A number of common complaints against the top-two are shown to be inconsistent with facts.

The voter turn-out statewide, in the primary or the general election, in California has not under the top-two fallen below the turnout under partisan primaries; indeed, given the passage of Senate Bill 202 and the removal from the primary ballot of all citizen initiatives and the campaign spending associated with them—in 2014, about equal to all the campaign spending that remained—the wonder is that the voter turn-out in the primary did not fall.

Voters faced with a district general election between two candidates of the same party usually don’t skip it; under the top-two, participation in such a district race by a voter who completes any part of a ballot is on average 88%, compared to 95% when the election between candidates of different parties; the latter figure being identical to the fraction under the partisan primary

TABLE XVII. From Figure 6 and Figure 3, the results of the fit to the data giving the fraction of the time a model Republican or Democratic voter, who cast a ballot for either U.S. President or for Governor, also voted in a same-party, general, district election, depending on whether the voter belonged to the same party as the candidates in the general election, or to the other party.

Year	Race	Same Party	Other Party
2012	all districts	88.5%	79.7%
2014	all districts	95.3%	81.0%
2016	all districts	88.7%	86.7%
2016	U.S. Senate	100. %	68. %

from 2002 to 2010 in districts where the general election featured candidates of both major parties.

Voters who do not belong to the party of the two candidates in a district race don’t skip it to any significant degree more than voters who do; the difference in the likelihood of voting ranged from a high of 14% in 2014 to a low of 2% in 2016. The large participation by voters who don’t belong to the party can be decisive, if the split between voters who do is at all close. In the only statewide race yet (as of 2017) run in California under the top-two, the 2016 U.S. Senate race between Democrats Harris and Sanchez, the Republican participation statewide was less, 68%; but though Republicans preferred Sanchez only 59% of the time, that was still enough to swing the state outcome by 14%, easily enough to have decided the outcome had the race split more evenly among Democratic voters.

Qualified political parties other than the Republican or the Democratic party are not suffering in California: not in voter registration; nor in their ability to remain ballot-qualified; nor in the money those parties are spending. In particular no past or present correlation is found between whether or not these parties have candidates on the general election ballot and the growth and decay of their registration.

There is no evidence from the increase or the decrease in the control of legislatures or of U.S. House delegations in top-two states by Republicans or by Democrats that the top-two is biased for or against any party; indeed there is no evidence that such control is correlated with any form of primary system in the 50 states, top-two or otherwise. In California the abrupt decrease in 2012 in control by Republicans is easily explained by the previous decline in registration of the Republican party relative to the Democratic party; the appearance of a rash of new and competitive districts drawn by the Citizens Redistricting Commission and employed for the first time in 2012; and by a previous collapse in the competence of the Republican state party organization, a collapse which became obvious once those competitive districts appeared.

The number of legislative races contested by both parties in California remains very high, 88%. Under the top-two, more such races are decided for one or other major party in the primary; even so, the number of races where the general election features both a Republican and a Democrat continues to be high compared to other states (75%, compared to 61%).

We conclude the top-two primary to be a very effective and successful reform.

ACKNOWLEDGMENTS

The author gratefully acknowledges the assistance of Mr. Luis Buhler in criticizing this long manuscript and its long [23] companions. Any omissions [24] and any errors, small [25] or large, that remain are the responsibility

of the author.

Appendix A: Fuller discussion of figures

1. Figure 1

Data are from the website of the California Secretary of State. The numbers of votes cast in 2016 for and against Proposition 54 by Assembly district are from [26]; the number of votes cast in November of 2016 by Assembly district for the office of U.S. President is from [27]. Data for the number of voters registered by State Assembly District with either the Democratic or the Republican party, and the total number of voters registered, are from the October 24, 2016 report of registration [28]. Data for the winning percentage for Proposition 54 by Assembly district are from [29]. The number of votes cast in November of 2016 in each Assembly district for the office of U.S. President is from [30].

2. Figure 2

Data are from the website of the California Secretary of State [31]. Voter registration by county is found by totaling the columns on p. 2 of *Voter Registration Statistics By County: Report of Registration as of October 24, 2016*. Votes cast for the office of U.S. President by county are found by totaling the columns of pp. 17–22 of *President [by county]*. Total vote cast by county is found from p. 3, the column “Total Voters” of *Voter Participation Statistics By County*.

Given a set of points (x, y) , each with a weight w , the line $y = mx + b$ that is the weighted least-squares fit to the points can be found by first computing the sum of the weights $W = \sum w_j$, and then the four weighted averages defined by

$$\begin{aligned} \bar{x}W &= \sum w_j x_j & \bar{y}W &= \sum w_j y_j \\ \overline{x^2}W &= \sum w_j x_j^2 & \overline{xy}W &= \sum w_j x_j y_j \end{aligned}$$

when the slope and y -intercept of the line are

$$m = \frac{\overline{xy} - \bar{x}\bar{y}}{\overline{x^2} - \bar{x}^2} \quad \text{and} \quad b = \frac{\bar{y}\overline{x^2} - \bar{x}\overline{xy}}{\overline{x^2} - \bar{x}^2}.$$

For a fit that weights all points equally, set all the values w_j equal to a common constant.

3. Figure 3

Data are from the website of the California Secretary of State. The number of votes cast in 2016 in each Assembly district for Harris or for Sanchez for U.S. Senate is from [32]. Other data are as for Figure 1.

4. Figure 4

Data are from the website of the California Secretary of State. General election results for the district races for the general elections of 2012, 2014, and 2016 are from the reports of the vote [33]. General election results for the race at the top of the ticket (for U.S. President or for Governor) are also from the reports [34] of that vote by district. Voter registration in each district for each election is from the report of the voter registration [35] dated 15 days before the general election.

5. Figure 5

The sawtooth pattern in blue indicates that the ratio of the vote for Assembly candidates in poly-candidate districts, to the vote in those districts for the office at the top of the ticket, is smaller in presidential election years than in gubernatorial election years. Presumably, because the turnout in the general election is higher in presidential rather than gubernatorial election years, as is shown in *I*, Figure 1, and because the voters who cause the difference are a bit less likely to care about, or be informed about, down-ticket races than voters who vote in every statewide election. Only one of the three top-two elections occurred at a high point of this sawtooth, while three of the five partisan elections did. Since the high point under the top-two is higher than any of the three high points under the partisan system, and both the low points under the top-two are higher than either of the low points under the partisan system, it could be argued that an increase in this ratio occurred at the same time that the top-two was instituted. We assert however a weaker conclusion: there is no evidence that the change from partisan district elections between 2002 and 2010, to top-two elections between 2012 and 2016, decreased this ratio.

The (smaller) sawtooth pattern in green indicates that a person who casts a ballot is more likely to skip voting for the office at the top of the ticket in a gubernatorial instead of a presidential election year; an exception to the sawtooth occurs however in 2016 for the Trump vs. Clinton presidential race, one surmises because both major-party candidates were to an unusual degree disliked in California, and California was not believed to be a swing state for that race and so voters could skip that race without consequence. We note that the contest for U.S. President is conducted using partisan primaries (the top-two system is used for other contests), so it is hard to attribute the break in the sawtooth in 2016 to the top-two. Regardless, over the duration of the plot the ratio has been bounded from below by 96.2% and from above by 98.5%. We note however that there has been only one gubernatorial race under the top-two system, in 2014; and that that race included a Republican and a Democrat in the top-two. The history in the plot cannot therefore be used to predict that the ratio would

be unchanged if the gubernatorial race ever proves to be between candidates of the same party.

Data are from the website of the California Secretary of State. The general election vote totals, and candidates, for the regular general elections for state Assembly in 2002 through 2016, are from the various statements of the vote [36] collectively known as *State Assembly-member by District* or *Member of the State Assembly*. The top-of-ticket, general-election vote for the elections of 2002 through 2016, are from the tabulations of the general election votes for the presidential or gubernatorial candidates by Assembly district [37], known as *Counties by Assembly Districts for Governor* or as *Counties by Assembly Districts for President*. The total number of ballots cast in California in general elections are from the summary *Historical Voter Registration and Participation in Statewide General Elections 1910–2016* [38].

6. Figure 6

The slope and intercept of the line making one arm of the “V” can be found by fitting a line to points with a negative horizontal coordinate, provided one includes the effect of points of positive horizontal coordinate by including for each point its reflection about the vertical axis; these artificial points are plotted in Figure 6 as open circles, to aid the eye in judging the reasonableness of the fit. We note this trick is technically incorrect to apply if an R vs. R race occurs in a district with a Democratic plurality; but there are so few such points, and they appear so near a voting registration advantage of zero where such points would have no effect on the slope of the “V” anyway, that the trick can be applied with negligible error.

Within this model of fitting a “V” there appears a slight tendency for voters to vote more often in a same-party, two-candidate general election when the candidates belong to the voters’ party than when they do not, though this effect was almost zero in the elections of 2016. The same tendency was more pronounced in the Harris-Sanchez race of 2016 for the U.S. Senate. A chevron “Λ” would have resulted had this tendency been reversed. Data for the plot are from the same sources as for Figure 4.

7. Figure 7

We note two curiosities: in 2014 in Assembly district 39, incumbent Democrat Raul Bocanegra outraised Democratic challenger Patty Lopez more than 9 to 1; the point is not circled because the incumbent lost. In 2016 Bocanegra ran again as a challenger against the incumbent Lopez, and again outraised her more than 9 to 1; this point is also not circled because here too the incumbent lost.

Money spent on district races is from a tabulation in a study by Forward Observer [39]. Voter registration by district for 2012, 2014, and 2016 is from the respective reports of voter registration, 15 days before the November general election, from the website of the California Secretary of State [40].

8. Figure 8

Money spent on Senate races is taken as for Figure 1; except for Mr. Choi, where the figure of \$28,976.00 for total contributions to his campaign committee [41] from 1/1/2014 to 12/31/2014 is from Cal-Access [42]. Voter registration by state Senate district for 2012, 2014, and 2016 is from the respective reports of voter registration 15 days before the November general election, from the website of the California Secretary of State [43].

9. Figure 9

Money spent on Senate races is found as for Figure 1. Voter registration by district for the U.S. House of Representatives for 2012, 2014, and 2016 is from the respective report of voter registration 15 days before the November general election, from the website of the California Secretary of State [44].

10. Figure 10

Data are from the website of the California Secretary of State. General election results for the district races for the general elections of 2012, 2014, and 2016 are from the same references [27] as for Figure 4, as are the figures for the voter registration [32] in each district.

The values of the slope m and y -intercept b for the lines fit to the data are listed in Table XIX.

11. Figure 11

Data for which incumbent members of the U.S. House ran but were defeated in either the general or the primary election are from the Wikipedia discussion of the U.S. House races in each election year [45]. Because the numbers plotted were obtained by scanning through the data on each of the 435 races in each election year and tabulating the results by hand, there may be clerical errors amounting to 1 or 2 races in some few election years; but the figures are more than reliable enough for estimating that in years without a reapportionment, between 2 and 3 incumbents per year are defeated nationwide in a primary election for the U.S. House.

TABLE XVIII. Descriptions by the National Council of State Legislatures of the various systems of primary elections in use by the 50 states.

Top-Two	The top two vote-getters advance to the general election regardless of party.
Partisan primaries:	
Closed	Voters must be registered members of the party holding the primary.
Partially closed	Voters must be registered members of the party holding the primary; however, parties may choose each election whether to allow unaffiliated voters ^a to participate.
Partially open	Voters may choose which primary to vote in, but must either do so publicly or their vote may be regarded as a form of registration with that party.
Open to unaffiliated voters.	Unaffiliated voters may choose which party primary they want to vote in, but voters affiliated with other parties may not cross over.
Open	Voters may choose which primary to vote in privately. The choice does not register the voter with the party.

^a voters registered, but with no political party.

TABLE XIX. For Figure 10, the values of m and of b in of the grey line $y = mx + b$ that is the least-squares fit to the data. The variables x and y are measured in percent.

Office	year	m	b
Assembly	2012	1.433	2.190
	2014	1.565	11.877
	2016	1.486	6.295
Senate	2012	1.384	0.817
	2014	1.565	19.004
	2016	1.730	4.381
U.S. House	2012	1.523	-0.257
	2014	1.565	9.553
	2016	1.589	3.714

12. Figure 12

Data for the number of general elections for legislative district races that engage both a Democrat and a Republican, in the 46 states that have such elections in even-numbered years, are from [19]. Data from the California Secretary of State for such elections in California are from the files of the California Secretary of State; for the Assembly and the state Senate, from the same files as for II, Figure 4; and for the primary elections for 2012 and 2014 and 2016, from [46].

According to Wikipedia [47], in 2014 elections to state legislatures were held in 46 states, with a total of 6049 seats up for election. The remaining 4 states are Mississippi, New Jersey, Virginia, and Louisiana. Therefore of the four states with top-two elections to their state legislatures (California, Washington, Nebraska, and Louisiana), three are included in the sample of 46. In California in 2014 there were 100 legislative seats up for election (all 80 in the Assembly, and 20 of the 40 in the state Senate); in Washington, 122 (all 98 of the House of Representatives Assembly, and 24 of the 49 in the state Senate), and in Nebraska, 25 (Nebraska is unicameral; of the 49 in the Senate, the 24 even-numbered seats, plus an election to a two-year term in district 3), for a total

of 247. So of the 6049 legislative seats up for election in 2014, only 247/6049, or 4.1% were in states with a top-two system for their state legislature, and the remaining 95.9% were in states with some form of partisan primary.

The study [19] however makes the statement that there were “more than 5,800 legislative seats”, which is consistent with but quotes a figure a bit lower than the Wikipedia count of 6049. We do not know the reason for the difference in the figures. If the study figure of 5,800 were accepted, then the fraction of legislative seats up for election in 2014 that were in states with a top-two system for their state legislature increments to 4.3%, and the fraction in states with some form of partisan primary decrements to 96.7%. For our purposes the difference is inconsequential; and so we have adopted the lower figure of 5800 to be cautious.

13. Figure 13

Data for the number of general elections for legislative races that engage both a Democrat and a Republican, in the 46 states that have such elections in even-numbered years, are from the reference of Figure 12. The four missing states turn out to have all seats of both the upper and the lower house of their state legislature up for election every four years, in an odd-numbered year; and so there is one such election one year off from 2014, and it is data from that year that is plotted. Those data are taken from the websites of the Secretary of State or of the Department of Elections for the respective state. For Mississippi in 2015, this is from [48]; for New Jersey in 2013, from [49]; for Virginia in 2015, from [50]; and for Louisiana in 2015, from [51].

The partisan makeup of all 50 state legislatures after the 2014 general election is taken from the National Council of State Legislatures [52]. The Nebraska legislature is non-partisan, but the parties of its members are well-known.

The classification of the five types of partisan primaries is also taken from the National Council of State Legislatures [52]. The Council's descriptions of the categories may be found verbatim in Table XVIII. Nebraska has the top-two for some offices, partisan primaries for others.

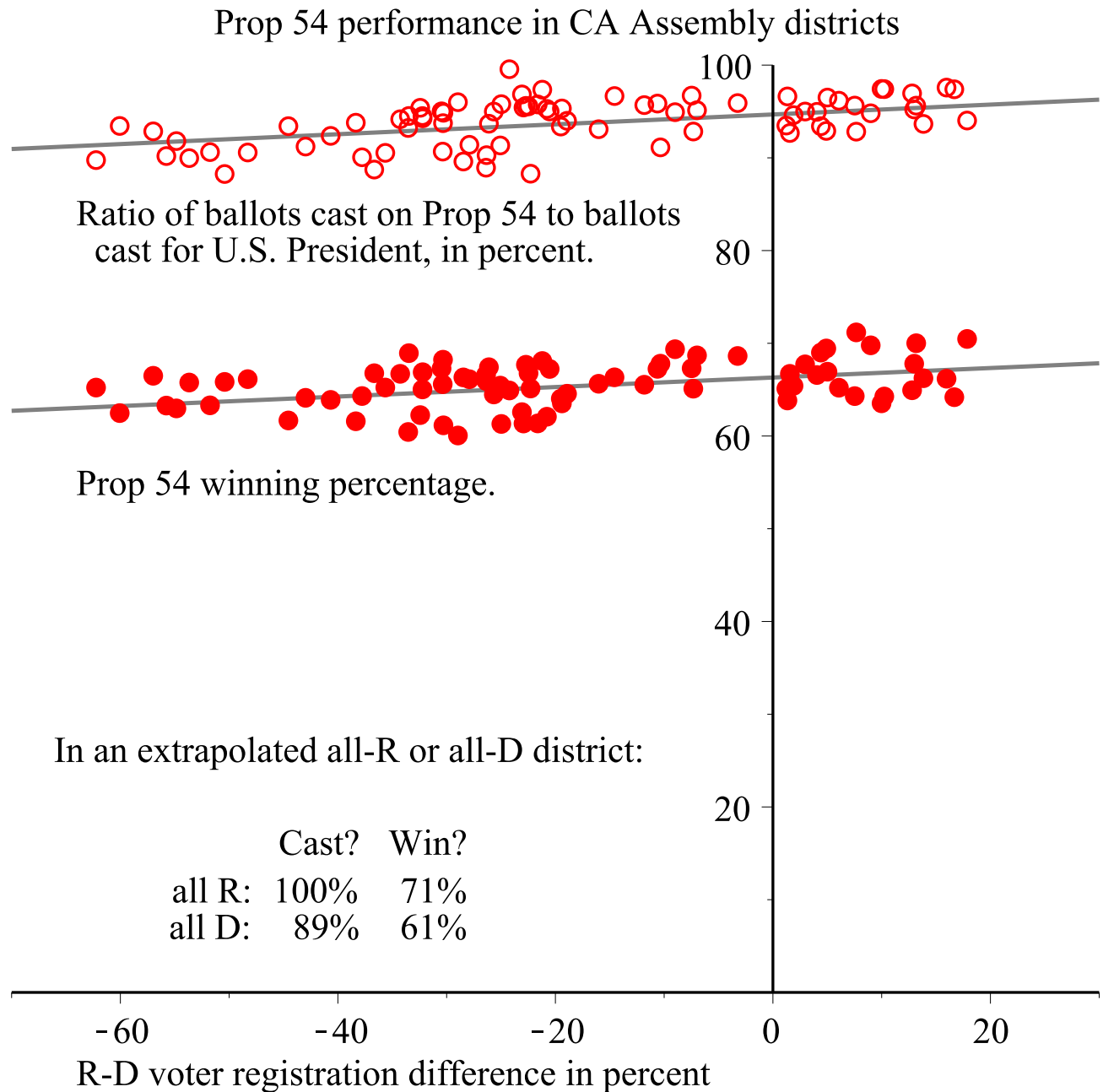


FIG. 1. Plotted along the horizontal axis, for November of 2016 and for each of California’s 80 Assembly districts, is the difference in the percentage of voters registered as Republicans and those registered as Democrats; the solid points show the percentage of the vote for Proposition 54, the *California Legislature Transparency Act*, cast in each district in favor of the proposition. The open points show the ratio, expressed as a percent, of the number of ballots cast for or against Proposition 54, to the number cast for the office of U.S. President—approximately, therefore, to the total number of ballots cast at all. The lines are least-squares fit to the data, with the districts weighted according to their voter registration. Proposition 54 won with 65.4% of the vote, statewide; the fits indicate that in an extrapolated all-Republican district it would have won with 71% of the vote, and in an extrapolated all-Democrat district with 61% of the vote. In the extrapolated districts the fraction of the voters who would have cast a ballot for or against Proposition 54 would be 100% (essentially) and 89%, respectively. For a fuller discussion of this figure see Appendix A 1.

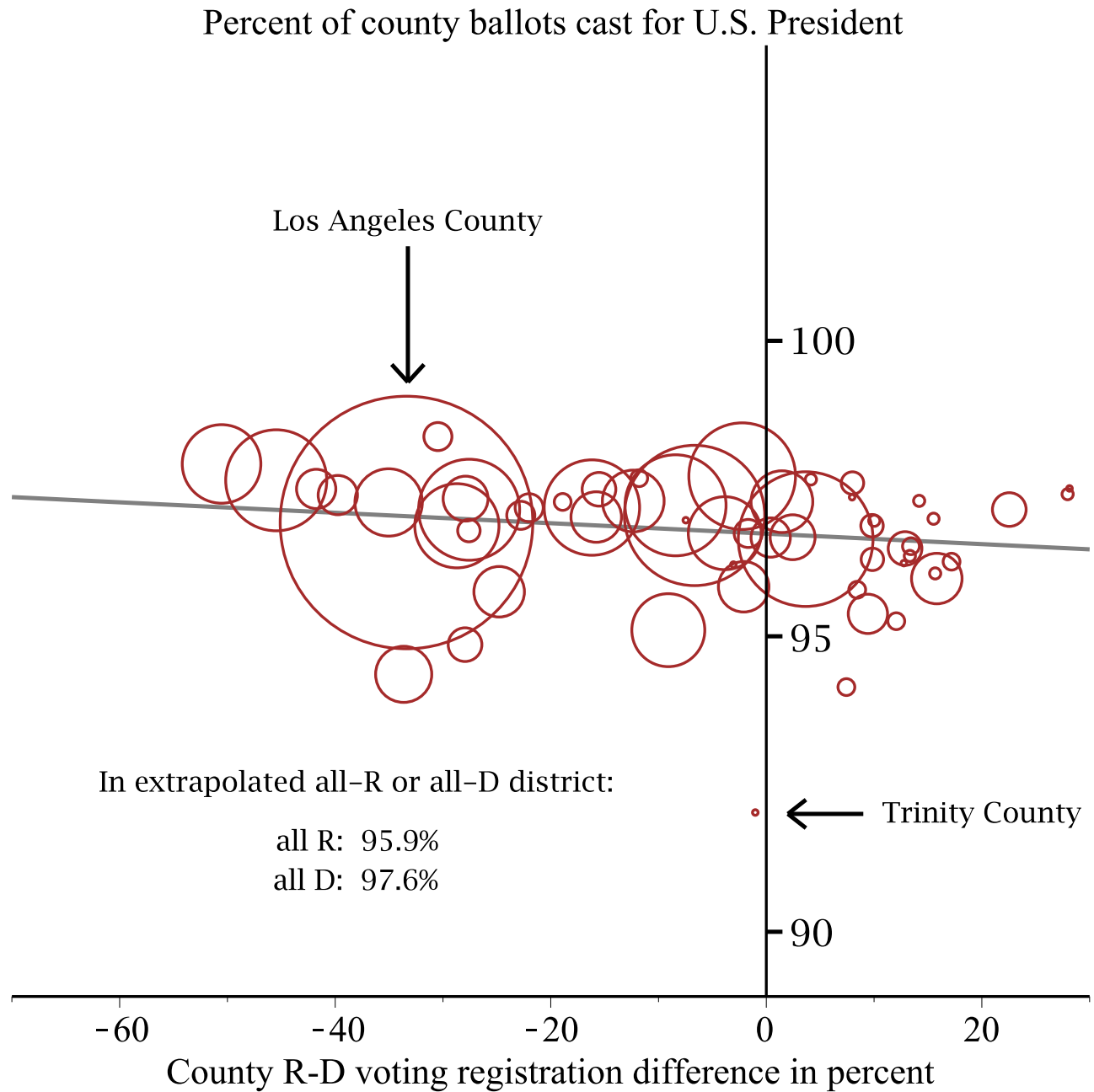


FIG. 2. Plotted along the horizontal axis for 2016, and for each of California's 58 counties, is the difference in the percentage of voters registered as Republicans and those registered as Democrats; plotted along the vertical axis is the percentage of the ballots cast in the county that included a vote for the office of U.S. President in 2016. The area of each circle is proportional to the number of voters registered in the county; the diameter ranges from that of a broad disk for populous Los Angeles County to that of a virtual dot for tiny Trinity County (Alpine County is smaller yet). The line is a least-squared fit that weights each county according to its number of registered voters. The percentage of ballots that included a vote for U.S. President is not only high (97.1%) but is essentially independent of the partisan character of the district. For a hypothetical all-Republican district, it is 95.9%, and for a hypothetical all-Democrat district, it is 97.6%, a difference of only 1.7%. For a fuller discussion of this figure see Appendix A 2.

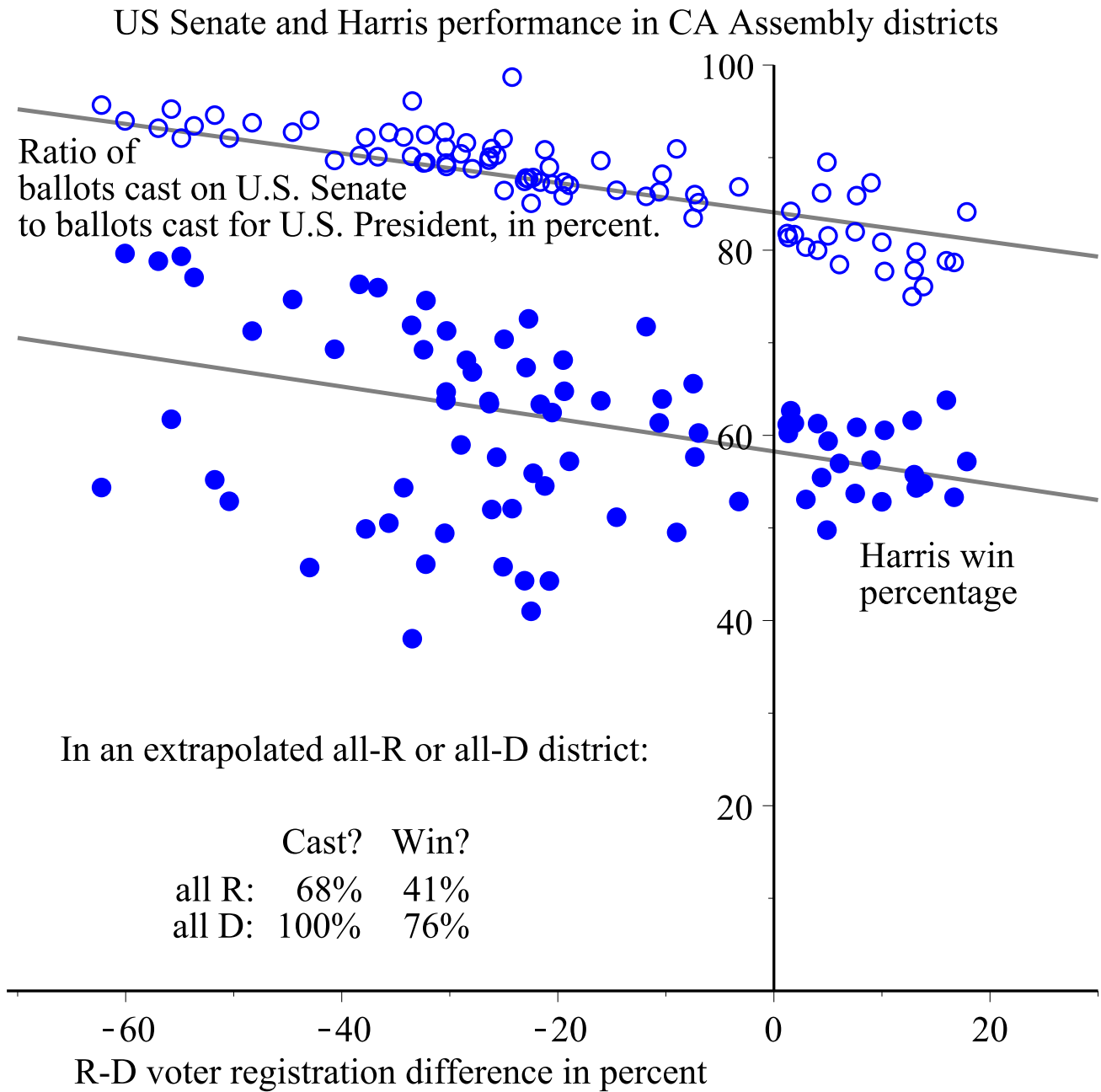


FIG. 3. As for Figure 1, but for the 2016 general election for U.S. Senate between Democrats Harris and Sanchez. Plotted along the horizontal axis, for 2016 and for each of California's 80 Assembly districts, is the difference in the percentage of voters registered as Republican and those registered as Democrats. The solid points show the percentage of the vote cast for Harris for U.S. Senate. The open points show the ratio, expressed as a percent, of the number of ballots cast for U.S. Senate, to the number cast for the office of U.S. President—approximately, therefore, to the total number of ballots cast at all. The lines are least-squares fit to the data, with the districts weighted according to their voter registration. Harris won with 61.6% of the vote, statewide; the fits indicate that in an extrapolated all-Republican district she would have lost, gaining only 41% of the vote; and in an extrapolated all-Democrat district she would have won, with 76% of the vote. In the extrapolated districts the fraction of the voters who would have cast a ballot in the race for U.S. Senate would be respectively 68% and (essentially) 100%. For a fuller discussion of this figure see Appendix A 3.

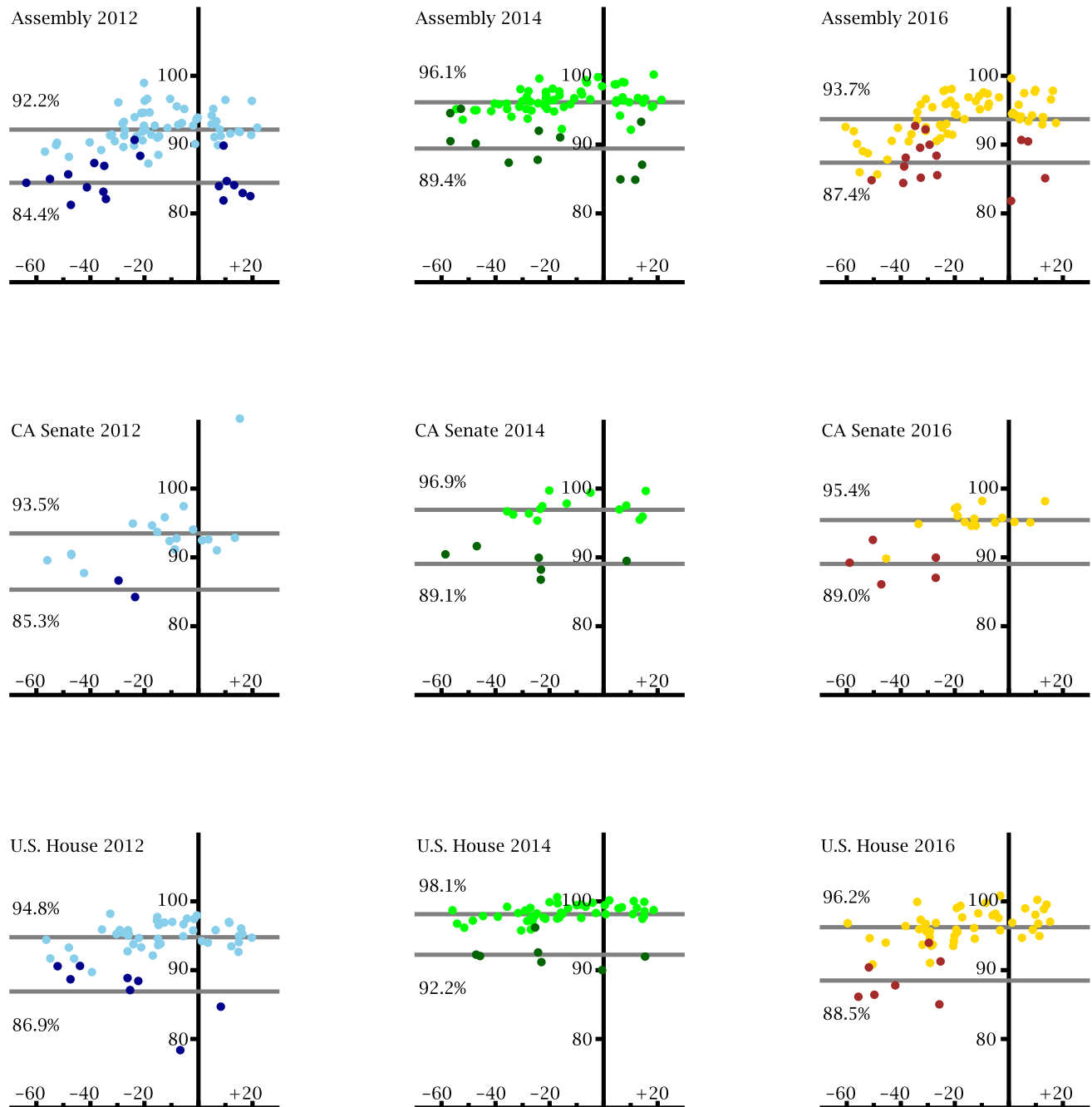


FIG. 4. For district races in the California general elections for 2012, 2014, and 2016, scatter plots of the ratio, in percent, of ballots cast in the district race to the ballots cast in the top-of-the-ticket race (for U.S. President in 2012 and 2016, and for Governor in 2014). This ratio can exceed 100%, and does reach close to 110% in one Senate race in 2012. The horizontal axis is the advantage the Republican party had in registration over the Democratic party, as a percentage of voters registered in the district. The light points are for two-candidate races where the two candidates are of different parties (e.g., Republican vs. Democrat, or Democrat vs. Libertarian); the dark points are for two-candidate races where the two candidates are of the same party (in practice, only Democrat vs. Democrat, or Republican vs. Republican). The separate averages of the light and of the dark points in each figure are each plotted as horizontal as grey lines. Only in Assembly races did a general election occur with but one candidate on the ballot; these races (there were 2 such in 2012, and 4 in 2014, and 2 in 2016) are not plotted nor fit. For a fuller discussion of this figure see Appendix 4.

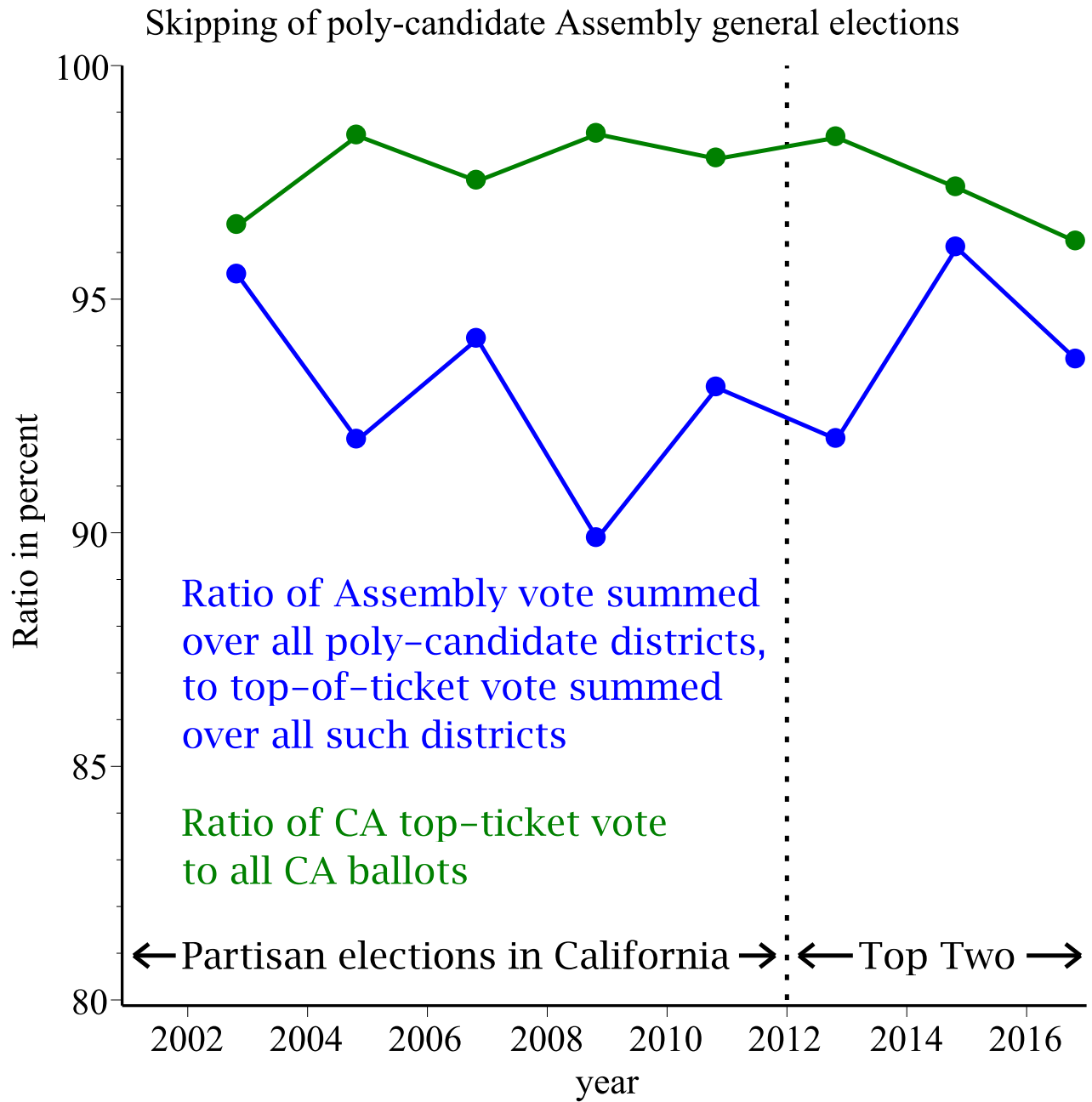


FIG. 5. Under either the system of partisan or of top-two elections in California, define a poly-candidate Assembly district as one in which there was more than one candidate on the general election ballot. Shown in blue is the ratio, for successive regular elections, of the total vote cast in California in such districts to the total vote cast in such districts for the office at the top of the ticket (either for U.S. President or for Governor). The ratio is expressed in percent (note that the vertical scale starts at 80%, not at 0%). Shown in green is the ratio of the total statewide vote for the office at the top of the ticket to the total statewide vote, also expressed in percent. For a fuller discussion of this figure see Appendix 5.

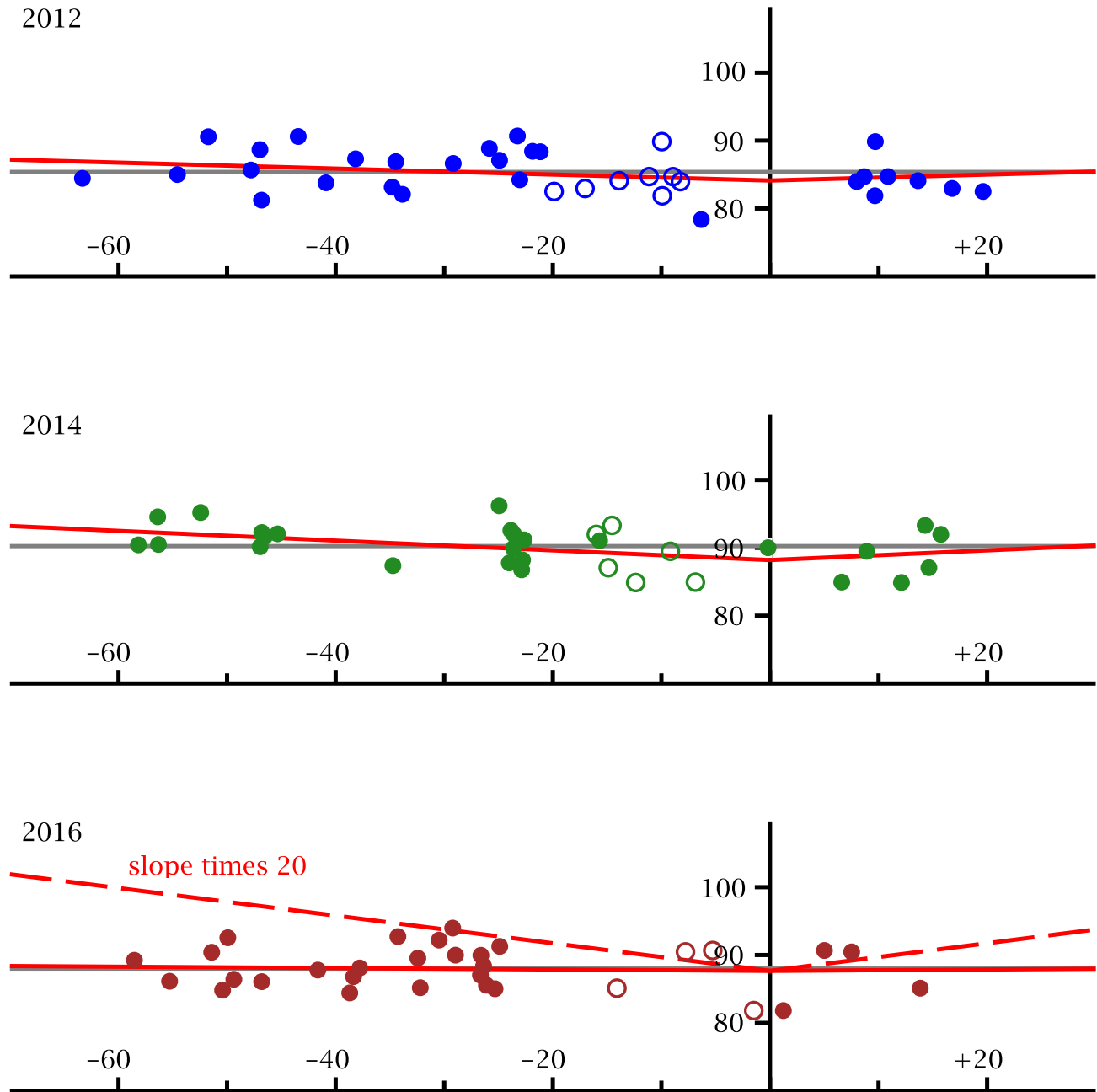


FIG. 6. Scatter plot for 2012, 2014, and 2016, and for the Assembly, state Senate, and U.S. House districts in that year combined, of the ratio of the number of ballots cast in a general election where the two candidates for the district belong to the same political party, to the number cast for the office at the top of the ticket (either for U.S. President or for Governor). The ratio is expressed in percent. The horizontal axis is the advantage the Republican party had over the Democratic party in voter registration in the district, expressed as a percentage of all registered voters. (Note that the vertical scale in each figure starts at 70%.) The solid points are the actual data; the horizontal grey lines represent the average over those points. The red solid lines are a least-squares fit to the data of the simple model that a Republican voter facing an R vs. R race, or a Democratic voter facing a D vs. D race, vote in a district race with one probability; while a Republican voter facing a D vs. D race, or a Democratic voter facing an R vs. R race, vote with another probability. This model gives rise to a characteristic “V” shape, symmetric about an advantage in voter registration equal to zero, if the first probability is lower than the second; in 2016 this “V” is so shallow that it has been repeated in red dashed lines with a slope 20 times actual to make the dip visible. For a fuller discussion of this figure see Appendix 6.

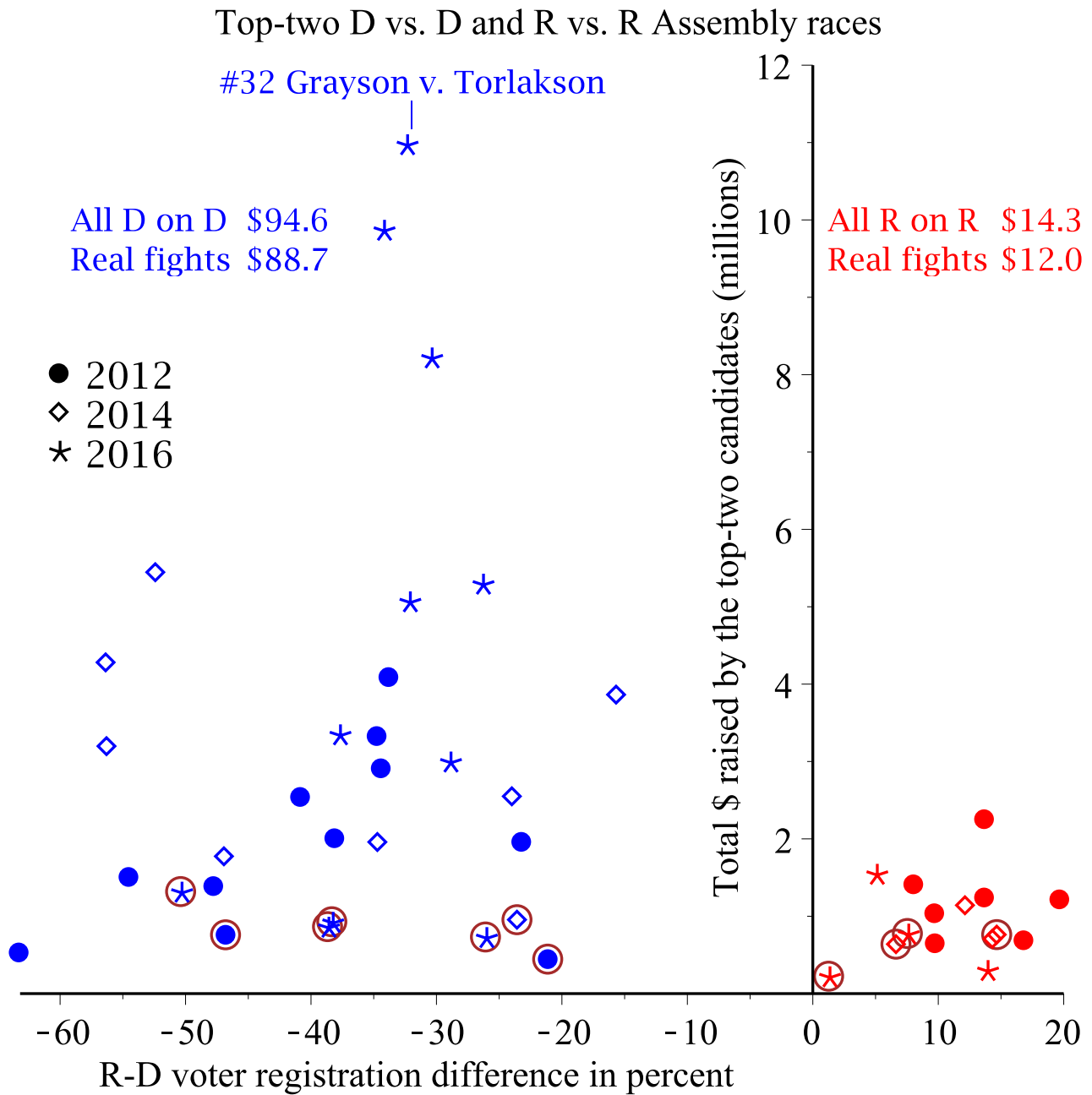


FIG. 7. Scatter plot of all the same-party general elections for California state Assembly. The horizontal axis is the advantage the Republican party had over the Democratic party in voter registration in a district, expressed as a percentage of all registered voters. The vertical axis is the total money spent in the race from all sources: the candidates; political parties; and independent expenditure committees. Races with two Democrats are shown in blue; races with two Republicans shown in red. The points are shown as solid circles, hollow diamonds, or as stars if the race occurred in 2012, 2014, or 2016, respectively. The sum of the money spent on all these races is shown. Races where an incumbent was running and the money raised or spent for the incumbent was more than 9 times that for the incumbent's opponent, and where the incumbent won, are circled in brown. The remaining races are defined as real fights, as opposed to an incumbent merely raising campaign cash; the money spent only on the real fights is also shown. There were 34 real fights. The most expensive Assembly race was Grayson (the victor) vs. Torlakson in Assembly District #32 in 2016. For a fuller discussion of this figure see Appendix A 7.

Top-two D vs. D and R vs. R Senate races

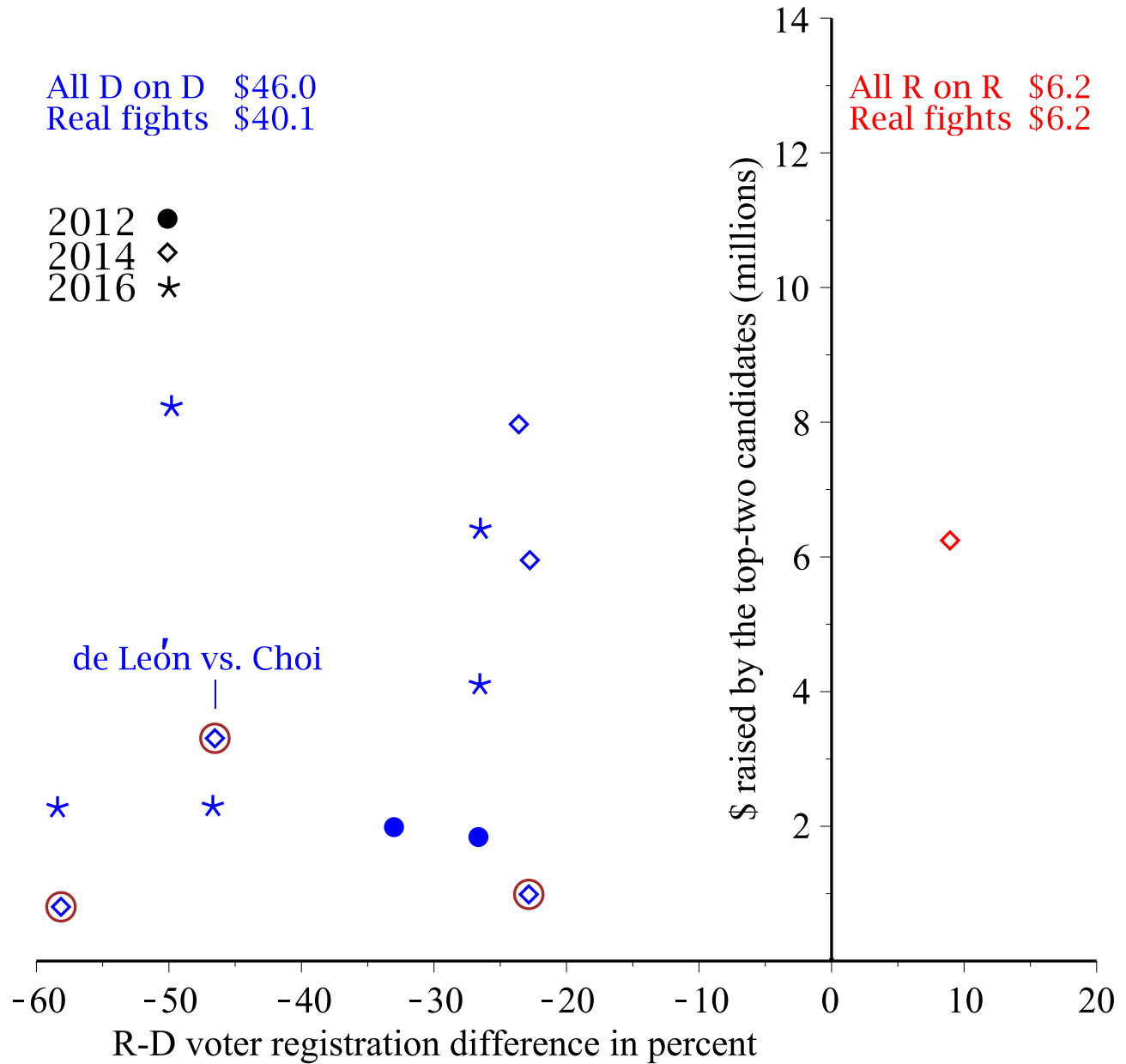


FIG. 8. As for Figure 7, but for the California state Senate. There were 10 real fights. One of the races not considered as a real fight is the race for the re-election of Senate Leader Pro Tempore de León; it is not plausible that the over 3 million raised by De León was spent on voter contact to ensure his re-election against Choi, who raised \$29,000. For a fuller discussion of this figure see Appendix A 8.

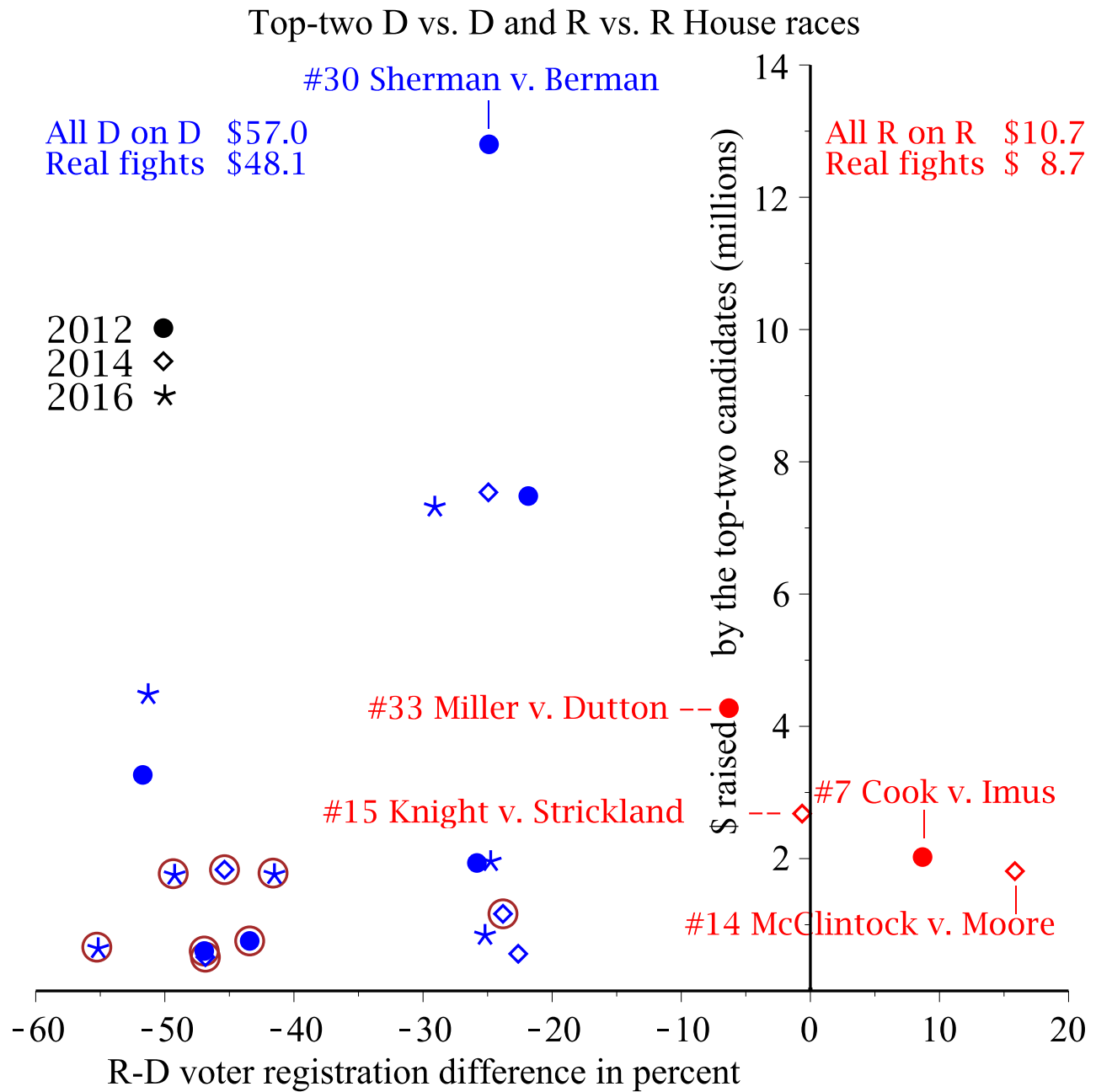


FIG. 9. As for Figures 7 and 8, but for races for the U.S. House of Representatives. There were 14 real fights. The most expensive race was that of Sherman (the victor) vs. Berman in Congressional District 30 in 2012. The contestants and the Congressional district number in all four of the R. vs. R. races are labeled. The most notable example of a general election between two candidates of a party different from the party that had an advantage in voting registration is that of Dutton vs. Miller in CD #33 in 2012. For a fuller discussion of this figure see Appendix A9.

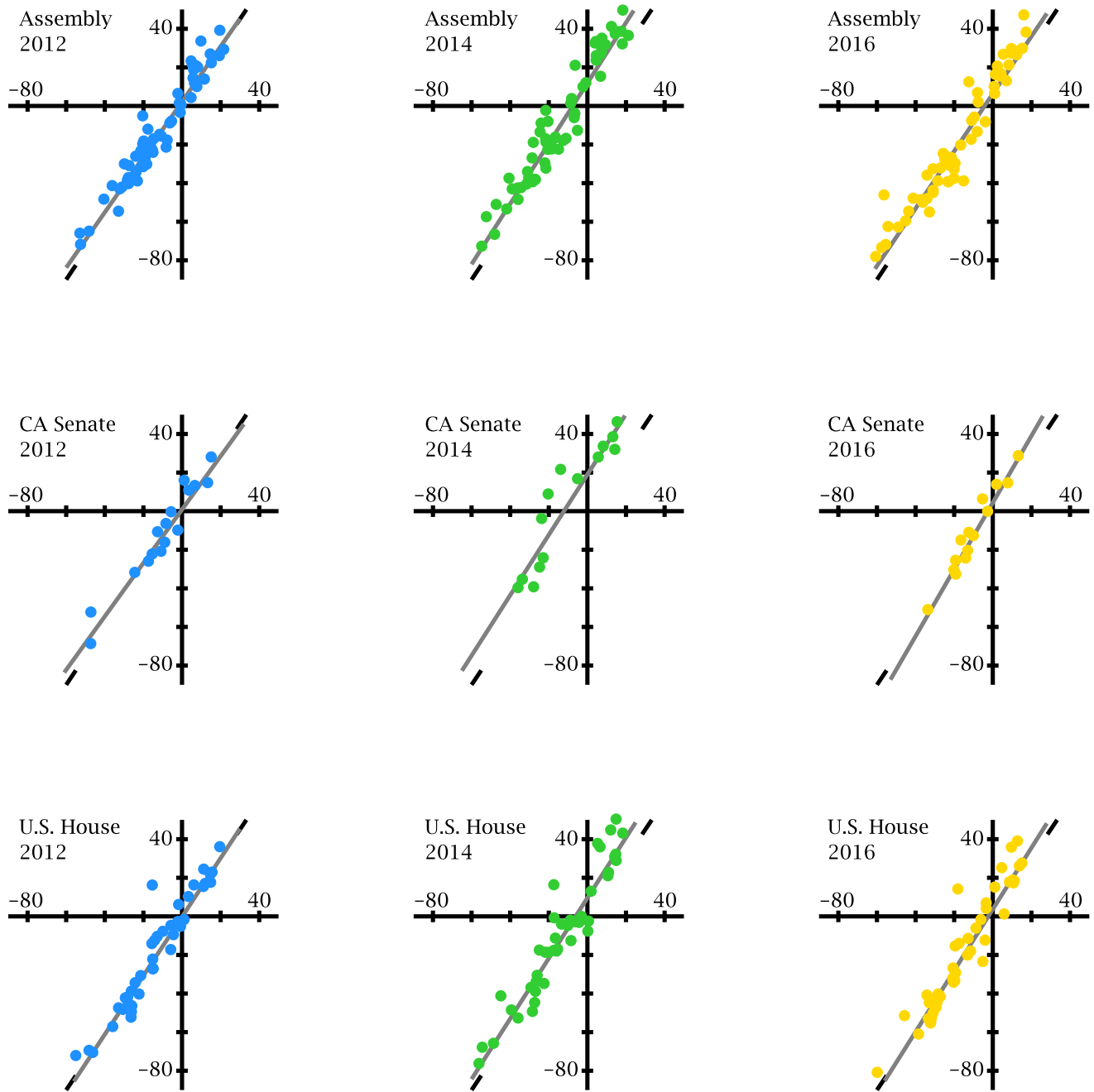


FIG. 10. The Assembly, state Senate, and U.S. House elections in California for 2012, 2014, and 2016 had constant district boundaries and were conducted using the top-two system. Consider only those elections where the candidates in the general election were a Republican and a Democrat. Plotted horizontally is the advantage, as a percentage of all the voters registered in the district, the Republican party had over the Democratic party in registration; plotted vertically is the advantage, as a percentage all the votes cast for the office in the general election, the Republican candidate had over the Democratic candidate. The grey line in each figure is a least-squares fit of a line to the points in that figure; to guide the eye, at the ends of each line are two black bars that if extended would form a line through the origin with a slope of $3/2$; all the grey lines have essentially this slope, differing in their offset from the origin. For a fuller discussion of this figure see Appendix 10.

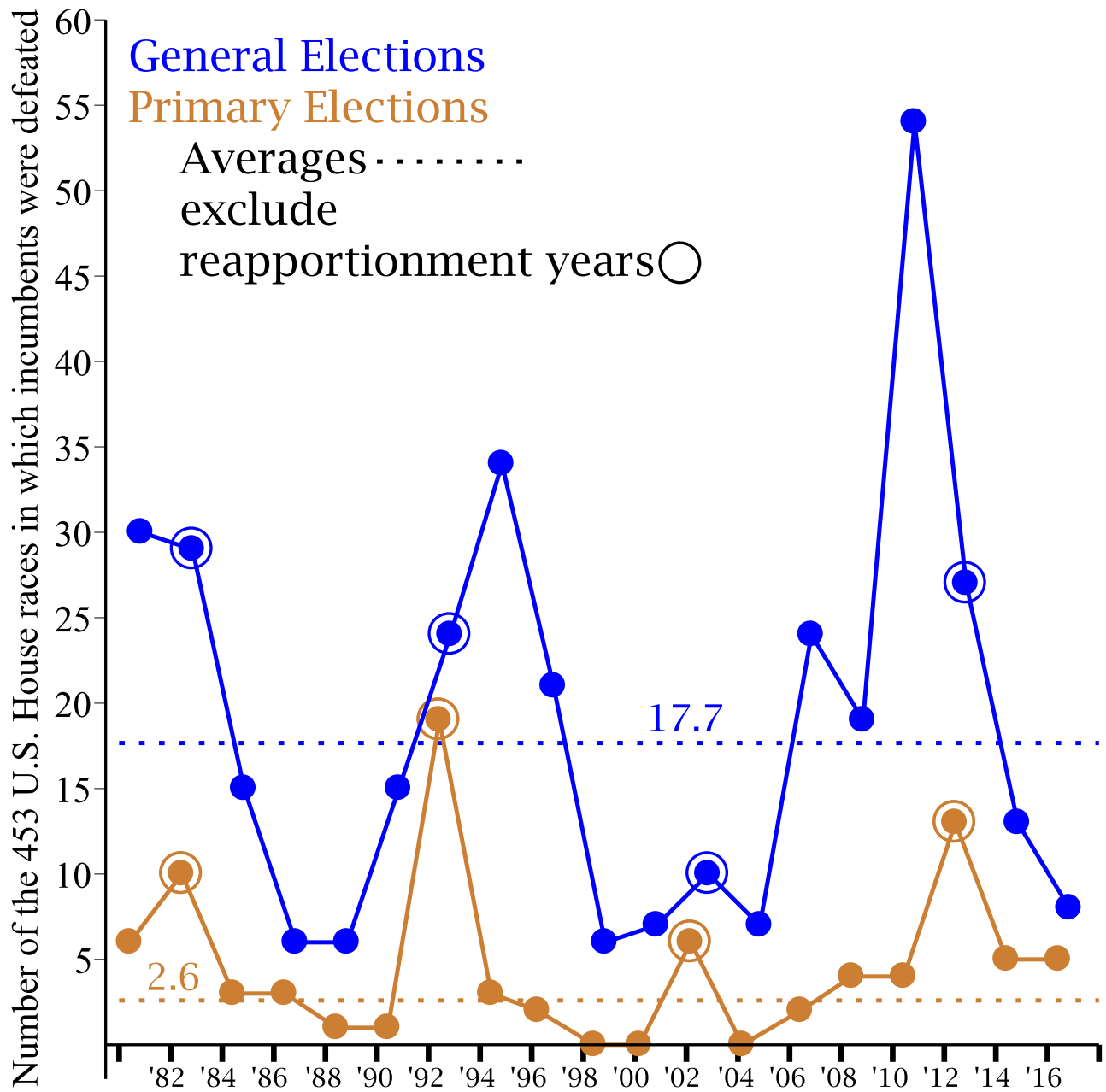


FIG. 11. Plotted in blue is the number of the 435 U.S. House races in each election year in which an incumbent was defeated in a general election; plotted in gold is the number in which an incumbent was defeated in a primary election. The circled points indicate the first election held after the decennial reapportionment of House seats among the states and the decennial redrawing of House districts within each state. Both can compel incumbents to run against one another in the same new district, or open the door to an incumbent being challenged by a member of his own party; so more incumbents lose in primaries in those years than in others. In any year that is not a reapportionment year, an average of 2.6 incumbents are defeated in primaries, and an average of 17.7 are defeated in general elections (except in CA, WA, and LA, which are top-two states, by candidates belonging to another party). For a fuller discussion of this figure see Appendix A 11.

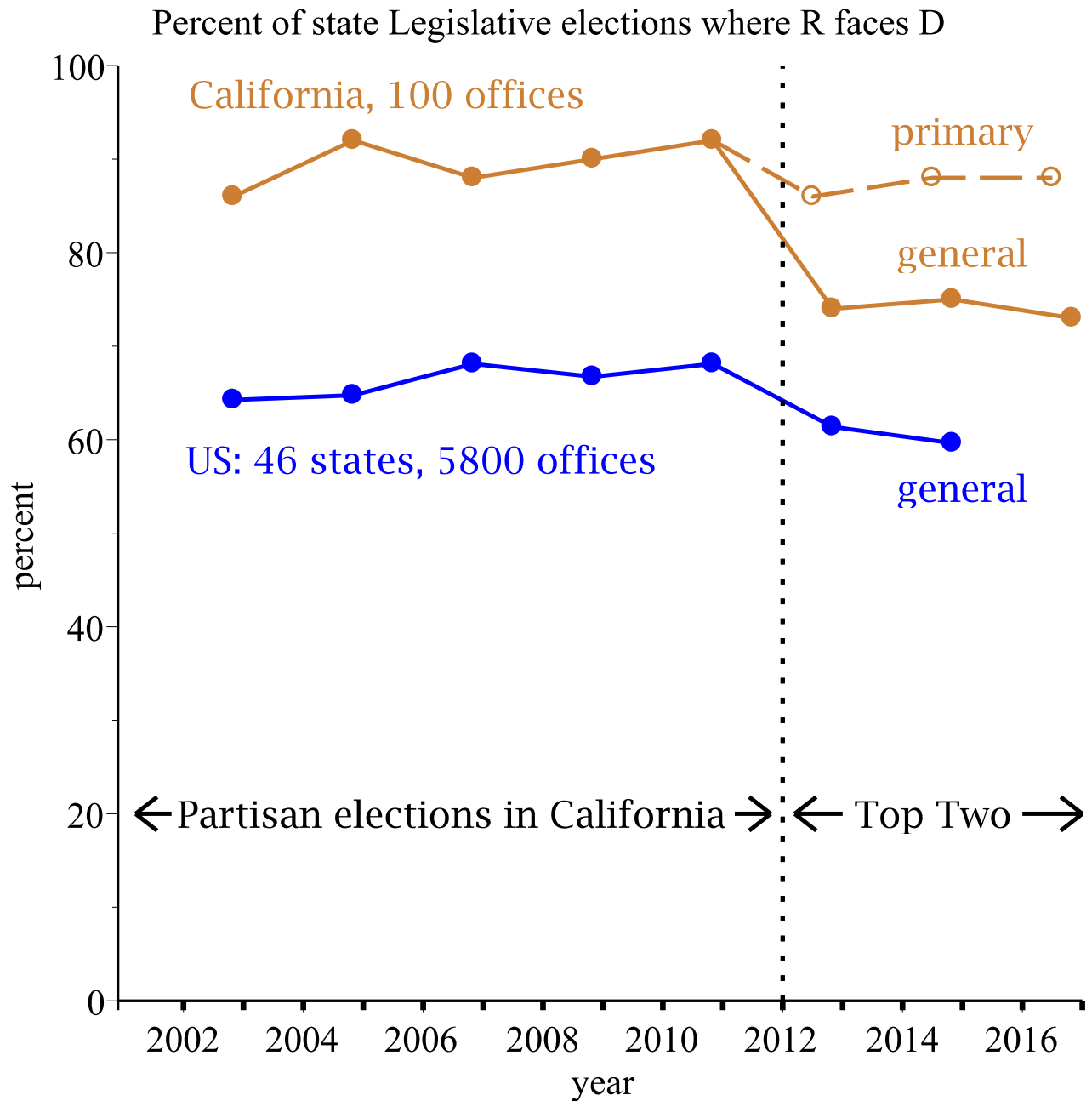


FIG. 12. Plotted in gold, solid points for each election is the percentage of the elections for legislative office (Assembly and state Senate) in California in which both a Republican and a Democrat were on the general election ballot. Plotted in blue, solid points is the same percentage for the 46 states, with a total of over 5800 legislative offices, that have their legislative races in even-numbered years as California does. Where there are partisan primaries, the number of primary elections in which both a Republican and a Democrat ran is necessarily equal (except for the possibilities of write-in candidates and candidates qualifying for the ballot as independents) to the number of general elections in which both a Republican and a Democrat ran. Where there are top-two primaries, the figures are different; plotted in open circles is the percentage in California, for the elections of 2012 and after, where both a Republican and a Democrat were on the primary ballot. Of the 46 states, all but 3 have partisan primaries. For a fuller discussion of this figure see Appendix A 12.

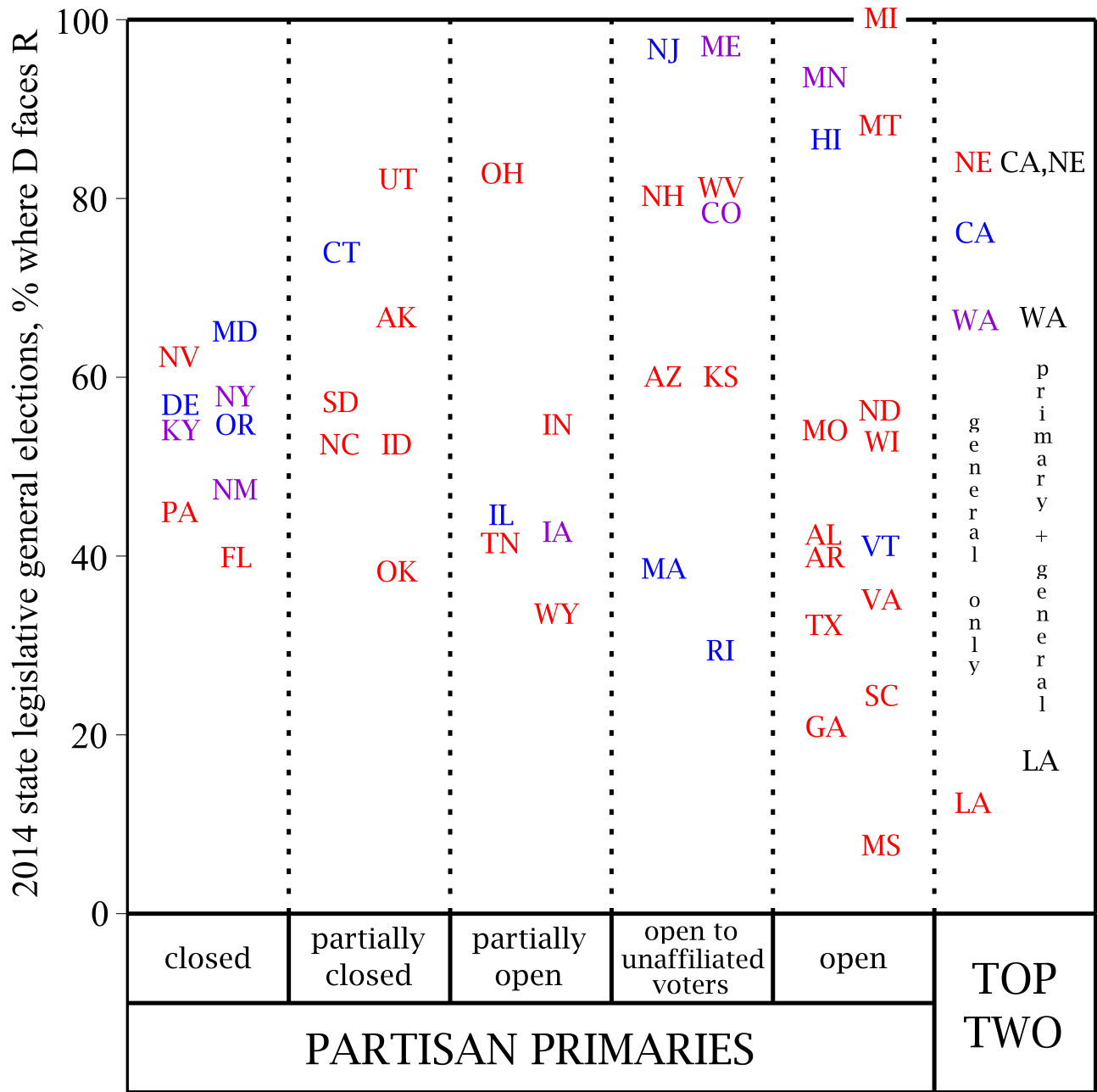


FIG. 13. Plot, for the 50 states, of the percentage (vertical axis) of the legislative races in the that ended with both a Democrat and a Republican on the general election ballot. For 46 states, for 2014; and for the four (MI, NJ, VA, and LA) that have legislative elections in odd-numbered years, a year one off from 2014. Each state is identified by its standard two-letter identification; the states are grouped by whether they have a top-two or a partisan primary, and within the category of partisan primaries, which sort they have according to the categorization of the National Council of State Legislatures [52]. Only one state, Michigan, hit 100%. A state is printed in red, blue, or purple depending on whether the 2014 elections left both the state houses majority Republican, both majority Democrat, or split between the parties. For the four top-two states the fraction of legislative races contested by both Democrats and Republicans in the primary (or that end contested by both in the general election because a write-in candidate ran in the primary) is printed in black. For a fuller discussion of this figure see Appendix A 13.

- [1] Note: all the website addresses throughout these references have been standardized to use a backslash (“\”) instead of a forward slash (“/”) as a delimiter, even if the original address appears with a mix of the slashes, i.e., <http://this/file.pdf> is written in the references, even if the original address appeared as <http://this/file.pdf> or as <http://this/file.pdf>.
- The author of this paper was the co-author, co-proponent, and chief financial backer of Proposition 54.
- [2] Data for Tables I, II, and III are from the statements of the vote for the general elections in the years 2012, 2014, and 2016 from the website of the California Secretary of State, specifically,
- For 2012, from *Statement of Vote: November 6, 2012, General Election*, available at <https://elections.cdn.sos.ca.gov/sov/2012-general/sov-complete.pdf>.
- For 2014, from *Statement of Vote: November 4, 2014, General Election*, available at <https://elections.cdn.sos.ca.gov/sov/2014-general/pdf/2014-complete-sov.pdf>.
- For 2016, from *Statement of Vote: November 8, 2016 General Election*, <https://elections.cdn.sos.ca.gov/sov/2016-general/sov/2016-complete-sov.pdf>.
- [3] From an admitted fact that there is a positive correlation between the difference in the number of Republicans and Democrats measured in many districts, and how well Proposition 54 did in those districts, does not *in general* guarantee that Republicans on average favored the proposition more than did Democrats on average. For one example, if in districts with large Republican registration it happened that all the Democrats favored the proposition heavily, and if in districts with small Republican registration it happened that all the Democrats opposed the proposition heavily, one could get the observed positive correlation even if Republicans on average opposed the proposition. Such a scenario violates the assumption *in our model* that all Democrats, in particular all Democrats independent of district, vote in favor of the proposition with a common probability.
- [4] For an analysis of Latino voters in California, whether Democrats or other, voting overwhelmingly ($\geq 90\%$) for a Latino candidate in two R vs. R Assmby general elections see *Candidate Ethnicity and Latino Voting in Co-Partisan Elections*, Sara Sadhwani and Matthew Mendez, California Journal of Politics and Policy 10(2), 2018. DOI = 10.5070/P2cjpg10241253. Direct link <https://escholarship.org/us/item/9kq704cf>.
- [5] See p. 11, footnote 11, of Eric McGhee (with research support from Daniel Krimm), *Voter Turnout in Primary elections*, Public Policy Institute of California, <http://www.ppic.org/content/pubs/report/R.514EMR.pdf>
- “These estimates are derived from a regression discontinuity analysis. Many fall contests became same-party contests by a razor-thin margin in the primary, raising the prospect that the same-party outcome was effectively random in those cases. We leveraged this fact, using the margin by which a seat became same-party (or did not) as the forcing variable which assigned a fall contest to same-party status. The result of this analysis suggested that the number of votes as a share of total registered voters was 8 percent lower in same-party contests, a statistically-significant difference. We used software from Rocio Tituniuk to implement a randomization inference approach to calculating standard errors, choosing a margin of five percentage points above or below the threshold for the sake of analyzing the results. Details of these estimations are available from the author on request. For details on the randomization inference method, see Cattaneo et al. (2013).”
- The reference in this quotation to Cattaneo et al. (2013) is to the paper Cattaneo, Matias D.; Brigham Frandsen; and Rocio Tituniuk, *Randomization Inference in the Regression Discontinuity Design: An Application to Party Advantages in the U.S. Senate.*, University of Michigan, 2013.
- [6] We ignore the slight influence of write-in candidates compared to candidates whose names actually appear on the ballot.
- [7] To examine the correlation between the money spent in a campaign and its competitiveness is of course not a new idea. For an extensive analysis of the role of money in competitive races nationwide for the U.S. House of Representatives, for example, see *The Politics of Congressional Elections, Ninth Edition*, by G.C. Jacobson and J.L. Carson, Roman & Littlefield, New York, 2016, in particular, pp. 61–76 and 79–110.
- [8] Searchable at <https://www.opensecrets.org/overview/cost.php>. The figures in the table follow from reading the “Total Spent” in the table “House: Financial activity for all House candidates” after adjusting the search to be for “All candidates” and to “Display totals”. The specific pages so accessed are:
- For 2011–2012, the page <https://www.opensecrets.org/overview/index.php?display=T&type=A&cycle=2012>.
- For 2013–2014, the page <https://www.opensecrets.org/overview/index.php?display=T&type=A&cycle=2014>.
- For 2015–2016, the page from <https://www.opensecrets.org/overview/index.php?display=T&type=A&cycle=2016>.
- [9] For the methodology see the page <https://www.opensecrets.org/overview/methodology.php>. For the elections of 2010 and following, the money spent on U.S. House races was determined by accounting for:
- “(1) The amount of money congressional and presidential candidates reported having spent on their campaigns between Jan. 1, 2011 and Dec. 31, 2012. To prevent double counting, we excluded money donated from one candidate to another as well as money transferred to party committees.
- (2) The amount of money party committees, including the DNC and RNC, spent on election activities in the same period. For these calculations, we excluded any money the party committees transferred to federal candidates or other party committees, as that money is even-

tually spent by those candidates and committees and is included elsewhere in this total.

(3) The total amount of money spent by 527 groups on federal elections.

(4) The total amount of “outside” spending we have been able to identify, including money spent on issue ads, electioneering communications, and independent expenditures. However, this includes only spending that was reported to the Federal Election Commission; spending on many issue ads is not reported.

(5) The amount spent by political action committees on “overhead” expenses, like salaries and office rentals. Much PAC money is spent on candidate contributions, but we include that money elsewhere.

(6) Spending by “host committees” and party committees on federal conventions.”

Point (6) is relevant in our view for the elections for U.S. President, but not for elections for membership of the U.S. House.

- [10] The number of special elections for the U.S. House in each two-year election cycle is taken from Wikipedia, *List of special elections to the United States House of Representatives*, https://en.wikipedia.org/wiki/List_of_special_elections_to_the_United_States_House_of_Representatives.
- [11] See the website of the Center for Responsive Politics, specifically the page *Most Expensive Races in Election Cycle 2012*, for the spending by general-election candidates and outside groups supporting those candidates, available at the site <https://www.opensecrets.org/overview/topraces.php?cycle=2012&display=currcandidatesout>.
- [12] Given a bag containing 2 red balls and 2 blue balls, if two balls are pulled at random out of the bag, the probability is $2/3$ that the balls drawn will be red and blue; $1/6$ that they will both be red; and $1/6$ that they will both be blue. Accordingly, in our example between two Republicans and two Democrats all of equal strength, the top-two would yield an ordinary D vs. R election $2/3$ of the time; an R vs. R election, $1/6$ of the time, and a D vs. D election, $1/6$ of the time.
- [13] Data for Tables 8–14, and for Table 16, are from the official election results posted on the website of the California Secretary of State for the appropriate election and year. Specifically,
 For Table VIII, the 2014 primary in Assembly District 9, see <https://elections.cdn.sos.ca.gov/sov/2014-primary/pdf/84-state-assemblymember.pdf>.
 For Table VIII, the 2016 primary in Assembly District 12, see <https://elections.cdn.sos.ca.gov/sov/2016-primary/pdf/110-state-assembly-formatted.pdf>.
 For Table X, the 2014 primary in Senate District 28, see <https://elections.cdn.sos.ca.gov/sov/2014-primary/pdf/78-state-senator.pdf>.
 For Table XI, the 2012 primary in Congressional District 31, see <https://elections.cdn.sos.ca.gov/sov/2012-primary/pdf/82-us-reps-formatted.pdf>.
 For Table XII, the 2014 primary in Congressional District 25, see <https://elections.cdn.sos.ca.gov/sov/2014-primary/pdf/63-congress.pdf>.
- For Table XIII, the 2012 primary in Congressional District 8, <https://elections.cdn.sos.ca.gov/sov/2012-primary/pdf/82-us-reps-formatted.pdf>.
- For Table XIV, the 2004 primary in Assembly District 50, see <https://elections.cdn.sos.ca.gov/sov/2004-primary/assembly.pdf>.
- For Table XVI, the 2014 primary in Congressional District 4, see <https://elections.cdn.sos.ca.gov/sov/2014-primary/pdf/63-congress.pdf>.
- [14] Given a bag containing 2 red balls and 3 blue balls, if two balls are pulled at random out of the bag, the probability they will both be red is $1/10$.
- [15] Given a bag containing 4 red balls and 2 blue balls, if two balls are pulled at random out of the bag, the probability they will both be blue is $1/15$.
- [16] Of the 435 House seats, 366 (all but those in California, Washington, and Louisiana) are filled using the system of partisan primaries. Suppose of those 366 we supposed in any election cycle some 300 or so could be judged to be (absolutely) safe for one or other major party; and suppose 3 incumbents per election lose to a non-incumbent challenger of their party in their party’s partisan primary. Then 1% of incumbents in such safe seats are removed each election; on average, it will then take 100 elections in a state with a partisan primary to remove any one such incumbent. With one House election every two years, that will take, on average, 200 years.
- [17] An Assembly district can fail to have an incumbent-free general election at least every 6 years, or a state Senate district at least every 8 years, if a vacancy occurs that is filled by a special election, the winner to become the new incumbent for the next general election and with a new multi-year span before that new incumbent is termed out. We will not account for this possibility.
- [18] Data for primary candidates, their party, and vote totals are from the website of the California Secretary of State. For the state Assembly, see the relevant files listed by election year in *II*, footnote [38]. For the state Senate, see:
 For 2002, <https://elections.cdn.sos.ca.gov/sov/2002-primary/state-senate.pdf>.
 For 2004, <https://elections.cdn.sos.ca.gov/sov/2004-primary/senate.pdf>.
 For 2006, https://elections.cdn.sos.ca.gov/sov/2006-primary/sov_detail_primary_senate.pdf.
 For 2008, <https://elections.cdn.sos.ca.gov/sov/2008-statewide-direct-primary/stsen08primary.pdf>.
- [19] The Thomas Jefferson Program in Public Policy at the College of William and Mary, *A Report on Partisan Competition in State Legislative Elections, 2014: Two-Party Contests Hit Lowest Point in Past 7 Cycles*, John J. McGlennon, Jacob Derr, and Jakob Deel, https://www.wm.edu/as/publicpolicy/documents/state_leg_report.pdf.
- [20] At the time of writing (2018), the analysis for 2016, as part of a continuing study [[18]] covering elections back to 2002, is not yet available.
- [21] National Council of State Legislatures, *State Primary Election Systems*, http://www.ncsl.org/documents/Elections/Primary_Types_Table_2016.pdf.
- [22] See the *Report of Registration as of May 21, 2018: Registration by County*, available at the website of the Cal-

ifornia Secretary of State at <http://elections.cdn.sos.ca.gov/ror/15day-stwddirprim-2018/county.pdf> There were 4,852,817 voters of no party preference, and 4,769,299 registered Republicans, out of a total of 19,023,417 voters registered statewide.

- [23] “One of his [the mathematician John E. Littlewood’s] most intricate papers, concerning Van der Pol’s equation and its generalizations, was written when he was over seventy: 110 pages of hard analysis, based on his joint work with Mary Cartwright. He called the paper ‘The Monster’ and he himself said of it, ‘It is very heavy going and I should never have read it had I not written it myself.’”

Béla Bollabás, *Foreword to Littlewood’s miscellany*, pp. 15–16 of *Littlewood’s miscellany*, edited by Béla Bollabás, Cambridge University Press, Cambridge, 1997.

- [24] “A large work is difficult because it is large, even though all its parts might finely be performed with falcity ; where there are many things to be done, each must be allowed its share of time and labour, in proportion only which it bears to the whole ; nor can it be expected, that the stones which form the dome of a temple, should be squared and polished like the diamond of a ring.”

Samuel Johnson, p. 9 of the *Preface to A Dictionary of the English Language*, Volume 1, First Edition, 1755, from the facsimile edition by Longman Group UK Limited, 1990.

- [25] “I very much approve of the trouble you take over revising your work, but there should be a limit to this; first because too much application blurs the outline instead of improving the details, and then because it distracts us from more recent subjects and prevents us from starting on new work and also from finishing off the old.”

Letter from Pliny the Younger (Gaius Plinius Luci filius Caecilius Secundus) to (?) Atrius, circa CE 110, from *The Letters of the Younger Pliny*, Penguin Books, 1969, p. 256; translated by Betty Radice.

- [26] See the *Supplement to the Statement of Vote: Counties by State Assembly Districts for State Ballot Measures*, available at <http://elections.cdn.sos.ca.gov/sov/2016-general/ssov/ballot-measures-by-assembly.pdf>.

- [27] See the *Supplement to the Statement of Vote: Counties by State Assembly Districts for President*, available at <http://elections.cdn.sos.ca.gov/sov/2016-general/ssov/pres-by-assembly.pdf>.

- [28] *Report of Registration as of October 24, 2016: Registration by State Assembly District*, <http://elections.cdn.sos.ca.gov/ror/ror-pages/15day-gen-16/assembly.pdf>.

- [29] Statement of Vote - November 8, 2016, General Election, see *STATEMENT OF VOTE SUMMARY PAGES*, which begins on p. 7. The reference is available online at <http://elections.cdn.sos.ca.gov/sov/2016-general/sov/06-sov-summary.pdf>.

- [30] *Supplement to the Statement of Vote: Counties by State Assembly Districts for President*, <http://elections.cdn.sos.ca.gov/sov/2016-general/ssov/pres-by-assembly.pdf>.

- [31] See *Statement of Vote - November 8, 2016, General Election*, available at <http://elections.cdn.sos.ca.gov/sov/2016-general/sov/2016-complete-sov.pdf>.

- [32] See *Supplement to the Statement of Vote: Counties by State Assembly Districts for United States Senator*,

available at <http://elections.cdn.sos.ca.gov/sov/2016-general/ssov/us-senate-by-assembly.pdf>.

- [33] For the results for Assembly in 2012, see *State Assemblymember*, <http://elections.cdn.sos.ca.gov/sov/2012general/14stateassembly180.pdf>.

For the results for state Senate in 2012, see *State Senator*, <http://elections.cdn.sos.ca.gov/sov/2012general/13-statesenators.pdf>.

For the results for U.S. House of Representatives in 2012, see *United States Representative*, <http://elections.cdn.sos.ca.gov/sov/2012general/12usreps.pdf>.

For the results for Assembly in 2014, see *Member of the State Assembly*, <http://elections.cdn.sos.ca.gov/sov/2014general/pdf/64stateassemblymember.pdf>.

For the results for state Senate in 2014, see *State Senator*, <http://elections.cdn.sos.ca.gov/sov/2014-general/pdf/58statesenator.pdf>.

For the results for U.S. House of Representatives in 2014, see *United States Representative*, <http://elections.cdn.sos.ca.gov/sov/2014general/pdf/43congress.pdf>.

For the results for Assembly in 2016, see *State Assemblymember*, <http://elections.cdn.sos.ca.gov/sov/2016general/sov/45stateassemblyformatted.pdf>.

For the results for state Senate in 2016, see *State Senator*, <http://elections.cdn.sos.ca.gov/sov/2016-general/sov/40statesenatorsformatted.pdf>.

For the results for U.S. House of Representatives in 2016, see *United States Representative*, <http://elections.cdn.sos.ca.gov/sov/2016general/sov/26usrepsformatted.pdf>.

- [34] For votes for U.S. President in 2012 by Assembly district, see the *Supplement to the Statement of Vote: Counties by Assembly Districts for President*, <http://elections.cdn.sos.ca.gov/sov/2012general/ssov/presbyassembly.pdf>.

For votes for U.S. President in 2012 by state Senate district, see the *Supplement to the Statement of Vote: Counties by Senate Districts for President*, <http://elections.cdn.sos.ca.gov/sov/2012general/ssov/presbysenate.pdf>.

For votes for U.S. President in 2012 by U.S. House district, see the *Supplement to the Statement of Vote: Counties by Congressional Districts for President*, <http://elections.cdn.sos.ca.gov/sov/2012general/ssov/presbycongress.pdf>.

For votes for Governor in 2014 by Assembly district, see the *Supplement to the Statement of Vote: Counties by Assembly Districts for Governor*, <http://elections.cdn.sos.ca.gov/sov/2014general/ssov/governorassembly.pdf>.

For votes for Governor in 2014 by state Senate district, see the *Supplement to the Statement of Vote: Counties by Senate Districts for Governor*, <http://elections.cdn.sos.ca.gov/sov/2014general/ssov/governorsenate.pdf>.

For votes for Governor in 2014 by U.S. House district, see the *Supplement to the Statement of Vote: Counties by Congressional Districts for Governor*, <http://elections.cdn.sos.ca.gov/sov/2014general/ssov/governorcongressional.pdf>.

For votes for U.S. President in 2016 by Assembly district, see the *Supplement to the Statement of Vote: Counties by State Assembly Districts for President* <http://elections.cdn.sos.ca.gov/sov/2016-general/ssov/presbyassembly.pdf>.

For votes for U.S. President in 2016 by state Senate district, see the *Supplement to the Statement of Vote: Counties by State Senate Districts for President*, <http://elections.cdn.sos.ca.gov/sov/2016-general/ssov/presbysenate.pdf>.

For votes for U.S. President in 2016 by U.S. House district, see the *Supplement to the Statement of Vote: Counties by Congressional Districts for President*, <http://elections.cdn.sos.ca.gov/sov/2016-general/ssov/presbycongress.pdf>.

- [35] For voter registration in 2012 in each Assembly district, see the *Report of Registration as of October 22, 2012: Registration by State Assembly District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygeneral12/assembly1.pdf>.

For voter registration in 2012 in each state Senate district, see the *Report of Registration as of October 22, 2012: Registration by State Senate District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygeneral12/senate1.pdf>.

For voter registration in 2012 in each U.S. House district, see the *Report of Registration as of October 22, 2012: Registration by US Congressional District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygeneral12/congressional1.pdf>.

For voter registration in 2014 in each Assembly district, see the *Report of Registration as of October 20, 2014: Registration by State Assembly District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygeneral2014/assembly.pdf>.

For voter registration in 2014 in each state Senate district, the see *Report of Registration as of October 20, 2014: Registration by State Senate District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygeneral2014/senate.pdf>.

For voter registration in 2014 in each U.S. House district, see the *Report of Registration as of October 20, 2014: Registration by US Congressional District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygeneral2014/congressional.pdf>.

For voter registration in 2016 in each Assembly district, see the *Report of Registration as of October 24, 2016: Registration by State Assembly District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygen16/assembly.pdf>.

For voter registration in 2016 in each state Senate district, see the *Report of Registration as of October 24, 2016: Registration by State Senate District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygen16/senate.pdf>.

For voter registration in 2016 in each U.S. House district, see the *Report of Registration as of October 24, 2016: Registration by US Congressional District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15daygen16/congressional.pdf>.

- [36] For 2002, see <http://elections.cdn.sos.ca.gov/sov/2012-general/14stateassembly180.pdf>.

For 2004, see http://elections.cdn.sos.ca.gov/sov/2004-general/formatted_st_AD_all.pdf.

for 2006, see http://elections.cdn.sos.ca.gov/sov/2008-general/40_56_state_assembly.pdf.

For 2008, see http://elections.cdn.sos.ca.gov/sov/2008-general/40_56_state_assembly.pdf.

For 2010, see <http://elections.cdn.sos.ca.gov/sov/2010-general/73stateassembly.pdf>.

For 2012, see <http://elections.cdn.sos.ca.gov/sov/2012-general/14stateassembly180.pdf>.

For 2014, see <http://elections.cdn.sos.ca.gov/sov/2014-general/pdf/64stateassemblymember.pdf>.

For 2016 see <http://elections.cdn.sos.ca.gov/sov/2016-general/sov/45stateassemblyformatted.pdf>.

- [37] For 2002, see <http://elections.cdn.sos.ca.gov/sov/2002-general/ssov/govassem.pdf>.

For 2004, see http://elections.cdn.sos.ca.gov/sov/2004-general/ssov/pres_general_ssov_assembly.pdf.

For 2006, see http://elections.cdn.sos.ca.gov/sov/2006-general/ssov/gov_by_ad.pdf.

For 2008, see <http://elections.cdn.sos.ca.gov/sov/2008-general/ssov/8presbyassembly.pdf>.

For 2010, see <http://elections.cdn.sos.ca.gov/sov/2010-general/ssov/governorassemblies.pdf>.

For 2012, see <http://elections.cdn.sos.ca.gov/sov/2012-general/ssov/presbyassembly.pdf>.

For 2014, see <http://elections.cdn.sos.ca.gov/sov/2014-general/ssov/governorassemblies.pdf>.

For 2016, see <http://elections.cdn.sos.ca.gov/sov/2016-general/ssov/presbyassembly.pdf>.

- [38] See the site <http://elections.cdn.sos.ca.gov/sov/2016-general/sov/04historicalvoterregparticipation.pdf>.

- [39] Forward Observer, *Democrats Spent \$91.5 Million on Same-Party Races in 2016*, <http://www.fwdobserver.com/images/RESEARCH-BRIEF---CA-Candidate-Fundraising-in-Same-Party-Prop-14-Races---Feb-21-2017.pdf>.

Full disclosure: the author of the present paper commissioned the tabulation.

- [40] For the voter registration in Assembly districts in 2012, see the *Report of Registration as of October 22, 2012: Registration by State Assembly District* <http://elections.cdn.sos.ca.gov/ror/rorpages/15day-general-12/assembly1.pdf>.

For the voter registration in Assembly districts in 2014, see the *Report of Registration as of October 20, 2014: Registration by State Assembly District*, <http://elections.cdn.sos.ca.gov/ror/rorpages/15day-general-2014/assembly.pdf>.

For the voter registration in Assembly districts in 2016, see the *Report of Registration as of*

October 24, 2016: *Registration by State Assembly District* <http://elections.cdn.sos.ca.gov/lor/pages/15day-gen-16/assembly.pdf>.

- [41] Mr. Choi's campaign committee is *Choi for Senate 2014*, ID#1364099.

- [42] See the Cal-Access page <http://cal-access.sos.ca.gov/Campaign/Committees/Detail.aspx?id=1364099&session=2013>.

- [43] For the voter registration in Senate districts in November, 2012, see the *Report of Registration as of October 22, 2012: Registration by State Senate District*, <http://elections.cdn.sos.ca.gov/lor/pages/15day-general-12/senate1.pdf>.

For the voter registration in Senate districts in November, 2014, see the *Report of Registration as of October 20, 2014: Registration by State Senate District*, <http://elections.cdn.sos.ca.gov/lor/pages/15day-general-2014/senate.pdf>.

For the voter registration in Senate districts in November, 2016, see the *Report of Registration as of October 24, 2016: Registration by State Senate District*, <http://elections.cdn.sos.ca.gov/lor/pages/15day-gen-16/senate.pdf>.

- [44] For the voter registration in U.S. House districts in November, 2012, see the *Report of Registration as of October 22, 2012: Registration by US Congressional District*, <http://elections.cdn.sos.ca.gov/lor/pages/15day-general-12/congressional1.pdf>.

For the voter registration in U.S. House districts in November, 2014, see the *Report of Registration as of October 20, 2014: Registration by US Congressional District*, <http://elections.cdn.sos.ca.gov/lor/pages/15day-general-2014/congressional.pdf>.

For the voter registration in U.S. House districts in November, 2016, see the *Report of Registration as of October 24, 2016: Registration by US Congressional District*, <http://elections.cdn.sos.ca.gov/lor/pages/15day-gen-16/congressional.pdf>.

- [45] Wikipedia uses two different forms for the links to the files.

For the even numbered years 1982–1990, and 2002, and 2012–2016, see the link https://en.wikipedia.org/wiki/xxxx_United_States_House_of_Representatives_elections, where xxxx is the four-digit election year.

For the even numbered years 1992–2000, and 2004–2010, see https://en.wikipedia.org/wiki/United_States_House_of_Representatives_elections,_xxxx, where xxxx is again the four-digit election year.

- [46] Data for the number of primary elections for the California Assembly and Senate that engage both a Republican and a Democrat are:

For 2012, and for the Assembly, from Assembly: *State Assemblymember*, at the site <http://elections.cdn.sos.ca.gov/sov/2012-primary/pdf/102-state-assembly1-80formatted.pdf>; while from the Senate, from Senate: *State Senator*, at the site <http://elections.cdn.sos.ca.gov/sov/2012-primary/pdf/97-state-senators-formatted.pdf>;

For 2014, and for the Assembly, from Assembly: *State Assemblymember*, at the site <http://elections.cdn.sos.ca.gov/sov/2014-primary/pdf/84-state-assemblymember.pdf>; while for the Senate, from Senate: *State Senator*, at the site <http://elections.cdn.sos.ca.gov/sov/2014-primary/pdf/78-state-senator.pdf>; and

For 2016, and for the Assembly, from Assembly: *State Assemblymember*, at the site <http://elections.cdn.sos.ca.gov/sov/2016-primary/pdf/105-state-senators-formatted.pdf>;

For 2014, and for the Senate, from Senate: *State Senator*, at the site <http://elections.cdn.sos.ca.gov/sov/2014-primary/pdf/78-state-senator.pdf>; while for the Senate, from Senate: *State Senator*, at the site <http://elections.cdn.sos.ca.gov/sov/2016-primary/pdf/105-state-senators-formatted.pdf>.

- [47] See *2014 United States Elections* at https://en.wikipedia.org/wiki/2014_United_States_elections.

- [48] For the districts in which candidates ran in the Mississippi Democratic party primary, see *2015 Democratic Primary Certified Final Return Amended*, <http://www.sos.ms.gov/Elections-Voting/Pages/2015-Democratic-Primary.aspx>.

For the districts in which candidates ran in the Mississippi Republican party primary, see *2015 Republican Primary Certified Results*, <http://www.sos.ms.gov/Elections-Voting/Pages/2015-Republican-Primary.aspx>.

- [49] For the New Jersey General Assembly (the lower house of the New Jersey legislature) see *Candidates for General Assembly For GENERAL ELECTION 11/05/2013 Election*, <http://www.nj.gov/state/elections/2013-results/2013-official-general-election-results-general-assembly.pdf>.

For the New Jersey Senate (the upper house of the New Jersey legislature) see *Candidates for State Senate For GENERAL ELECTION 11/05/2013 Election*, <http://www.nj.gov/state/elections/2013-results/2013-official-general-candidates-state-senate-0912.pdf>.

- [50] For the House of Delegates (the lower house) of the Virginia legislature, see the Virginia Department of Elections, Elections Database, a search by Year: 2015; Office: House of Delegates; District: All Districts; Stage: All General Elections. See http://historical.elections.virginia.gov/lelections/lsearch/year_from:2015/year_to:2015/loffice_id:8/lstage:General.

For the Senate (the upper house) of the Virginia legislature, see the Virginia Department of Elections, Elections Database, a search by Year: 2015; Office: Senate of Virginia; District: All Districts; Stage: All General Elections. See http://historical.elections.virginia.gov/lelections/lsearch/year_from:2015/year_to:2015/loffice_id:9/lstage:General.

- [51] From the webpages of office of the Secretary of State of the state of Louisiana, see <https://voterportal.sos.la.gov/Graphical>, when set for the date of October 24, 2015.

- [52] National Council of State Legislatures, *2014 State and Legislative Partisan Composition*, http://www.ncsl.org/Portals/1/Documents/Elections/Legis_Control_2014_Dec2_11am.pdf. A.M.D.G.