The Loser's Bonus: Political Geography and Minority Party Representation

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Abstract

In a majoritarian system where support for two parties is geographically clustered, the minority party is better off with a system of smaller winner-take-all districts than with a polity-wide winner-take-all system. We use automated districting simulations of U.S. states to measure the magnitude of this "loser's bonus" in each state, and contrast long-term patterns of partisan representation in the House and Senate. We demonstrate that Republicans benefit from the loser's bonus in most of the large states of the Northeast and West Coast, while the Democrats benefit elsewhere. On balance, the loser's bonus is beneficial to the Republicans, and the size of U.S. Congressional districts relative to urban clusters of Democrats is quite well suited for the representation of Republicans in Congress. Our results have implications not only for policy debates and patterns of representation in the United States, but also in other industrialized federations with two tiers of representation and a high correlation between population density and voting behavior.

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Introduction

Perhaps one of the most striking developments in U.S. politics over the last 50 years has been the dramatic growth of the correlation between population density and voting behavior. American cities—even small cities and towns—now vote overwhelmingly for Democrats. In virtually every city, the vote share of Republicans increases as one exits the city center and enters the suburbs, eventually transitioning to comfortable Republican majorities in the exurbs and surrounding rural periphery.

Sharp differences between the electoral behavior of urban and rural voters are not unique to the contemporary United States. From 19th-century limited-franchise elections to contemporary European national elections and the Brexit referendum, from Latin America to Africa, it is often the case that the interests and identities that animate voting behavior in democracies are highly correlated with population density.

A classic observation in the field of political geography is that legislative representation is shaped in fundamental ways by the superimposition of winner-take-all districts on geographic clusters of like-minded voters. When partisan competition is organized around a conflict between groups that are geographically clustered according to population density, the spatial scale at which voters are partitioned into districts can determine which party wins and loses (Gudgin and Taylor 1979; Johnston et al. 2001).

Perhaps no one is more acutely aware of this than the Democrats in the United States, who in recent years compete successfully in the Senate and the Electoral College—where states are used as winner-take-all districts—but fall well short of a legislative majority in the House of Representatives in spite of receiving more votes than the Republicans.

This paper contributes to a nascent literature that returns to the notion, rooted in the classics of British political geography, that at least part of the Democrats' difficulty in transforming votes to seats goes beyond partisan gerrymandering, and lies in the basic task of sub-dividing the U.S. states—with their dense clusters of Democrats and dispersed ribbons of Republicans—into winner-take-all districts (Cottrell 2015; Erikson 1972, 2002; Goedert 2014; Jacobson 2003).

Chen and Rodden (2013, 2015) for example, demonstrate that a wide range of computer-generated districting plans adhering to traditional redistricting principles of compactness and contiguity would have produced disproportionate Republican legislative majorities in Florida even without the intentional gerrymandering by the legislature that inflated it even further in practice.

This literature has been preoccupied with the normative claim that a party with half of the votes should receive half of the seats (see, e.g. McGann (2013)). Much of the empirical literature is aimed at assessing the extent to which districting plans fall short of that standard—a concept known as "electoral bias." Chen and Rodden (2013) analyzed an actual tied election, and the vast majority of empirical papers attempt to simulate hypothetical tied elections for analytical purposes by inflating the vote share of the losing party across districts (Gelman and King 1994; King and Browning 1987; McGann et al. 2015).

This approach to electoral bias was developed in the context of hotly contested British, Australian, and New Zealand parliamentary elections in the middle of the 20th century, when the vote shares of the two major parties were consistently within a few percentage points (Brookes 1960; Johnston 1977). However, in the modern era of American political polarization, states like Florida and Ohio are exceptions to the rule; most are dominated,

at least in federal elections, by one party. Thus the exercise of simulating hypothetical tied elections is often quite unrealistic and potentially misleading in states like Alabama and New York.

While normative questions about fairness and the impact of gerrymandering are crucial questions for American democracy, they have diverted attention from a related question that has motivated the classic works of political geography outside the United States: how does the simple act of drawing winner-take-all districts on top of geographic clusters of co-partisans affect representation?

If we leave aside the prevailing debates about gerrymandering and race and focus exclusively on political geography, the U.S. states offer an ideal opportunity to develop and test for the first time some of the basic hypotheses that were introduced by Gudgin and Taylor (1979) in their classic political geography textbook. Above all, the U.S. states in the early 21st century offer tremendous cross-sectional diversity in both partisanship and political geography, while providing a very attractive natural experiment: at-large statewide representation is used in the Senate while states are subdivided into winner-take-all districts in the House of Representatives. Moreover, unlike the pioneering British geographers working on these questions in earlier decades, we now have a nationwide geo-referenced precinct-level data set to work with.

This paper exploits this opportunity by developing and measuring a concept we call the "loser's bonus." In a system with single-member districts, the party that receives fewer votes in a polity-wide election will often win at least some seats due to the fact that clumps of its supporters are concentrated within districts so as to produce local majorities. For example, Democrats have dim hopes to win Senate seats, but are able to win two urban Congressional

seats in overwhelmingly Republican Tennessee. Republicans are able to string together sufficient rural and suburban voters to win several seats in overwhelmingly Democratic New York and California, even though Senate seats are typically out of reach.

We show that while Democrats are more geographically concentrated than Republicans in virtually every state, the extent and spatial scale of this phenomenon varies a great deal across states according to the geography of the state's historical industrialization and settlement patterns. Democrats are relatively dispersed at the scale relevant for Congressional districting in states that lack large cities, e.g. Arkansas, West Virginia, Iowa, New Hampshire, and Connecticut. In contrast, Democrats are highly clustered at this scale in states with one or more major cities, including Texas, Georgia, Illinois, and Pennsylvania.

We show that in states where the scale of spatial clustering of Democrats is sufficiently low, the loser's bonus is small, and we should not expect substantial differences between state-wide and districted elections. However, when Democrats are highly clustered in large cities, the loser's bonus is quite beneficial to Democrats in states where they constitute a long-term minority, like Utah and Tennessee, and a boon to Republicans in states like Illinois or New York where they are the minority party. Summing over states, we discover a striking asymmetry: Republicans gain far more from the loser's bonus than Democrats.

The goal of this paper is to turn attention away from such factors as incumbency bias and gerrymandering and measure the size of the loser's bonus' in each state that can be attributable purely to the necessity of carving up its political geography into winner-take-all districts. We achieve this by conducting repeated districting simulations of each state using a nationwide geo-referenced precinct-level data set from the 2008 presidential election.

This approach allows us not only to exploit cross-state variation in the clustering of

Democrats relative to the size of Congressional districts, but also to hold patterns of political geography constant and alter the size of districts. This enables us to examine the impact of the fact that the partitions used in the United States are extremely large—almost ten times the size of those used in other advanced industrial democracies like the UK, Canada, Australia, and France. We find evidence for the general hypothesis that the loser's bonus increases—that is, seat shares come closer to proportionality with vote shares—as partitions become smaller. We show that smaller districts would thus disproportionately benefit the Democrats. If the United States used partitions more similar in size to those of other former British colonies, the seat bonus in favor of the Republicans in the House of Representatives would be cut in half, but would not disappear.

Finally, we leave our simulations behind and ask whether these insights can help shed light on actual outcomes of Senate and House elections. We demonstrate that the combination of political geography and districting alone can explain why the Democrats are at a substantial disadvantage in the House relative to the Senate once we hold constant the malapportionment of the latter in favor of Republicans. Republicans benefit handsomely from the loser's bonus in large, industrialized states with many Congressional seats, while the Democrats benefit on a smaller scale in states with fewer Congressional seats.

Our findings have important implications for representation and debates about institutional reform in the United States. First, the apportionment of electoral votes according to Congressional districts would be quite advantageous for the Republicans. Second, redistricting reforms aimed at partisan symmetry would have different partisan effects in different states. Moreover, this paper has broader implications for countries, especially federations like Canada and Australia, where partisan support is highly correlated with population density

and legislative representation is based on winner-take-all districts at multiple tiers.

Partisan geography in the United States

We begin by providing the rather striking stylized facts of contemporary American political geography that serve as the starting point for our analysis. We have collected election results from 185,160 precincts in every U.S. state except Oregon, which no longer uses precincts because of its vote-by-mail system. These precinct-level data reveal a strong positive correlation between precinct-level population density and the Democratic vote share in presidential elections. This relationship is statistically significant in every state except Alaska, Hawaii, and New Hampshire. Historical county-level data show that the correlation between population density and Democratic voting has been increasing substantially with each recent election (Rodden 2015).

A useful way to visualize this pattern is presented in Figure 1. We have calculated the distance between the center of New York City (defined as Central Park) and the centroid of every precinct in the continental United States (except Oregon). We plot this distance on the horizontal axis, such that the far right of the graph corresponds to New York and the far left corresponds to California and Washington. The vertical axis represents the Republican share of the two-party vote in the 2008 presidential election. Each "stalactite" is a city. The top, thick part of each stalactite is a relatively Republican exurb, and as the stalactite narrows, one traverses the middle and inner suburbs and finally the city center, where Obama's vote share reaches 100 percent at the tip of the stalactite. The band of dots at the top of the graph above the stalactites captures the Republican vote share in each state's rural periphery.

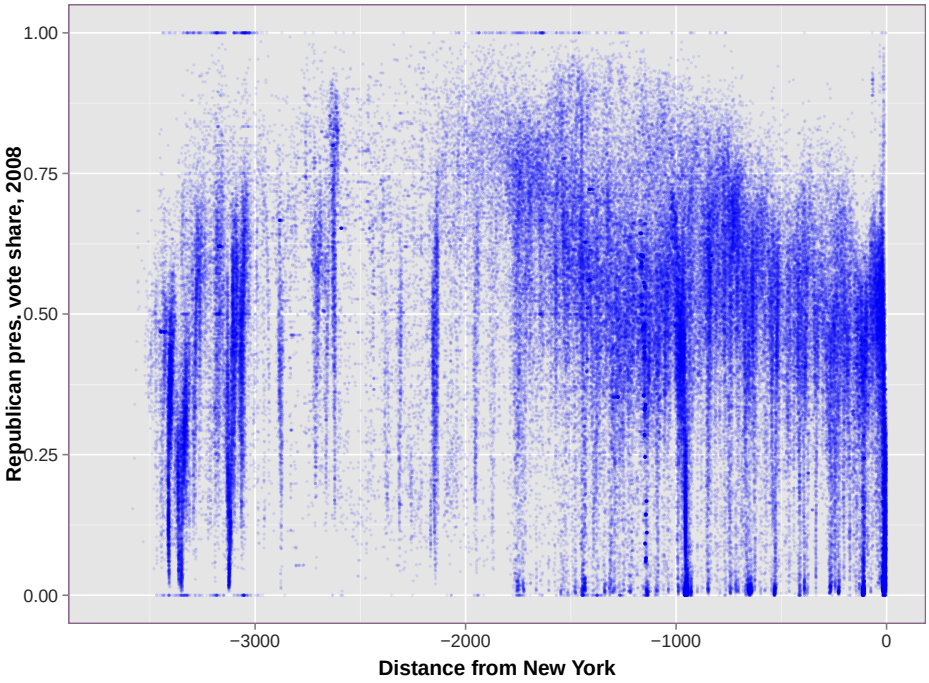

Figure 1: Distance from New York and Republican Presidential vote share, 2008

As one moves from East to West in Figure 1, one sees that the mean Republican vote share is relatively low in the original Northeastern manufacturing core—even in exurban and rural areas—though it still surpasses the national average (46%) in many suburban and rural precincts. As one moves outside the manufacturing core into the South and Midwest and eventually the Mountain West, the mean Republican vote share increases substantially, but this is driven mainly by suburban and rural voters: the stalactites associated with more isolated industrial centers like Birmingham, Memphis, Kansas City, and Denver are just as pronounced as in the original manufacturing core. Finally, when one reaches the West Coast, the East Coast pattern is seen once again: heterogeneous but Republican-leaning suburbs surround large and overwhelmingly Democratic cities.

The clustering of humans into cities, and hence the relative geographic concentration

of Democrats, is not limited to densely populated and overwhelmingly Democratic states like New York or New Jersey. There are significant urban clusters of Democrats even in states like Kentucky, Kansas, and Utah. Thus the contemporary geographic concentration of Democrats can be seen in both Democratic and Republican states alike.

The political geography displayed in Figure 1 is also partitioned into states in a way that generates substantial heterogeneity in the level and scale of concentration, both in Democratic and Republican states. In order to provide a simple measure of the relative geographic concentration of Democrats that corresponds to the scale of Congressional districts, for each state, we calculate the percentage of an average Democrat's nearest 700,000 neighbors who are also Democrats. (Jowei write a footnote that clarifies exactly how this was done). In Figure 2, we plot this quantity on the vertical axis against the statewide Democratic vote share on the horizontal axis. The states that are far from the 45 degree line are those where Democrats are highly clustered in space at the scale used to construct Congressional districts. These include Democratic states like Maryland, New York, and Washington, swing states like Pennsylvania and Missouri, as well as Republican states like Texas, Tennessee, and Utah.

Figure 2 reveals that at this spatial scale, in a group of states that have several small cities but no major metropolitan agglomeration, Democrats are not especially concentrated. This includes Democratic New England states like Connecticut, swing states like Iowa and New Hampshire, and Republican states like West Virginia and Arkansas, as well as states like Mississippi and South Carolina where not only are cities small, but dispersed rural African American populations remain as a legacy of slavery.

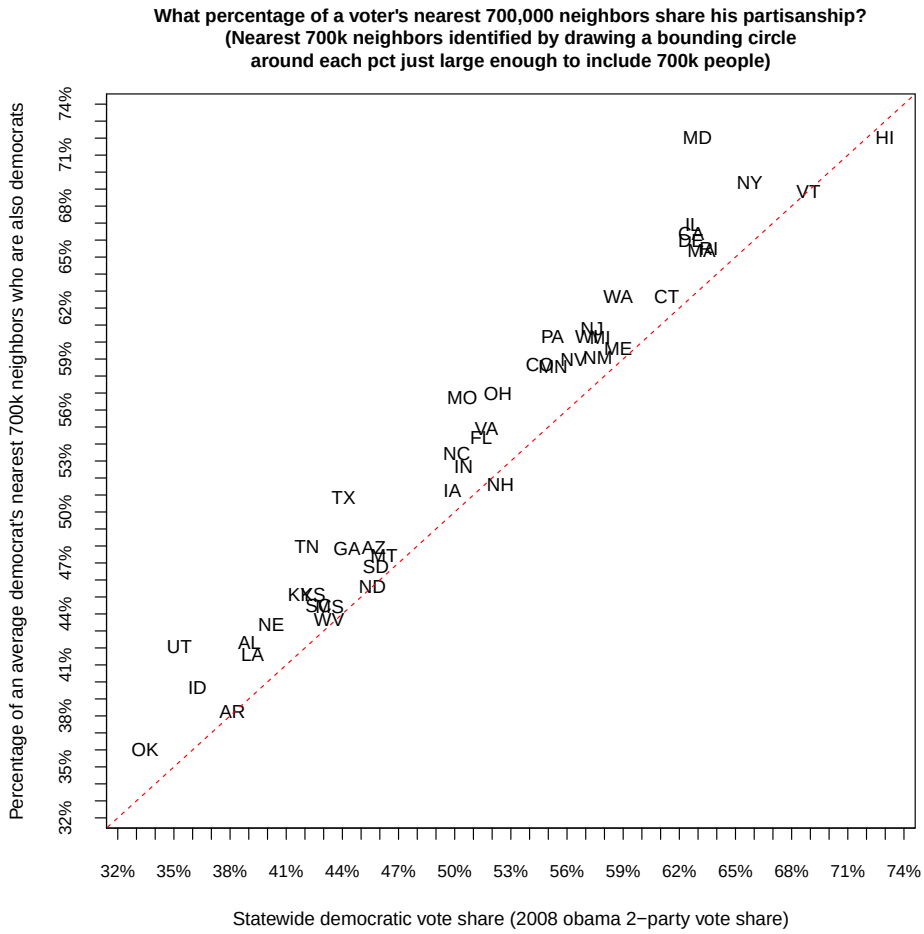

Figure 2: Relative Clustering of Democrats at the Scale of Congressional Districts in 49 U.S. States

Figure 3 returns to the portrayal of Figure 1, zooming in on four states selected to typify the cross-state heterogeneity that will be exploited in the remainder of the paper. Before moving on, it is useful to foreshadow our main argument using these examples. Thinking in one geographic dimension for simplicity, districting can be conceptualized as a process of drawing vertical partitions in Figure 3, each containing enough dots to include roughly 700,000 voting-age individuals. In states where the relative concentration of Democrats is low, e.g. South Carolina or Connecticut, the result of this process is that the losing party can expect rather similar results in statewide and districted elections because it does not

have sufficiently large contiguous clusters of supporters to facilitate local majorities.

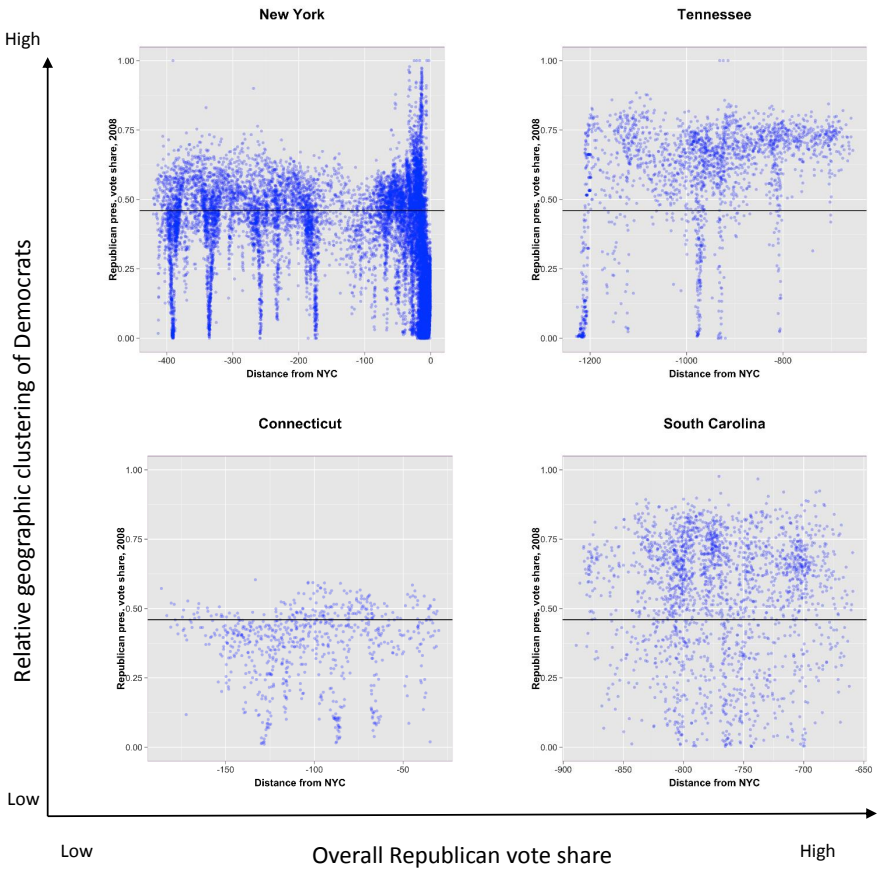

Figure 3: Political Geography in Four U.S. States

However, in states with highly clustered Democrats, districting generates a predictable loser's bonus. In states like New York, Democrats are inefficiently clustered in New York City, which is much larger than the scale of a Congressional district, and in upstate cities that are much smaller, such that a number of majority-Republican districts emerge in the suburbs of New York City and in upstate New York. In states like Tennessee, even though the rural and suburban Republican vote shares (and hence the overall statewide vote share) are high, Democrats are clustered in Memphis and Nashville in sufficient numbers that partitioning

schemes reward the Democrats with urban seats.

Districting and the Loser's Bonus

One of the enduring contributions of Gudgin and Taylor (1979) is the observation that in a two-party system, when there are distinct geographic clusters of votes for the two parties—for example working-class and professional neighborhoods within towns—and when the size of districts is larger than the homogeneous clusters, the distribution of partisanship across districts should approximate a normal distribution, and the votes-to-seats relationship tends toward something like the familiar "cube law" identified by Kendall and Stuart (1950).

In the contemporary United States, where the urban core of virtually every city is overwhelmingly Democratic, suburbs are heterogeneous, and exurbs and rural areas are Republican, the analogous scenario is one in which urban core areas are uniformly small relative to the size of Congressional districts. Let us examine a stylized example of a polity, portrayed in Figure 4, with only 48 voters, 24 of whom are predisposed toward the left party (L) and 24 of whom typically prefer the right party (R). Voters living close to one another in city centers typically vote for the L party, suburbs are evenly split, and those living further from one another in rural areas typically vote for the R party. There are 3 L voters in each city, and 3 R voters in each surrounding rural periphery.

Figure 4: Hypothetical polity with small cities

Let us imagine that this polity must be apportioned into six districts of equal size, the boundaries of which are portrayed with vertical bars. Each district contains 8 voters, and is hence larger than the scale of the L and R clusters. The two parties are evenly matched in four of the resulting districts, which inevitably contain urban, suburban, and rural areas, while the L party can expect a majority in one district that ends up slightly more urban, and the R party can anticipate a majority in one district that ends up slightly more rural. Thus the distribution of expected partisanship across districts is symmetric with a large peak in the middle.

Next, let us consider scenarios in which one of the parties suffers from a scandal or benefits from a strong economy and the election is not tied. To do so, we simulate 10,000 elections in which one voter is randomly selected to switch from L to R, then do the same for two voters, three voters, and so on until the R party wins all of the votes. We conduct the same exercise in the opposite direction. For each scenario, we calculate the average seat share across all simulations that would be produced by the districting scheme displayed in Figure 4. The resulting vote-seat curve is displayed with the green line in Figure 5.

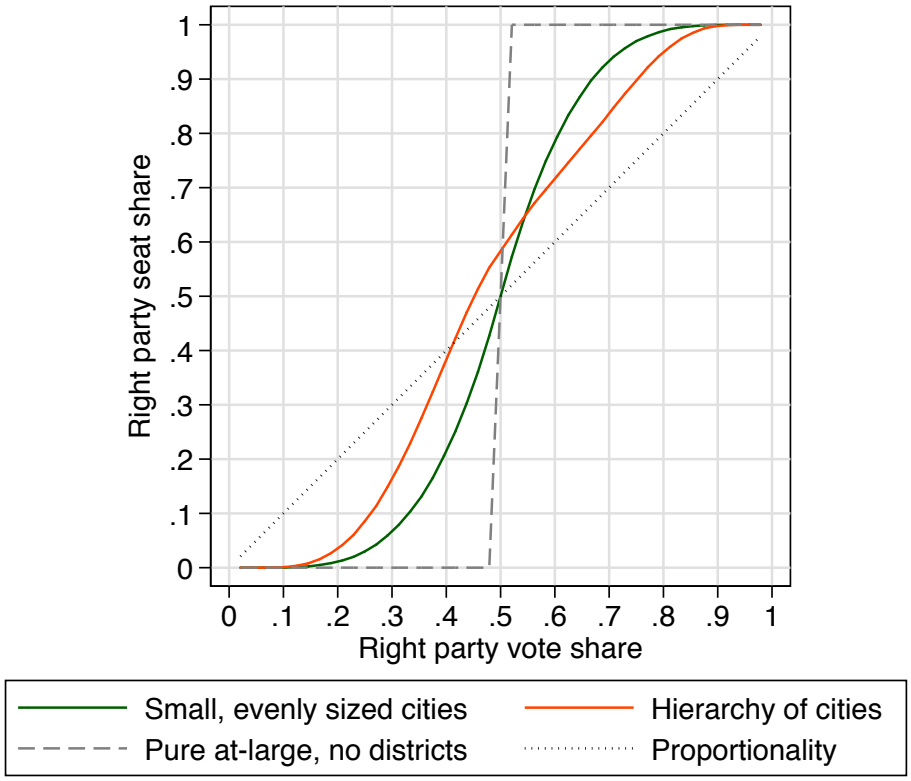

Figure 5: Vote-seat curves for two hypothetical polities, six districts

The green line in Figure 5 is a standard majoritarian vote-seat curve that approximates the cube law. For comparison, the dashed black line represents an at-large system in which the party with a majority of votes wins all of the seats, and the dotted line represents proportionality. The distance between the green line and the dashed black line is the loser's bonus. For instance, when receiving 40 percent of the votes, the R party can expect to receive 20 percent of the seats due to the fact that its supporters are able to win some rural-leaning districts.

Figure 4 represents the political geography of states like Iowa or West Virginia, where cities are small relative to the size of Congressional districts. Let us now examine a political geography that more closely resembles U.S. states with large cities, where instead of being

clustered in a series of small agglomerations that do not reach the size of districts, there is at least one cluster that reaches or surpasses that size, along with other smaller agglomerations that do not. For instance, the urban core of New York City is larger than the size of a Congressional district, while those of Rochester and Buffalo do not. Likewise, urban Memphis approaches the size of a Congressional district, while Knoxville and Chattanooga do not.

Such a polity is portrayed in Figure 6, which has one large city that votes overwhelmingly for the L party, surrounded by heterogeneous suburbs and a rural periphery that vote for the R party. It also contains a smaller city and a small town, both surrounded by right-leaning suburbs and rural periphery.

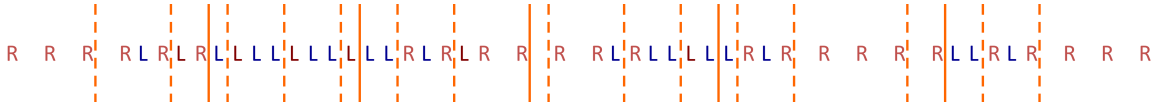

Figure 6: Hypothetical polity with a hierarchy of cities

Again, let us examine what happens when this evenly divided polity is partitioned into six districts of equal size. These are captured with the solid orange lines in Figure 6. Because its supporters are inefficiently packed into the large city, the Left party wins only 42 percent of the seats in spite of winning half the votes. This is an example of the classic case of electoral bias owing to an inefficient geographic clustering described by Brookes (1960), Johnston (1977), and Gudgin and Taylor (1979).

Following the approach described above, the orange line in Figure 5 derives the vote-seat curve for this example. Several features of this curve are noteworthy. First, the curve is

flatter and closer to proportionality than the green curve, and hence the loser's bonus is larger for both parties. Because of the greater relative clustering of the L party, it is able to win more seats when it performs badly (on the right side of the graph) than would have been the case with a more even distribution of support across cities. It is able to win seats in its urban core support area even when it performs very badly overall.

Likewise, because the support for the Left party is so concentrated, the Right party is able to string together suburban and rural voters in districts that it wins with slim majorities, and relative to the scenario portrayed by the green line, is able to enjoy a larger loser's bonus.

Moreover, the orange curve displays an asymmetry that is not present in the green curve. In general, the Right party can expect a larger loser's bonus than the Left party. Most notably, the Right party can expect a loser's bonus that propels it to a majority of seats with only 45 percent of the votes. Likewise, it achieves proportional representation with 40 percent of the votes, while the the Left party can only expect 30 percent of the seats with a similar vote share.

Figure 5 builds on the intuition of Calvo and Rodden (2015): A two-party system with perfect geographic dispersion of partisanship, such that a party with 45 percent of the overall vote receives 45 percent in each district, is equivalent to an at-large system, in that the election winner receives all of the seats. At the other extreme, if parties' support is perfectly segmented such that each district is homogeneous, representation is perfectly proportional to the vote share. Thus the vote-seat curve becomes flatter as partisan support becomes more clustered.

The wrinkle here is that when population density and voting behavior are highly correlated and dense cities are sufficiently large, the urban party is more concentrated within

districts than the rural party, generating a skew in the distribution of party support across districts, and an asymmetric flattening of the vote-seat curve.

The hypothetical vote distributions of Figures 4 and 6 were designed to increase the relative clustering of partisanship by district. The same can be achieved by holding the geographic vote distribution constant and reducing the size of districts. To demonstrate this, Figure 6 also includes partitions, indicated with dashed orange lines, that create 16 rather than 6 districts.

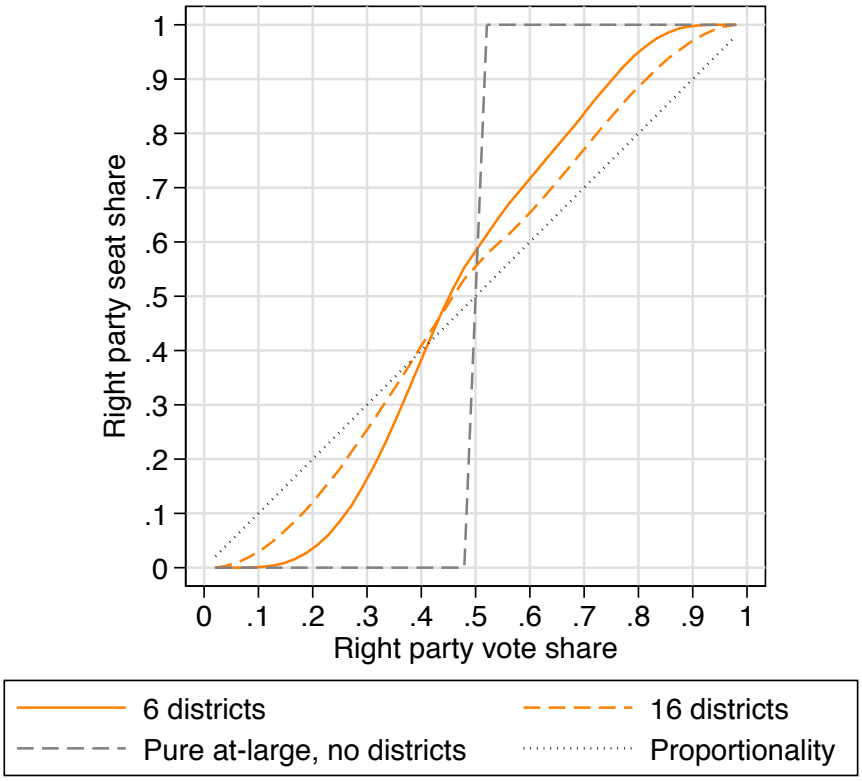

Figure 7: Vote-seat curves for a hypothetical polity, 6 versus 16 districts

Figure 7 displays the resulting vote-seat curve using a dashed orange line plot. The curve flattens even further and the loser's bonus increases for both parties. By drawing smaller and smaller districts, one allows local clusters of support for the losing party to form winning

districts. However, the basic asymmetry owing to the relative geographic clustering of the urban party does not disappear.

Measuring the loser's bonus

First steps in establishing the logic of urbanization and asymmetric clustering were taken by Gudgin and Taylor (1979), but these insights have not been systematically tested using data from observed elections. A recent paper by Cottrell (2015) simulates a large number of hypothetical electorates using a computational modeling approach, generalizing the relationship between asymmetric partisan clustering and the asymmetric flattening of the vote-seat curve. Instead of generating synthetic electorates through computational modeling, the central task of this paper is to exploit the observed political geography and partisanship demonstrated by the U.S. states, focusing in each state on the loser's bonus by contrasting the expected outcome of at-large elections with the expected outcome of districted elections.

The goal of our empirical analysis is to estimate the loser's bonus arising purely from the imposition of partitions on a state's partisan geography. That is, we wish to avoid drawing inferences from implemented districting plans that may have been colored by efforts to favor the incumbent party or comply with the Voting Rights Act. In our stylized examples, geographic space had only longitude and no latitude, and with equal-population districts, discretion in districting was not possible. In the real world of American redistricting, politicians have considerable discretion over the way urban, suburban, and rural voters are partitioned into districts. For instance, if the Democrats are able to form a majority in a state like Illinois and can draw radial districts from Lake Michigan out into the Chicago

suburbs, they might be able to reduce the anticipated hefty "loser's bonus" that would be enjoyed by Republicans because of the inefficient concentration of Democrats in Chicago.

Initially we wish to hold these factors constant, not because they are unimportant, but because they might obscure the underlying logic of partisan geography. In order to do so, we generate our own partitions using a districting simulation algorithm that generates compact, contiguous, equal-population districts in each state. The simulation algorithm is described in detail in the Appendix.

Next, we need a way of estimating the mapping of presidential votes to seats associated with these simulated districts. We estimate a district-level logit model for each Congressional election from the 110th to the 113th Congress, where actual Republican House victories are a function of presidential votes. We then use this logit model to estimate predicted Republican win probabilities based on the district-level McCain vote share for each simulated district in each simulated plan. We can then calculate the predicted Republican seat share associated with each plan. We simulated hundreds of plans for each state, and we plot the average Republican seat shares across simulations for each state with red markers in figure **??**, against the statewide McCain vote share on the horizontal axis.

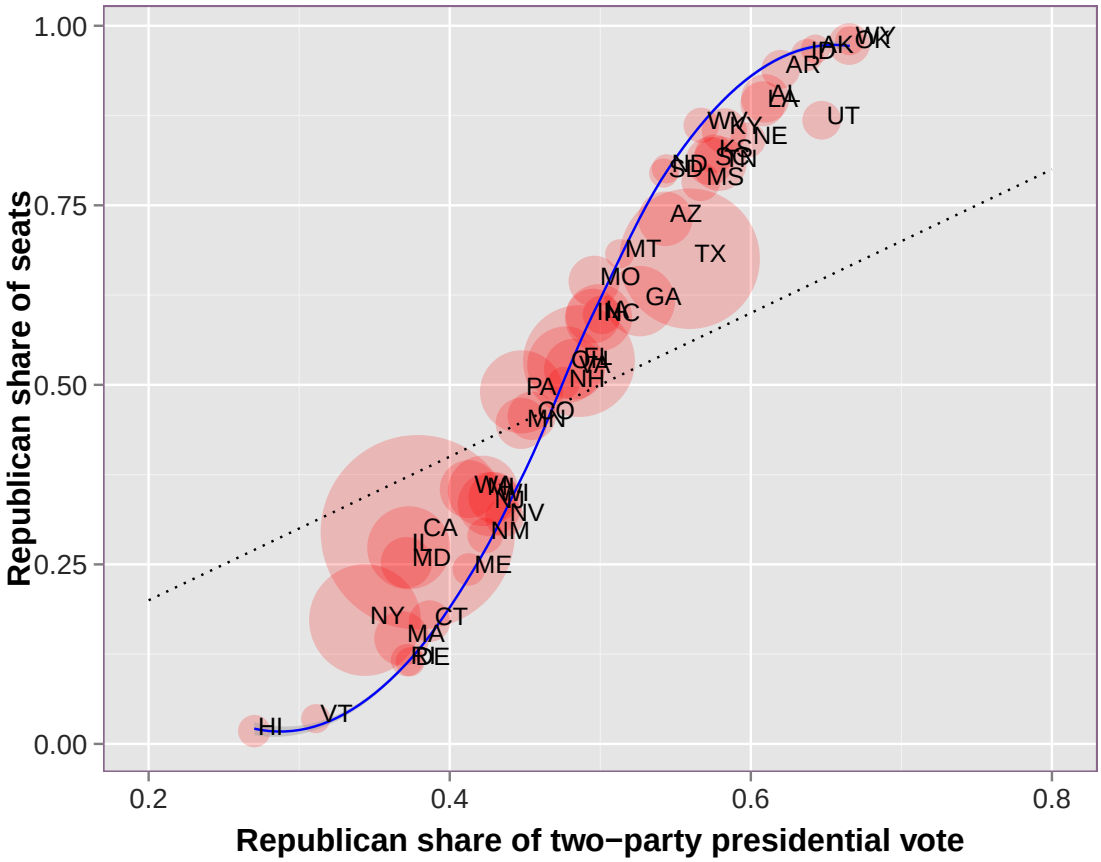

Figure 8: The Loser's Bonus

The red markers represent estimates of Republican win probabilities from the simulations, and are sized to correspond to the number of districts in the state. The blue line represents the estimated probability of Republican victory in a statewide election. The black dotted line represents proportionality.

The blue line corresponds to the predicted probability of victory—estimated from the logit model of Congressional districts—associated with a specific McCain vote share. By plotting the predicted probability of victory for a Republican candidate in a generic state with a specific McCain vote share, we mean to capture the expected outcome of an at-large statewide district on a comparable scale.

For each state in Figure **??**, the loser's bonus is the vertical distance between the middle

of the red marker and the blue line. According to the simulations, in one group of states the Republicans can expect to do much better under Congressional partitioning than under statewide districts. These include some of the largest states, including New York, Maryland, Illinois, California, Washington, and Michigan. These are states with large cities as well as smaller cities, where partitioning schemes create overwhelming victories for Democrats in big cities, while Republicans string together exurban and rural victories, often overwhelming non-metro clusters of Democrats in smaller cities and towns that are too small to form their own districts.

However, as we move past the swing states and into the solidly Republican states, we see that the loser's bonus begins to consistently favor the Democrats, sometimes quite substantially. In states like Georgia, Texas, Tennessee, Nebraska, Kansas, Louisiana, and Utah, the Democrats can expect better outcomes under single-member Congressional districts than under at-large districts. This is because their vastly outnumbered supporters are efficiently distributed in cities, and unlike the upper Midwest and Northeast, rather few of them are wasted in Republican-leaning rural hinterlands. The simulations produce frequent Democratic victories in Atlanta, Houston, Dallas, Austin, Memphis, Omaha, New Orleans, and Salt Lake City, and occasional victories in places like Kansas City, KS, Louisville, KY, and Birmingham, AL that make Congressional districts—even without the benefit of the Voting Rights Act—a better bet for Democrats than statewide districts.

The states that are on or very close to the blue line are not only small, single-district states but also larger states with geographically dispersed Democrats. As described above, these include states where Democrats are either not especially clustered in cities, or where cities are far smaller than Congressional districts. To show this more clearly, Figure 9 plots

the absolute magnitude of the loser's bonus in each state against an index of asymmetric Democratic clustering derived from Figure 2 above. Specifically, we calculate the share of an average Democrat's nearest 700,000 neighbors who are Democrats, and divide by the statewide Democratic vote share.

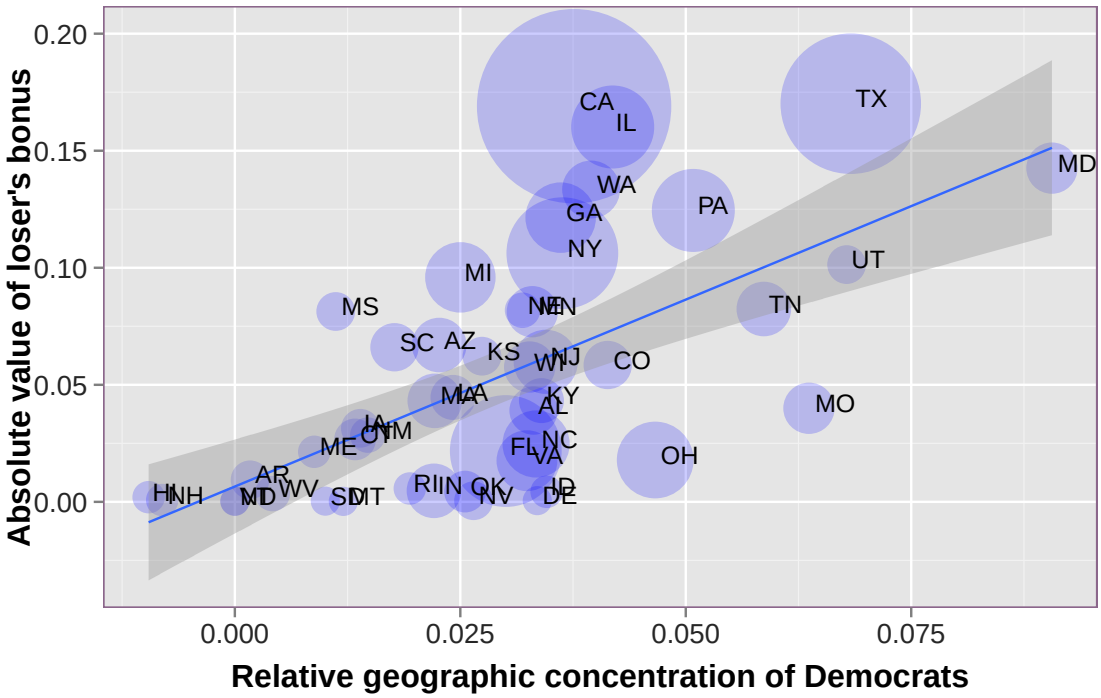

Figure 9: Relative geographic concentration of Democrats and the absolute value of the loser's bonus

Figure 9 shows that the extent to which the minority party can expect to do better under Congressional partitioning than under statewide elections is a function of the extent to which Democrats are relatively geographically clustered at the scale of Congressional districts.

As demonstrated in Figure 8, there are several large states whose political geography generates a large losers bonus in favor of the Republicans. There are only two relatively large Republican states with a substantial loser's bonus: Georgia and Texas. Thus on balance, the

loser's bonus favors Republicans. If we multiply each state's Congressional delegation size by the logit-predicted probability that a Republican wins a statewide race and then sum over all states, we can interpret this as a hypothetical scenario in which a states Congressional seats are filled by a statewide at-large election rather than through geographic districts. In this scenario, our logit model predicts that Republicans would win only 46 percent of the seats. Aggregating over all states, our districting simulations produce a roughly even divide between predicted Democratic and Republican seats.

In other words, the simulations suggest that even in a world without partisan gerrymandering, incumbency bias, or the Voting Rights Act, Republicans have a geographic advantage that would make them much better off under a districted system than with winner-take-all states. The U.S. Senate, of course, is based on a partitioning scheme that over-represents the relatively rural states of the economic periphery. When we weight our statewide Republican win probabilities equally for each state and sum them, the estimated Republican seat share jumps from 46 percent to 54 percent. This analysis sheds light on the importance of Senate malapportionment in bolstering Republican representation, and suggests that with equal apportionment of senate seats, the Senate's partitioning scheme would be more favorable for Democrats than that of the House of Representatives. Furthermore, it suggests that even if gerrymandering were abolished, a switch to the use of Congressional districts rather than states to allocate electoral votes in presidential elections would generate a striking imbalance in favor of Republicans.

On the Size of Districts

Our simulation approach can also be used to examine the extent to which the loser's bonus would increase with smaller districts. As explained above, the magnitude of the loser's bonus should increase as partitions get smaller and smaller, allowing additional clusters of minority party voters to form winning districts, until at the limit, proportionality with the vote share is achieved when every voter forms his or her own district. It is possible that the overall disadvantage for the Democratic Party discovered above would be reduced with smaller districts. Perhaps the partition size of 700,000 used in U.S. Congressional districts is especially beneficial for Republican representation, since this district size is sufficiently large as to generate copious surplus votes for Democrats in major cities while insuring that smaller concentrations of Democrats in the minor industrial agglomerations along 19th century mining and transportation corridors are swamped by the Republican periphery.

We have conducted a full set of districting simulations for all states using partitions of 100,000: a district size that is much closer to that used in other former British colonies. The result is displayed in Figure 10. This approach is useful because it allows for insights into political geography and the loser's bonus in states with only one or two Congressional districtsstates that were on or very close to the blue line in the graph above by construction. Many of these states now move away from the blue line when smaller partitions are used.

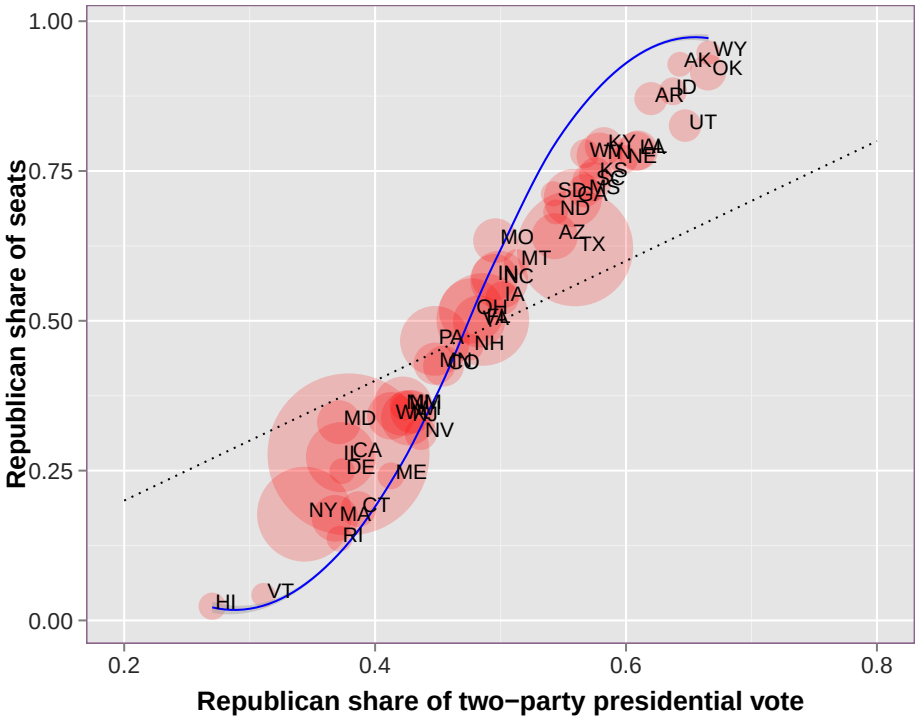

Figure 10: The Loser's bonus in simulations using districts with population 100,000

The red markers represent estimates of Republican win probabilities from the simulations, and are sized to correspond to the number of districts in the state. The blue line represents the estimated probability of Republican victory in a statewide election. The black dotted line represents proportionality.

Overall, Figure 10 clearly demonstrates the anticipated flattening of the vote-seat curve. The increasing loser's bonus associated with smaller districts, however, is more beneficial to the Democrats than the Republicans. In particular, the Democratic dominance of New England states is so complete, and Republicans are so dispersed, that smaller districts still do not help string together enough Republicans to form victories. Moreover, in large states like New York, smaller districts help generate more suburban Republican seats, but this is offset by and increase in the likelihood of Democratic victories in smaller cities like Buffalo and Syracuse. In Republican states, the difference is more noticeable. The red markers

move well below the blue line because small cites with populations a little above 100,000, like Sioux Falls, South Dakota and Fargo, North Dakota are now more likely to produce majority-Democratic districts.

This has an overall impact on the extent to which the losers bonus favors Republicans. Recall from above that our model predicted a difference of almost four percentage points between the anticipated seat share of Republicans under statewide and Congressional partitioning schemes. With these much smaller partitions, the gap has fallen to 1.5 percentage points. Thus with much smaller districts, it appears that the advantage of Republicans would be diminished but still present.

The Loser's Bonus in Action: Recent Congressional Elections

By combining districting simulations and a simple empirical model linking Congressional victories and presidential voting, thus far we have held constant such factors as incumbency, term limits, racial representation, and partisan gerrymandering. We now ask whether our basic insights about the loser's bonus hold up in the messier world of observed Senate and Congressional elections with long-standing incumbents and gerrymandered districts. Republican candidates won around 51 percent of all House seats contested from 1994 to the present, and almost 52 percent of all Senate seats contested during that period. If we weight these Republican Senate victories by the size of the state's Congressional delegation, however, the Republican seat share would drop all the way to 46 percent—an almost identical result to

that from the simulations.

In other words, as in the simulations based on 2008 presidential data, Republicans appear to have a significant long-term advantage in Congressional vis-a-vis Senate elections when we account for Senate malapportionment. To demonstrate the role of the loser's bonus in producing this effect, Figure 11 is analogous to Figure 8 above. The horizontal axis represents the average vote share of Republican candidates across all Senate elections in a state since 1994. The blue markers represent the share of all Senate seats won by Republican candidates during the same period. The red markers capture the share of all House seats in the state won by Republican candidates during this period.

The logic of the loser's bonus can be seen almost as clearly in the real world as in the simulations. The red markers for all of the large, Democratic states with big cities are far above the blue line, indicating that the Republicans make up a far larger share of these states' Congressional delegations than their Senate delegations. As we move into the Republican-leaning states, most are below the blue line, indicating that Democrats benefit from the loser's bonus since they have larger House delegations than Senate delegations.

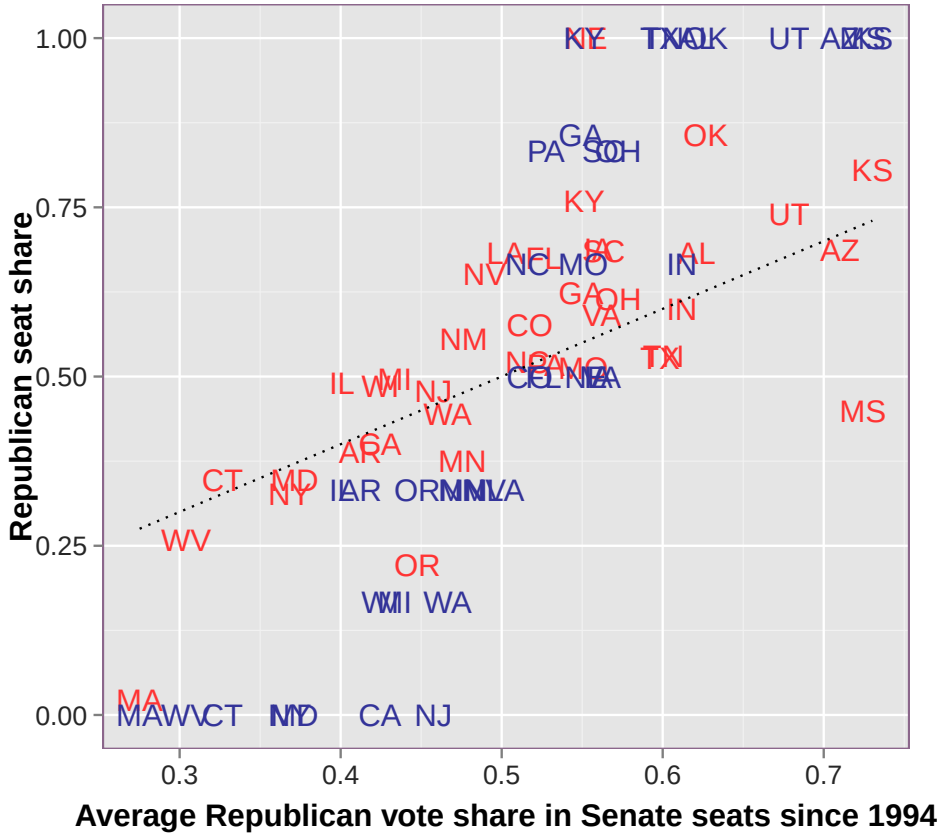

Figure 11: The Loser's Bonus in Congressional elections, 1994-2014

The red markers capture the share of all House seats in the state won by Republicans from 1994 to 2014. States with two or fewer Congressional districts are dropped. The blue markers represents the share of all Senate seats won by Republican candidates from 1994 to 2014. The black dotted line represents proportionality.

Figure 11 reveals the partisan asymmetry seen throughout the paper. As in the simulations, the states experiencing a significant Republican loser's bonus are relatively large, as is the size of the bonus. The bonus is smaller in the states where it favors Democrats, and with the exception of Texas, these are smaller states with relatively few Congressional districts.

Moreover, in several states where Republicans have received slightly more votes on average than Democrats in Senate elections over the last two decades, the red markers are

actually above the blue markers, indicating that Republican Congressional delegations are larger than Senate delegations. Among several others, notable examples include Louisiana, Colorado, and Florida. In contrast, there are no Democratic-leaning states with more than two districts where Democrats over-perform in the House except Oregon, where the difference is quite small. In other words, the loser's bonus does not kick in clearly for the Democrats until they are a relatively small long-term minority of voters, while it is present in all cases but one when the Republicans are a minority, even when elections are quite close.

Conclusion

This paper has provided a new approach to classic questions linking political geography, winner-take-all districts, and representation. Unlike most of the existing literature, we make no assumptions about what a "fair" or "just" vote-seat curve looks like, and we avoid the common practice of simulating tied or reversed elections in order to capture the notion of asymmetric electoral bias. It is difficult to know what a normatively acceptable vote-seat curve should look like in a state where one party is as dominant as the Massachusetts Democrats or the Alabama Republicans, and hypothetical tied Congressional elections are very difficult to imagine in these contexts.

Instead, we ask a related but distinct question: given their underlying geographic support bases, which representation scheme—statewide winner-take-all districts or Congressional districts—is more advantageous for which party? We use automated redistricting simulations to empirically evaluate the notion of the loser's bonus. As long as the parties are not perfectly geographically dispersed, the minority party can hope for a larger seat share

under a districted system than under a statewide system. We show that the magnitude of this bonus is a function of the extent to which the parties' support bases are geographically concentrated.

In the contemporary United States, where population density is highly correlated with Democratic voting, these patterns of partisan concentration are largely a function of patterns of urbanization and industrialization. Democrats win statewide majorities in early-industrializing states, where their support is often highly concentrated in cities in such a way that allows suburban and rural Republicans to win large numbers of seats in the House of Representatives. In states that industrialized later, many of which are less populous, Republicans are dominant in statewide elections, but Democrats are able to pick up seats when Democrats are sufficiently concentrated— that is, when cities are sufficiently large. Aggregating across all states, the absolute size of the former effect is larger than the latter, and the Republicans are unambiguously better off with a system of winner-take-all districts. We have also shown that this effect would dissipate but not disappear with smaller Congressional districts.

By no means do these results suggest that gerrymandering is unimportant. On the contrary, by comparing our simulations with enacted districting plans in notoriously gerrymandered states like Pennsylvania, North Carolina, Wisconsin, and Florida, one can rule out the claim that urban geography is solely to blame for asymmetries in the transformation of votes to seats. Nevertheless our approach in this paper was to hold such factors as gerrymandering and incumbency constant in order to focus on geography. This provides lessons that may be useful for debates about redistricting reform. First of all, our simulations suggest that we should not expect the structural advantage of Republicans in the House of Representatives

to disappear if districting is blind as to partisanship and focuses exclusively on compactness and contiguity.

Second, our results shed light on possible consequences of reform proposals or judicial tests that would force those drawing Congressional districts to achieve so-called partisan symmetry in the transformation of votes to seats (Grofman and King 2007; McGann et al. 2015). The existing literature has paid little attention to the impact of such rules in lopsided states. Using the traditional approach to electoral bias, in an overwhelmingly Republican state like Tennessee, the presence of two majority-Democratic districts would be viewed as significant evidence of partisan bias against Democrats (see e.g. McGann et al. (2015)). This is because when generating a hypothetical tied election, districts in suburban and rural Tennessee would be artificially inflated to somewhere just below a 50 percent Democratic vote share, and the super-majorities of Democrats in Memphis and Nashville-based Congressional districts would undermine Democratic seat gains. However, if we focus on the real world of lopsided Tennessee elections, we see that the clustering of Democrats in Nashville and Memphis is the Democrats' saving grace. If a redistricting reform compelled legislators or a districting commission to seek out partisan symmetry in the unlikely scenario of a tied election, they would be forced to break up Memphis and Nashville and link their fragments with the surrounding suburbs and rural areas, potentially destroying the loser's bonus and handing every seat to the Republicans.

In short, our results indicate that breaking up urban Democratic bailiwicks in the pursuit of partisan symmetry is potentially helpful for the Democrats in states like Illinois with Democratic majorities, and helpful to Republicans in states like Tennessee or Utah that are characterized by long-term Republican majorities.

Our findings also have implications for other reform debates. First, a frequent reform proposal is to repeal the Permanent Apportionment Act of 1929 and increase the size of the House of Representatives so as to resemble other advanced democracies. Our results suggest that this would be beneficial for Democrats. An additional set of reform proposals pertains to the allocation of electoral votes in presidential elections. If all states followed the example of Maine and Nebraska and allocated their electoral votes by Congressional district rather than by state, the result would provide a powerful advantage to the Republicans.

This paper also sets up questions for further analysis in American politics. First, it would be worthwhile to extend our analysis beyond partisanship and look at questions of ideology and representation. Our analysis suggests that the roll-call voting and ideology of Senate delegations might be to the left of the House delegation in the Democratic states with high levels of urban concentration of Democrats, and the opposite might be true in Republican states with high levels of urban concentration. Second, this logic might also extend to state elections, in which case we might expect to see systematic partisan and ideological differences between governors and legislators.

Finally, the most important contribution of this paper is to use a rich source of variation in partisanship and political geography to test some arguments from the classic political geography literature that have been largely ignored since their introduction by Gudgin and Taylor (1979). Above all, when one party's support is more geographically concentrated than its competitors at the relevant scale for drawing electoral districts, the concentrated party is punished for its concentration when its vote share is high, but rewarded when its vote share is low. Calvo and Rodden (2015) demonstrate that this is true for British parties as their support waxes and wanes over time, and here we show that it is true using a cross-section

of U.S. states.

Our approach might also be useful in other advanced industrial federations with two-tiered systems of representation including winner-take-all districts. In both Canada and Australia, left parties are more successful in the long run in some regions than others, and in all regions, left voters are highly concentrated in urban agglomerations while right voters are more geographically dispersed in suburbs and rural areas. Moreover, we have clarified a logic whereby asymmetric geographic clustering can effect the transformation of votes to seats in predictable ways in a variety of other contexts where partisanship is correlated with population density.

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Appendix: The districting algorithm

For each state, we determine the target population of each district in order to produce the required numer of Congressional districts, n. Each precinct is treated as a building block, and our goal is to create n districts with equal population. We do so as follows:

1. To begin the simulation procedure, each of the precinct building blocks represents a single district. Hence, there are thousands of districts in each state, each containing only one building block at the outset.

2. Randomly select one of these districts and denote it as district i.

3. Among the neighboring districts that border district i, select the one whose centroid is geographically closest to the centroid of i, and denote it as district j.

4. Merge district i together with district j in order to form a single new district.

   Steps 2 through 4 are repeated over and over again until there are n districts. At this point in the procedure, these districts are geographically contiguous and highly compact due to the nearest distance criterion employed in step 3. However, the districts are not guaranteed to be equally populated. Hence, repeated iterations of steps 5 through 8 are designed to achieve an equitable distribution of population across the simulated districts. These steps iteratively reassign precincts to different districts until equally populated districts are achieved.

5. Among all pairs of districts that border one another, identify the pair with the greatest disparity in district population. Within this pair, let us denote the more populated

district as m and the less populated district as l.

6. Identify the set of all precincts currently within district m that could be reassigned to district l without violating the geographic contiguity of either district.

7. For each precinct p satisfying the criterion in step 6, define Dp as precinct textitp's geographic distance to the centroid of district textitm minus its distance to the centroid of district l.

8. Among the set of precincts that satisfy the criteria in Step 6, select the precinct with the highest value of Dp and reassign it from district m to district l.