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The Impact of Turnout on Partisan Bias in US House Elections, 1972-2018

Objective: Partisan bias occurs when votes are distributed across districts in such a way that even if the vote between two parties were equal, one party would win more seats than the other. Gerrymandering is a well-established cause of partisan bias, but it is not the only one. In this paper we ask whether the decline of voter turnout can also influence partisan bias. *Methods.* We modified the Gelman-King partisan symmetry measure to make it sensitive to turnout differences across US House elections from 1972 to 2018. *Results:* We found that turnout variation has caused partisan bias in US House elections in the Democratic Party's favour since at least 1972, though turnout bias has gotten weaker in recent elections. *Conclusion.* While turnout bias can buffer the impact of turnout reductions, it has the potential to dramatically increase the number of seats a party loses when its supporters fail to vote.

Key Words: elections, US House of Representatives, bias, gerrymandering, turnout

It is well established within the American politics literature that turnout varies considerably by factors like socioeconomic status and education (Wolfinger and Rosenstone 1980; Leighley and Nagler 2017). However, scholarly findings about the impact of turnout levels on electoral outcomes is more mixed. While non-specialists may believe that higher participation elections increase victories for the Democratic Party and low participation election generally benefit the Republican Party, much of the literature shows a much more murky relationship between voter turnout and election results (DeNardo 1980; Erickson 1995; Nagel and McNulty 1996; Shields and Goidel 1997; Hajnal and Trounstine 2001). For example, using a simulation approach, Citrin, Schickler, and Sides (2003) found that even if turnout was increased to all adult citizens, electoral outcomes would change little. Conversely, Hansford and Gomez (2010) found that turnout variation does influence election outcomes once researchers take endogeneity problems into consideration. Similarly, using another simulation approach, Martinez and Gill (2005) found that the impact of turnout on election outcomes has steadily declined since the 1960s due to the erosion of class cleavages in American voter behaviour.

One potential explanation for these mixed results is that shifts in the vote, including those caused by turnout declines, do not directly translate into shifts in electoral outcomes. This relationship between votes and electoral outcomes is heavily influenced by each country's electoral system, or the overarching rules that translates votes into seats (Shugart 2005). The United States, like Canada, the United Kingdom, and a range of other countries, use a single-member district (SMD) electoral system, in which a country is divided geographically into districts and each district elects a single officeholder based on which candidate receives the most votes. The comparative electoral systems literature has presented overwhelming evidence that in SMD systems the percent of seats each party wins in a legislative body is disproportional to the

percent vote that each party receives during the election. For example, if a smaller party receives around 15% of the vote but that vote is distributed widely across many districts, that party will likely win few if any seats, producing a disconnect between votes and seats.

But there is a second factor, often termed "partisan bias" by political scientists and "electoral bias" by political geographers. Partisan bias is when an electoral system favours one party over another. More specifically, if the votes for two parties are identical but one party wins more seats than the other, then the system is biased in favour of the first party. A common cause of partisan bias, for example, is gerrymandering, since it shifts the vote in a way that creates an advantage for one major party over another.

Another possible cause of partisan bias is the variation of turnout levels across legislative districts. If turnout declines in a two-party system for one major party but remains stable for the other, for example, the impact on electoral outcomes can vary significantly. If the districts in which this party lost supporters are highly competitive, then this party may lose many seats. Conversely, if that vote decline occurs in safe districts, then the impact on electoral results would be closer to zero. The latter case is an example of partisan bias caused by turnout variation. Effectively, if one party is able to win an equal number of seats as the other party with fewer voters because low turnout is not impacting electoral results, then the electoral system is biased in the first party's favour. We refer to partisan bias cause by turnout variation as "turnout bias".

In this paper, we analyse the extent of turnout bias in US House elections from 1972 to 2018. Over this period, the party benefitting overall from partisan bias switched from the Democrats (before 1992) to the Republicans (in almost every election after then). But turnout bias has consistently aided the Democrats. In other words, while supporters of the Democratic Party have tended to vote in lower numbers than supporters of the Republican Party, the use of

single-member districts has partially insulated the Democratic Party from the impact of this turnout disparity. More generally, while partisan bias has varied greatly over the period from 1972 to 2018, the impact of declines in voter turnout on partisan bias has been smaller but more consistent during this period. While turnout bias in US House elections has consistently favoured the Democratic Party during this period, it has been shifting towards zero over recent decades, especially after the 2010 reapportionment.

Political Geography and Turnout Bias

That the results of elections to the United States House of Representatives are often disproportional is well-attested and recognised; each party's share of the seats is frequently incommensurate with its national share of the votes cast. What is less widely-appreciated – although less so in recent decades with the increased attention on gerrymandering and moves to have it outlawed through the courts – is that those results are also frequently biased. In this situation, the two parties are not treated equally by the electoral system; if Democrats and Republicans tied on the same national share of the vote, but the spatial distribution of each party's support was unchanged, they would not necessarily win the same number of seats. Under such circumstances, the Republicans might win x seats, while the Democrats might win fewer (x-z) or more (x+z) seats: z, the difference in seats won by Republicans and Democrats when they have the same national vote share, is a measure of the extent of bias.

Sources of bias in the results of elections conducted in single-member district (SMD) electoral systems have been identified using procedures developed and applied in New Zealand (Brookes 1959, 1960; Johnston 1977), and are well-established in studies of the United Kingdom (Johnston et al. 2001a) but less so elsewhere (though see analyses of US presidential elections –

Johnston et al. 2001b, 2005; Pattie and Johnston 2014 – and of Australia's alternative vote system – Johnston and Forrest 2009). Within political science, a related measure of bias developed by Gelman and King (1994), called "partisan symmetry", is now widely used in this area of research.

Fundamentally, as made clear in Gudgin and Taylor's (1979) classic analysis, disproportionality and bias reflect two aspects of the geography of each party's support – the degree to which its votes are concentrated into particular places, and the degree to which those places are spatially clustered – plus the matrix of district boundaries laid across those distributions. While a common manipulation is gerrymandering, it is not the only likely source of one party's votes being less efficiently distributed than its opponent's. There is also what Gudgin and Taylor (1979) referred to as non-partisan gerrymandering. As Rodden (2019) has persuasively argued and demonstrated, in the US for most of the last few decades support for the Democratic Party has been more concentrated and clustered spatially than that for the Republicans, reflecting the former's electoral strength in the country's urban areas, especially those that formed the geographical core of its manufacturing economy in the early twentieth century and those at the core of the contemporary digital/information/knowledge economy.

Building off of previous work by Grofman, Koetzle, and Brunell (1997), we argue that other factors can also influence bias, including variation in turnout levels across legislative districts. We refer to this type of partisan bias as turnout bias. To the extent that one party is stronger than its opponent in districts with low turnout, this can make election outcomes more disproportional and biased. In a district with 600,000 adult residents entitled to register and vote, if 80% of them turn out, then in a two-party contest 240,001 votes are needed for victory; if only 50% turn out, then only 150,001 votes are needed for victory. At any share of the national vote

total, therefore, a party that is stronger in districts where the average turnout is low will probably get a larger share of the seats nationally in relation to its percentage of the votes cast than one that is stronger in districts with on average high turnout rates, a pattern that has characterized UK general elections over the last seven decades, to the relative advantage of the Labour party (Johnston *et al*, 2021).

In other words, if all districts have more or less the same voting-eligible populations, and turnout is on average lower in seats won by one party rather than another, then the party winning in the lower turnout areas will require fewer votes to elect each candidate than the party which tends to win in higher turnout areas. The former gets a better return for its vote in terms of the number of representatives it returns than does the latter party.

A number of factors can lead to this geographic variation in voter turnout (Gimpel, Morris, and Armstrong 2004; Bartle, Birch, and Skirmuntt 2017; Cebula, Payne, and Saltz 2017). One factor could be the geographic distribution of social groups that are more or less likely to vote (Hill and Leighley, 1999; Johnston and Pattie, 2006; Mansley, E. and Demšar, 2015). In the US, if poorer and less educated voters tend to live in different districts than those who are more affluent or more educated, for example, then the former districts will likely have lower voter turnout than the latter districts. Similarly, governments can create voter suppression policies that tend to reduce turnout in certain areas instead of others – for example, by reducing the number of polling places in urban areas, thereby producing much longer lines and other inconveniences at urban polling areas compared to those in suburban and rural areas (Kimball and Baybeck 2013; Stewart and Ansolabehere 2015; Li, Pomante, and Schraufnagel 2018). The structure of SMD itself can also indirectly influence the geographic distribution of turnout as well. If in a certain district many voters assume that the candidate of one party will win the election, for example,

citizens might be less inclined to vote than if it was a more competitive race (Hogan, 1999; Denver, Hands and MacAllister, 2003; Pattie and Johnston, 2005).

Turnout bias is therefore one component of partisan bias. Partisan bias is the overall bias of an election in one party's favour over another. Turnout bias is how much turnout variations across districts shift this bias in one direction or another. From a strictly mathematical perspective, if one assumes only two parties, turnout bias in SMD electoral systems is caused by two factors: how much one party has lower voter turnout than the other party, and how much that turnout difference is geographically distributed across electoral districts. When turnout declines for Party A in a particular district relative to Party B, one of two things can happen: the party that would have won without the turnout decline still wins with the turnout decline, or the turnout decline leads to the district flipping from Party A to Party B. In the former case, since the percent vote for Party A has declined but the number of seats won by each party has remained the same, turnout bias will become more positive for Party A. Party A won the same number of seats with fewer votes. In this case, the SMD electoral system effectively insulated Party A from the consequences of its voters not turning out. In the latter case, Party A lost both votes and the seat, though there is a high likelihood that this one seat loss would cause a greater impact on the percent of seats lost by Party A than the percent of votes that were lost. In this case, the shift in the turnout bias caused by this district would favour Party B.

Data and Methods

This paper is based on an analysis of US House of Representative election results from 1972 to 2018, covering districts created after the censuses held in 1970 (1972-1980 elections), 1980 (1982-1990 elections), 1990 (1992-2000 elections), 2000 (2002-2010 elections) and 2010

(2012-2018 elections). The data are taken from a larger set compiled by Tamas (2019) that are based on Dubin (1998) as well as data collected by the Office of the Clerk, United States House of Representatives[1]. Apart from the Democratic and Republican party candidates, few others won substantial shares of the votes cast let alone won seats, and so they were treated as missing values. In the case of candidates who were co-nominated by both the Democratic and Republican parties, we coded the candidate as a Democrat or Republican based on which party she or he caucused with after entering Congress and then treated the district as uncontested.[2]

Each uncontested race was treated as a missing value, and then a multiple imputation technique (King, et. al, 2001) was used to estimate what the major party votes would have been had there been both a Democratic and Republican candidate.[3] In the few cases when the district had uncontested races during the entire decade, the percent vote for the winning candidate was imputed as 75%.[4] A similar imputation technique was used to estimate the total number of voters in the few cases in which there was an uncontested race and the state did not report final vote tallies.

In order to identify the turnout rate in each district, an ideal approach would have been to express it as a percentage of the registered electorate. Such data are not available for all districts at all elections, however, and so we have deployed an alternative estimate based on available data. This is the voting-age population, or the entire population aged 18 and over.[5] Many of them may not have been registered as electors, in some places more than others, and indeed many may not have been eligible to vote. No consistent way of allowing for that across five decades has been identified, nor of estimating changes in the population by district between censuses, and so our best estimate of the turnout rate in each election in each district is the voting age population

(VAP), taken from each decennial Census (for each election, VAP data were taken from the most recent Census) with no inter-censual interpolation, divided by the number of voters.

The longest-established metric for evaluating bias was developed by a New Zealand political scientist in the mid-twentieth century (Brookes 1959, 1960); suitably modified it has been applied widely in the analysis of United Kingdom election results (Johnston et al. 1999a, 1999b, 2001a). Gelman and King (1994) have developed a bias estimate that follows a related logic, and they have integrated that estimate into a unified method of analysing the two-party vote within single-member district electoral systems with plurality voting. (On the literature about the development of measures of partisan symmetry within American elections, see Grofman 1983; Grofman et al. 1997; King and Browning 1987; Grofman and King 2007; Stephanopoulos and McGhee 2015; Warrington 2018; Tamas 2019).

Influenced by Edward Tufte's notion of a vote-seat curve (Tufte 1973), the Gelman-King method assumes that votes will shift upward or downward for the Democratic and Republican parties in a generally uniform (but nonetheless somewhat randomly fluctuating) manner across congressional districts. If overall the Democratic Party gained votes in an election in comparison to the previous election, then chances are that vote gain was made across most districts. Following this logic, Gelman and King assume that the Democratic and Republican vote shares follows a particular curve across districts, and that this curve can be shifted upward or downward. Using this assumption, for each election, they shift the curve to the point that the Democratic and Republican parties each received an equal percent of the vote. Thus, to simplify somewhat, if across all districts the Republican party gained 51% and Democratic Party gained 49% of the two-party vote, the Republican vote is shifted down by 1% and the Democratic vote is shifted up by 1% across all districts, making the average percent Democratic and Republican

vote across all districts equal while also keeping the distribution of each party's percent vote the same. With the average percent vote for the two major parties now equal, the 'winner' in each district is then determined. If the two parties win the same number of seats, then the system is considered to be unbiased. Any deviation from that figure indicates bias towards the party that 'wins' more seats (and the excess number of seats taken by the winning party provides a metric for that bias). Applying Gelman and King's logic to this paper, bias is reported as positive if the Democrats 'won' more seats than the Republicans once the vote-seat curve was shifted to the point that the Democratic and Republican parties received an equal percent of votes. Conversely, if the Republicans 'won' a larger number of seats, this is reported as negative bias.

A critical question in applying this method is how an equal percent of votes is calculated. For Gelman and King, one shifts the percent two-party vote across all districts so that the average two-party district vote for both Democratic and Republican candidates is 50%. In other words, the population or turnout differences across districts are not taken into consideration. The approach makes a great deal of sense if one is attempting to measure the impact of gerrymandering on election results, since taking the relative number of voters across districts into consideration would at best add statistical noise and at worst add statistical bias.

For this study on the impact of turnout variation on partisan bias, however, it is fundamentally important that these turnout differences be taken into consideration. For this reason, we calculated partisan bias three different ways. The first looks only at the percent vote, thereby assuming no difference of population or turnout across districts. In the second, we pretended that all adults living in each district voted and estimated the number of votes for Democratic and Republican candidates in each district by multiplying the percent vote and the adult population. (For example, if 100,000 adults live in a district and the Republicans received

55% percent of the two-party vote, then we assumed for this measure that the Republican vote was 55,000 before shifting the vote-seat curve.) Finally, in the third method, we calculated the percent vote using the raw number of Democratic and Republican votes, thereby taking both population and turnout into consideration. In each case, the vote-seat curve was shifted using an iterative process that stopped once the total vote for Democratic and Republican candidates became equal, as defined by the methods discussed above.

Turnout bias is estimated by comparing partisan bias when turnout is taken into consideration (i.e., when the number of votes in each district is compared) against partisan bias when turnout is not taken into consideration (i.e., when we assume that every adult in the district had voted). As we will show below, turnout had a consistent impact on the bias estimate throughout this forty-six year period.

Analysis of Turnout Bias

Figure 1 shows the shift in partisan bias measured the three ways described above. The full, black line shows the estimated bias based on percent vote only, with the number of voters effectively considered equal across all districts during the election in question. The graph shows two main periods of partisan bias using this measure, the first from 1972 to 1992, when the bias was consistently in favour of the Democratic Party, and the second from 1994 to 2018, when the bias was mostly in favour of the Republican Party. In 1984, for example, this measure estimated that the pro-Democratic bias was 49 seats. Indeed, this pro-Democratic bias was very high until 1992, when it began to drop. In 1994, during the Republican Revolution that made Newt Gingrich House Speaker, the pro-Democratic bias dropped to only 1 seat. Following that

election, other than in 2008, when Barack Obama won the presidency, the partisan bias was consistently pro-Republican.

Figure 1 approximately here

An important note is that this measure of partisan bias took a significant shift in the Republican Party's favour in 2012, even though the Democrats again won control over the White House. In this election, while the Democratic House candidates won 1% more votes overall than Republican House candidates, the Republican Party won 33 more House seats, giving it a clear majority. A key reason for this dramatic increase in pro-Republican bias in 2012 might have been extreme gerrymandering by Republican-controlled state legislatures after the 2010 census (McGann *et al.*, 2016; Daley, 2016). Since that reapportionment, the average bias in favour of the Republicans estimated with the traditional approach was 44.25 seats, more than twice the average pro-Republican bias during the 2002-10 period (19 seats.)

The second measure of partisan bias, shown as a broken line in Figure 1, takes population differences across districts into consideration. (In other words, this measure assumes all adults in the district voted but allows for variation in the number of adults across districts.) As the graph shows, there was very little difference between this measure and when only the percent vote was used for the calculations. Of the 24 elections studied, the traditional and full turnout measures of bias were identical in 19, or 80% of the time. The only elections when there was a difference was the earliest four elections, 1972 through 1978, and 2008, and in all but one case the bias differences between these two approaches was four or fewer seats, or less than 1% of the 435 seats in the US House of Representatives. This, of course, is not an unexpected result, since states had been required to make legislative districts equal in population since the mid-1960s.

For our purposes, the most important line in Figure 1 is the one that estimates partisan bias when the percent vote is influenced by turnout. This broken line follows roughly the same pattern as the other two lines. It was significantly pro-Democratic Party through the 1970s and 1980s but then shifted to a pro-Republican bias in the 1990s. Like the other estimates, it also briefly had a pro-Democratic bias around 2008, when Obama won the presidency, and then shifted to its most pro-Republican bias in 2012. However, in every election studied, the turnout bias estimate is more pro-Democratic than the other two estimates. In other words, once one takes voter turnout into consideration, the Democratic Party consistently won more seats than if one effectively assumed that the number of voters was equal or based on full turnout in each district.

Technically speaking, this pro-Democratic turnout bias can be interpreted one of two ways. Either Republican voters turned out in lower numbers in a district that would have otherwise been won by the Republican Party but flipped to a Democratic Party victory, or supporters of the Democratic Party turned out in lower numbers but not enough for the district to flip to the Republican Party. In other words, in the second possibility, there were fewer Democratic voters, but this did not have a significant impact on the number of seats each major party won. The most likely answer is the second interpretation. While US House elections have overall been biased in the Republican Party's favour since the 1990s, that bias has been partially counteracted by how Democratic voters are geographically distributed across House districts.

However, this general statement about the relationship between turnout and partisan bias is just the beginning of exploring this relationship. The bias caused by turnout variation is shown a different way in Figure 2. In this graph, turnout bias is estimated by subtracting the estimated bias if there had been complete turnout (i.e., if turnout was equivalent to the adult population in

each district) from the estimated bias based on actual percent turnout in each district. The solid line shows the turnout bias each election year, while the dashed line shows that the average bias for each apportionment period, which begin in years ending with the digit 2 and end in years ending with the digit 0.

Figure 2 approximately here

Consistent with Figure 1, Figure 2 shows that turnout bias was pro-Democratic Party in each election studied. But the graph also shows that this pro-Democratic bias has not been steady. Instead, it has gotten weaker over this nearly half century period. This decline in the turnout bias becomes especially clear when one examines it by apportionment period, which is shown with the dashed line in Figure 2. From 1972 to 1980, turnout variations led, on average, to a 27-seat bias in favour of the Democratic Party. That pro-Democratic bias dropped to 16 seats during the 1982 to 1990 period. Then, from 1992 to 2010, the average, pro-Democratic bias caused by variation in turnout in the House of Representatives was 13 seats (or more exactly, 12.8 seats from 1992 to 2000 and 13.2 seats from 2002 to 2010). From 2012 to 2018, the bias was 6.75 seats. In sum, over the past half century, turnout bias in US House elections always favoured the Democratic Party but dropped from around 6% of the seats in the 1970s to around 1.5% of seats after 2010.

Turnout Bias in the South

But this decline in the turnout bias was not consistent across the United States. Instead, the turnout bias dropped much faster and more dramatically in the South than in the rest of the country. This is shown visually in Figure 3. For this graph, the South is defined as the states that joined the Confederacy during the American Civil War (i.e., Alabama, Arkansas, Florida,

Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia) while the North is defined, for simplicity, as the rest of the country. In order to keep the analysis consistent, the original percent votes were retained, but the analysis was split between districts in southern states and districts in other parts of the country.

Figure 3 approximately here

As Figure 3 shows, the impact of turnout bias was relatively high in the North from 1972 to 1980, accounting for an average seat gain of approximately 6% of seats for the Democratic Party during this period. After that point, the bias was relatively steady, amounting to approximately a 3% seat gain for the Democratic Party. In the 1982 through 1990 apportionment period, the average Democratic seat gain was 3%. In the 1992 to 2000 period, it was 3.5%, and in the period from 2002 to 2008 the bias averaged 3%. In the latest apportionment period, from 2012 to 2018, the turnout bias dropped to 2% in northern districts.

In the South, the turnout bias began higher and then virtually disappeared by the end of the study period. The turnout bias in the South was high in the 1972 to 1980 apportionment period (around 7%) and remained high in the 1982 to 1990 apportionment period (around 6%). But then, starting around 1992, the turnout bias in the South dropped significantly. It was 1.6% in the 1992 to 2000 apportionment period and then increased to 3% in the 2002 to 2010 apportionment period, though that rise seems to have been mostly caused by a jump in the bias in the Obama presidential victory in 2008 and first midterm in 2010. Then, after the 2010 reapportionment, it effectively disappeared in the South. Over this four-election period, our measure estimates that the Democratic Party gained only one seat due to turnout bias.

In other words, turnout had a big impact on partisan bias in the South in the 1970s but effectively no impact today. Why has the turnout bias declined across the United States and

nearly disappeared in the South? There are two factors worth highlighting. The first, shown in Figure 4, is that there has been a declining relationship between turnout levels and the partisan vote in congressional elections over the past half century. As the graph shows, there had always been a negative relationship between the Democratic vote and turnout levels, but that relationship was stronger in the 1970s than today. While the rate of this drop has been consistent in the South and outside the South, the correlation between turnout and vote has mostly been around .10 weaker in the South than outside the South. Outside the South, the correlation coefficient was around -.40 in the 1972 to 1980 apportionment period, around -.30 from 1982 to 2010, and then dropped to -.17 after the 2010 reapportionment. In the South, that correlation coefficient was around -.30 from 1972 through 1990, around -.20 from 1992 to 2010, and then around -.10 after the 2010 reapportionment.

Figure 4 approximately here

But this is not the end of the story. As discussed above, a critical factor influencing the direction of turnout bias is whether the decline of turnout for a party simply leads to it winning the seat by a smaller percent of the vote or if that turnout decline causes the seat to flip to the other party. In this way, voter suppression and other factors that influence the turnout of a party's supporters have little impact when that decline occurs in a safe district. In safe districts, for instance, supporters of the losing party may be discouraged from voting as their candidate has no realistic chance of flipping the seats, hence reducing overall turnout. It is also possible that some supporters of the wining party in safe seats may stay home too, safe in the knowledge that their candidate is a shoo-in. Both scenarios would result in lower turnout in safe than in competitive districts. In all these situations, lower turnout reduces the votes needed by the most popular party in the district to ensure its victory, registering as positive bias for that party. However, in

marginal districts, any turnout decline could cause that party to lose seats, causing a turnout bias in the negative direction for that party.

As Figure 5 shows, there was a substantial change in how many House seats in marginal districts were won by the Democratic or Republican party in the South after the 2010 reapportionment. Separating by region (gray for the North and black for the South), the graph shows the percent of marginal seats won by Democratic candidates minus the percent of marginal seats won by Republican candidates, with a seat being defined as marginal if the two-party vote for the Democratic and Republican candidates were between 45% and 55%. The graph shows that over most of the period studied, this figure ranged from -0.6% (or a 0.6% advantage for the Republican Party) to 1.9% (or a 1.9% advantage for the Democratic Party.) But after the 2010 reapportionment, this figure shot down to -2.9%. In other words, inconsistent with the rest of the period studied, in the South, the advantage in marginal districts suddenly flipped significantly in the Republican Party's favour.

Figure 5 approximately here

This finding is consistent with the argument that southern states had gerrymandered legislative districts to pack Democrats into a few districts while having the Republican win more seats in marginal districts. It also suggests a potential danger of turnout bias. When seats are won by a small percent of the vote, then the value of voter suppression increases. A small decline in turnout by the supporters of one major party across many marginal districts can lead to a significant turnout bias in favour of the other major party as well as an increase in seats won by the governing party that far exceeds the turnout loss by the other party. Turnout bias dropped to almost zero in the South at exactly the time that marginal districts in that region shifted to the Republican Party's favour.

Conclusion

Our general point in this paper is that bias in SMD elections can manifest itself in a variety of ways that go beyond gerrymandering and "self-packing". One of those ways is turnout, which can impact the results in different ways. Depending on how this turnout decline is distributed across districts as well as how competitive those districts are, that turnout decline can have little impact on seats or flip a much higher percent of seats than the percent turnout decline.

These findings suggest that there is some level of randomness to how much turnout bias an SMD system will have in any given election. Turnout declines by the supporters of one party do not translate directly into that party losing seats. Instead, strategies like voter suppression are usually most effective in marginal districts. When elections are close, shaving off a small percent of voters can cause seats to be won by a party that would have otherwise lost them, potentially producing seat losses for its rival far beyond the percent of voters kept from the polls. In this way, while turnout bias can be relatively small in some circumstances, in other circumstances it can be quite large, leading to dramatic shifts in how many elected positions each party wins.

This also suggests how gerrymandering and voter suppression can be used at once by a party to win control over government without necessarily being supported by a plurality of voters. Through gerrymandering, a party can pack supporters of its main competitor into a small number of districts and create a larger number of districts that are won by a small percent of the vote. Voter suppression then becomes especially effective in those marginal districts, thereby increasing the probability that the party creating the gerrymandered districts wins in the more competitive districts. In these ways, running elections through single-member districts increases

the number of methods that a governing party can use to manipulate elections in order to improve its chances of retaining power without having to win the support of a majority of voters.

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[1] Clerk of the House of Representatives, "Election Statistics, 1920 to Present", https://history.house.gov/Institution/Election-Statistics/. [Retrieved September 1, 2019].

[2] A fraction of American states permit "fusion" candidates, when a single candidate is co-nominated by multiple parties. In some races, the fusion candidate was co-nominated by both the Democratic and Republican party (Tamas 2018). Since 1970, there have been a small number of such races – 46 in total over the full set of elections (New York, 34 cases; Pennsylvania, 10 cases; and Vermont, two cases) and never more than five during any election year. In each of these cases, the fusion candidate won the election without a major party challenger. For this reason, the election result was imputed like an uncontested race with the winning party determined by which party the fusion candidate caucused with during the next congressional term.

[3] Specifically, elections during each apportionment period (i.e., 1972 through 1980, 1982 through 1990, etc.) were combined into a single dataset with each row being a single district. There were five data columns, each containing the two-party percent Democratic vote for each election (e.g., in the above example, a column for 1972, 1974, 1976, 1978, and 1980). If the election was uncontested (i.e., no Democratic candidate, no Republican candidate, or a Democratic-Republican fusion candidate), then the cell for that election was made a missing value. The multiple imputation approach developed by King, et. al (2001) was then used to impute these missing values for each election in which there was at least one contested race within the district.

[4] In other words, if there were no values in a district for the entire apportionment period, then the Democratic vote was imputed as 75% if a Democratic candidate won and 25% if a Republican candidate won. This solution is based on the approach used to impute missing values for uncontested races in King and Gelman (1991). See endnote 4 in Kastellec, Gelman, and Chandler (2008) for explanation of the logic behind this approach.

[5] In some respects, the voting eligible population (VEP) would be preferable to the voting age population (VAP), not least as using VAP can underestimate turnout, and exaggerate the apparent decline in turnout, especially in districts with higher numbers of non-citizen residents (McDonald and Popkin, 2001; Holbrook and Heidbreder, 2010). We are, however, restricted in what we can do here: VAP at least has the benefit of basing all our calculations on a conceptually consistent denominator.