Can Voter Suppression Inflate Electoral Bias? An Analysis of US House Elections, 1870-2018[1]

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Abstract:

Combining Monte Carlo simulations with an analysis of district-level US House of Representative election results since 1870, I explore the following question: Does voter suppression increase electoral bias in single-member plurality (SMP) electoral systems? Much of the literature on electoral bias in the American field assumes that its primary cause is gerrymandering. But as I demonstrated in a recent journal article (Tamas 2019), a key characteristic of SMP is that its translation of votes into seats is heavily influenced by the distribution of party support across geographic space. This geographic influence leads to a situation in which electoral bias can be inflated for a wide range of reasons. In this paper, I argue that the relationship between voter suppression and seat loss in SMP systems is curved. While small turnout declines may have little impact on electoral outcomes, as the number of voters kept from the polls increases, the number of seats flipped can increase exponentially.

Introduction:

One of the critical issues facing current American politics is the rise of new voter suppression laws by Republican-controlled state governments. The immediate impetus for these laws was President Trump's defeat during the 2020 election as well as his reaction to that defeat, which included claiming without evidence that the election had been stolen and which incited a riot against Capitol Hill. But the more critical change was the elimination of preclearance by the Supreme Court, allowing states with a history of voter discrimination to change laws without approval by the Department of Justice? These changes in the law include reducing the number of polling places, especially in urban areas, limiting access to voting drop boxes ETC.

A critical question, based on both the political rhetoric between Republican Party and other political actors as well as from the research on voter suppression, is whether modern voter suppression laws could have a significant impact on American election outcomes. My answer is that voter suppression does not exist in a vacuum. Instead, this and other approaches to manipulate elections are filtered through the electoral system, or the overarching rules that determine how votes are translated into seats. As I will show below, in proportional representation (PR) electoral systems the relationship between voter suppression and seat loss is largely linear. As an increasing number of supporters of a political party are kept from the polls, the percent of seats lost by that party due to voter suppression rises slowly and steadily. It does not matter if the voter suppression is concentrated in one geographic region, nor does it matter how relative party support varies geographically. Generally speaking, for every one percent decrease in the vote for a party relative to other parties, that party would lose half a percent of seats in the legislature.

In comparison, within a single-member plurality (SMP) electoral system, a particular threshold has to be reached before it has an electoral impact. A range of factors influence what this threshold would be, but the simplest determinant is the marginality of districts. When few districts are competitive, as is the case in the current US elections, then the impact of voter suppression that blocks only a small percent of voters will have minimum impact on the number of districts flipped.

In this way, gerrymandering and voter suppression can actually work against each other, since the packing of the supporters of one party into a few districts also insulates them from having those districts flipped from keeping a small percent of voters from the polls. However, as the percent of supporters of one party are kept from the polls is increased, the likely impact on the political system can be devastating. It can produce an avalanche of seats flipping from one party to another. In this way, in SMP systems, the impact of voter suppression on seats flipped can look like a curve. It can be very low when only a small percent of voters are kept from the polls, but then rise exponentially as a higher percent of voters are kept from the polls.

To put this in other terms, responsiveness is often considered a positive attribute in electoral systems – that change in voter attitudes also creates a change in government. However, when a political system is highly responsive, such as when there are many competitive districts, that system is likely also highly responsive to voter suppression strategies as well. Under these circumstances, voter suppression can be like a "double whammy" to citizens who are first unfairly kept from the polls and then, because of the electoral bias caused by how SMP translates votes into seats, lose representation far beyond the percent of voters who are kept from participating. As the competitiveness of elections decline, the impact of voter suppression weakens, unless the percent of voters kept from the polls can overcome these margins. However,

margins of victory are not the only factor. For example, because SMP runs elections through districts, geographically concentrated can also increase the impact of voter suppression strategies on electoral outcomes, which is especially possible when election laws are defined through a federalist system. None of these factors matter in PR systems.

This approach to understanding the impact of voter suppression suggests that current voter suppression laws in the US might be at a low level of the curve, and that they are not as of yet effective enough to significantly alter most election outcomes. However, that same framework also suggests that more effective approaches to voter suppression in the US could significantly damage the relationship between the vote and representation. Under those circumstances, voter suppression techniques become one more current threat to American democracy.

Voter Suppression, American Style:

Driven by significant legal changes over the past decade, voter suppression has become a critical area of research on American politics. The most recent era of voter suppression has been set off by two key events. The first was the Florida felon lists during the 2000 election, in which the state removed citizens from the voting roll because their names were similar to people who had committed felonies in Florida or Texas, a move that was almost certainly decisive in flipping the presidential election from Al Gore to George W. Bush. The second was a group of Supreme Court cases which gave states more leeway in changing their voting laws, most notably Shelby County v. Holder, 570 U.S. 529 (2013), which called the preclearance requirement for certain states state law changes unconstitutional on the grounds that the data it was based on was forty years old. (Preclearance, states with history of racial discrimination in voting laws had to gain

preclearance from the Department of Justice before they could change laws restricting access to the vote.) This was followed recently by BRNOVICH v. Democratic National Committee (2021), which upheld Arizona's new restrictions to voting and stated that the courts would overturn voting restrictions only when they impose substantial burdens on minority voters, effectively blocking their ability to vote. Producing inconvenience, including increasing cost of voting for one group as compared to another, is not enough to challenge state voting law, and plaintiffs would have to demonstrate intent

These newest wave of voter suppression laws primarily attempt to increase the cost of voting by producing new barriers. While there are a wide range of changes to the laws proposed or already enacted by Republicans in state legislatures, they generally follow the same themes. (1) Create or increase formal identification by citizens before they are permitted to vote, such as providing a drivers license. (2) Limiting the use of mail-in or absentee ballots, such as by requiring reason for using a mail-in ballot, requiring extra identification on an absentee ballot, or in Texas's case, permitting voters over 65 to use absentee ballot without reason while barring everyone younger – potentially, since older voters are more likely to support Republican candidates. (3) Reducing the number of polling places, especially in urban areas. This change includes reducing the times that polling places can be open, reducing access to ballot drop boxes, and making other changes that increase wait times and reduce access to voting, especially in areas that are heavily populated by supporters of the Democratic Party. (4) A long list of other factors that increase the cost of voting – Arizona, disallowed carriers of ballots, which makes voting in Native American regions much more difficult. One of the most famous, Georgia disallowed groups from handing out water and food to people waiting in line to vote, which often took hours in the Atlanta area.

A critical question, and much of the research on this, is how much voter participation is reduced by voter suppression laws. The results are decidedly mixed. For example, while some studies have shown no impact of voter identification laws (Ansolabehere 2009; Mycoff, Wagner, and Wilson 2009), others have found that stricter identification laws do reduce turnout of ethnic minorities (Hajnal, Lajevardi, and Nielson, 2017). Similarly, recent research has found little evidence that variations in laws on voting by mail impact turnout (Thomson, et. al 2017; Yoder et. al 2021). Conversely, Li, Pomante, and Schraufnagel (2018) found that combining various types of voter suppression into a single index produced a measure that demonstrated that increasing the cost of voting decreased voter turnout.

Combined, these research findings suggest that current types of voter suppression laws have a real but limited impact on voter turnout. Consider in comparison the current impact of gerrymandering on state legislative elections. Within states like West Virginia, Wisconsin, and North Carolina, the effect of gerrymandering on election outcomes is overwhelming and obvious, and in the case of races to the US House of Representatives, the impact of gerrymandering is muted only by federalism leading to the varying laws of different states working against each other. The impact thus far by the new wave of voter suppression laws is likely real but not yet strong enough to be registered by standards social science statistical methods, especially considering the various other factors that could impact turnout.

Why is voter suppression relatively weak thus far? One explanation is that policies that reduce turnout by particular social groups have lower legitimacy than they did a half century ago. In other words, the Civil Rights Movement took significant steps towards undermining the justification of these types of laws, and for that reason states looking to reduce the vote by urban dwellers or ethnic minorities have to find sneakier ways to keep them from submitting their

ballots. So instead of creating literacy tests that impossible to pass and given only to African-American voters, states have to invent more subtle approaches, like requiring all voters to show an identification card or reducing the number of polling places in highly populated areas. Effectively, thus far, the states are skimming, and hoping that reducing the vote by a small amount will translate into victories in important close races.

Voter Underrepresentation and Asymmetrical Disproportionality:

The critical point of this paper is that voter suppression (and other techniques for producing voter underrepresentation) is translated through the electoral system, or the overarching rules that translate votes for candidates or parties into the percent of elected positions those candidates and parties win, has developed into one of the critical areas of political science. Tracing its roots to Duverger's *Political Parties* (1954), the study of electoral systems has found a range of ways that these systems impact the domestic politics of a country. Probably the two central findings have been that majoritarian systems, including and maybe especially SMP, favor two (or at least two-and-a-half) party systems and have high disproportionality – that is, the percent of seats that each party wins in the legislature is not proportional to the percent of votes that party received in the legislative election. Building off of Duverger's framework, Arend Lijphart (1991) has argued that SMP is one factor leading to majoritarianism, which he argues is a system more likely to slip into authoritarianism than consensus systems, which are more likely to have proportional electoral systems.

In this paper, I expand upon this argument that SMP increases dangers to representative democracies by placing voter suppression within the context of electoral systems. Specifically, I argue that voter suppression and other forms of voter underrepresentation create an electoral bias

in SMP systems that can lead to far greater seat loss than in more proportional electoral systems. The impact of voter suppression on electoral results is rarely linear and never deterministic. While blocking a small percent of citizens from voting in SMP systems might produce little impact, since the suppression has to meet a certain threshold before it starts changing electoral outcomes, at a certain point that suppression can set off a cascade of seats being switched from one party to another. While it varies by electoral system and election when the number of seats being lost starts accelerating in relation to the percent of voters being kept from the polls, that pace generally far exceeds the impact of voter suppression in a more proportional electoral system. Moreover, because elections are conducted in districts with single winners, parties can also gain electoral advantages through geographically concentrating the voter suppression, such as by blocking a high percent of voters within certain regions or by concentrating these suppression tactics in specific types of geographic areas, such as in urban centers.

In taking this step, I am addressing both the literature on disproportionality and electoral bias (often referred to as "partisan bias" within the American literature), or the degree to which an electoral system favors one set of parties over another. Within this literature, electoral bias is generally treated as distinct from proportionality, or the degree to which the percent of seats won by each party is reflected in the percent votes it receives. For example, Gudgin and Taylor (1979) argued that disproportionality and bias reflect two aspects of the geography of party support, or the degree to which voter support is concentrated spatially and the degree to which those locations are spatially clustered. Grofman and King (2007) similarly distinguish between proportionality and partisan symmetry, based on a concept of fairness. In their conceptualization, a party receiving 55% of the vote does not mean that they should be allocated 55% of the seats in

a legislature. Instead, if elections are symmetrical, then if either Party A or Party B received 55% of the vote, they should receive an identical number of seats.

I would argue, to the contrary, that disproportionality is inherently a type of bias. To make this point, I would argue that one has to distinguish between bias and noise, or random fluctuation, across electoral districts within an SMP system. In the simplest terms, bias is directional while noise is random. While noise cancels itself out if there are enough cases, bias systematically shifts the results in a positive or negative direction. In SMP systems, at the district level, there is always noise. As long as there are at least two candidates running, it is very unlikely that one of the candidates will receive 100% of the vote. However, since it is a single-member district, winning candidate will receive 100% of that seat. 100% minus the percent vote received by the winning candidate is, by definition, the disproportionality at the district level. The critical question is whether that discrepancy is randomly distributed across districts, or if they systematically favor one party over the other. If this discrepancy is randomly distributed, they will largely cancel each other out, leading to election results that are largely proportional to the distribution of votes. If they are systematic, such as if a party consistently wins many district-level elections by a small percent of the vote while the other major party wins a small percent of district by a very wide margin (a common consequence of gerrymandering, for example), then the systematic discrepancy, or bias, will produce significant disproportionality.

While there are likely a wide range of ways that SMP biases electoral results, two key types are particularly important for this discussion. The first relates to the distribution of the percent vote across districts. Much of the research on electoral bias focuses on this type of bias, including as it relates to gerrymandering or the geographic distribution of voters (Johnston, et. al 2001), such as Rodden's work on the urban concentration of the Democratic Party and other pro-

labor parties (Rodden, 2019). The second relates to the distribution of the number of voters across districts. Effectively, the higher the number of votes in a district relative to other districts, the lower the influence each voter in that district has on the electoral outcomes relative to voters in other districts. If the relative number of voters in districts is systematically related to what party these districts elect, then effectively there is a bias against voters in the districts with more voters. Put in the simplest terms, if both parties in a two-party system received equal votes in a legislative election, and each district was won by 55% to 45% of the vote, but the first party was elected in districts that all had twice the number of voters than those won by the second party, then the second party would win 67% of the seats – that is, twice as many seats as the first party.

This also implies that SMP systems have underlying biases that are less obvious, better hidden, and barely explored by election and electoral system scholars. While disproportionality is inherently a form of bias, most proportionality indexes do not capture that bias. This is because they attempt to encapsulate all disproportionality within a single election to a legislative body in a single number, and because that number is often calculated as always being positive. This approach has its advantage, especially when applied to many comparative politics studies. It produces a single figure that can be compared across countries or for the same legislative body over a time series. However, in the process, these measures hide the various forms of bias that exist within SMP and other electoral systems. First of all, these indexes lack direction. They cannot indicate whether there is a bias in favor of one party over another party, or one type of party in relation to another type of party, since all the disproportionality is combined into a single figure. This collapsing of all disproportionality also means that unless there are only two parties, the bias across two sets of parties cannot be measured. For example, the bias between the Conservative Party and Labour Party in the UK cannot be determined using most proportionality

indexes because those indexes are also registering the bias in favor or against smaller or more regional parties.

Measuring this bias is another factor. If one is examining the relationship between votes and seats, then it is very difficult to directly ascertain how much voter suppression has impacted the distribution of seats in government. The foremost problem is that it would be nearly impossible to measure with accuracy how much voter suppression led to a decline in vote in each legislative district and then use that information to calculate the number of seats that switched party hands because of that turnout decline. Moreover, if one is concentrating on the impact on electoral bias, then the impact does not occur directly from voter suppression or even turnout decline to seat loss. Instead, the bias is caused by the variation of the number of voters across districts, which is encapsulated in the concept "voter underrepresentation."

At a purely conceptual level, voter underrepresentation can be compared to gerrymandering as follows. At a mathematical level, gerrymandering can be conceptualized as swapping voters across districts. In other words, when government gerrymanders districts, they are redrawn in ways that keeps them the same size, but certain voters are switched to other districts. In terms of outcome, they are equivalent to large numbers of people moving from one district to another, if for each person moving there was another person who moves in the exact opposite direction, thereby keeping the populations of the districts constant. One could even compare it to individuals changing their party allegiances as long as in a neighboring district another individual changed their party allegiance in exactly the opposite direction. In terms of the vote, all of these conceptualizations would produce the same results. Of course, the critical difference between gerrymandering and these other examples is that the former is coerced.

Voter underrepresentation is about changing the number, and composition, of voters in each district. In malapportionment, it is equivalent to the movement of voters from one district to another without switching. In this way, the population of one district grows while the other decreases – and for the voters in the increased population district, the relative value of their vote declines in relation to the district with the smaller population. (In other words, if a district has twice the number of voters as another district, then the influence of each voter in the outcome of the election is half that of each voter in the less populous district.) Indeed, the history of malapportionment in the United States was consistent with this abstract description. As people moved from rural areas to the cities, but legislative district lines remained the same, the population levels across districts became steadily more varied.

In comparison, voter suppression is equivalent to removing voters from a district without putting them into another district. Other than that malapportionment moves the process at twice the rate—every removal of a voter in one district is matched by adding a voter in another district—the process is effectively the same. As voters are removed from a district through either suppression or even simply choosing not to turn out, the value of the vote for those in the district who do vote increases. In this way, if two districts have exactly the same population, but in one district has twice as many people vote than the other, in the district in which turnout was very low the influence of those who vote would be twice that of those who voted in the first district.

Put in this way, voter suppression is a subset of voter underrepresentation. When voters are blocked from the polls (or do not vote for any other reason), they effectively increase the influence of those who do vote, and the influence of these remaining voters is higher in districts with fewer voters than more voters, regardless of whether this variation in the number of voters is caused by turnout variation or malapportionment. In this way, a fundamental piece of logic in

this paper is that voter suppression can reduce turnout by certain groups, which does influence levels of voter underrepresentation, which in turn can produce electoral bias.

There is, however, one critical distinction between malapportionment and turnout variation. Malapportionment is always based on geographic variation, or putting a higher population in one district than another. Technically, voter suppression can be absolutely consistent across districts and still produce electoral bias. If there are two parties running for seats in a legislative body in an SMP system, and an increased number of supporters of the first party are kept from the polls, and if the system is particularly responsive, then the seats can flip to the first party at a faster rate than the second party is losing voters.

In this way, I distinguish between geographically uniform and geographically varied shifts in turnout levels. While it is conceptually easier to analyze vote shifts as consistent across districts, this assumption is unrealistic when one is analyzing the parts of vote shifts caused by voter suppression. (1) Voter suppression techniques often target particular subpopulations, which means that their impact will tend to vary in relation to where this subpopulation lives. (2) Voter suppression techniques are often explicitly focused on geographic areas. For example, reducing the number of polling places by county will tend to produce much longer wait times in urban than rural areas, which in turn would impact urban districts more than rural districts. (3) In the US case, most election laws are enacted by state governments, effectively creating geographic variation in national-level elections.

The most commonly used measure of electoral bias, Gelman and King's partisan symmetry measure (Gelman and King 1994), is based on the vote-seat curve and therefore assumes that in SMP systems vote shifts are generally consistent across districts. While different districts support each political party at different levels, when vote shifts nationally, the vote will

generally rise or decline for each party in a largely consistent manner across districts. One cannot make this assumption when gauging the impact of voter suppression.

This is important because the above approach is based on assumptions consistent with the vote-seat curve, which is an assumption widely used when attempting to determine the electoral bias within a system. The vote is assumed to increase or decrease for each of the two major parties in a consistent pattern, by and large, across districts. While there is good reason to make this assumption in general, it does not apply well to voter suppression, where levels of suppression will vary geographically and therefore across districts.

One approach to measuring electoral bias that does not depend on an assumption of geographic consistency across electoral systems is asymmetrical disproportionality. Asymmetrical disproportionality (Tamas 2019) unifies concepts of disproportionality, commonly used in electoral systems research, with notion of directionality, or bias, commonly used in American politics research especially as it relates to the impact of gerrymandering. One measure of asymmetrical disproportionality is the directional proportionality index, or DPIx, which is based on the Loosemore-Hanby index, and shows the degree to which an election disproportionately benefits one party over another while keeping the impact on all other parties constant (see if correct wording, “constant”.)

The purpose of DPIx is to measure asymmetrical disproportionality, or the degree to which the electoral system affects the results for some parties more than other parties. Unlike most proportionality indexes, which produce a single figure to summarize the aggregate amount of disproportionality for an entire election, DPIx measures the relative disproportionality for one set of parties as related to another set of parties. (For example, it might measure the disproportionality for a single party in relation to another party, such as the Democratic Party in

relation to the Republican Party, or third parties in relation to major parties.) The basic equation for DPIx is the following:

$$\frac{(S_1 - V_1) - (S_2 - V_2)}{2}$$

with:

- S_1—the total percent seats won by all parties in the first set.
- V_1—the total percent vote for all parties in the first set.
- S_2—the total percent seats won by all parties in the second set, and
- V_2—the total percent vote for all parties in the second set.

If voter underrepresentation impacts electoral bias, two factors should be true: (1) the vote would be lower in some districts than other districts, and (2) these differences in the number of voters would also be related to party support.

The impact of voter underrepresentation, the asymmetrical disproportionality between the two major parties if the percent of seats elected actually represented the percent of voters who actually voted in the district. In other words, proportionality related to the number of voters per district. If one district has half the voters of a second district, then in terms of the impact on the outcomes based on who actually voted, then District 1 and District 2 would not each elect a single representative, but mathematically, District 1 would produce 0.67 representatives and District 2 would elect 1.33 representatives. – One could therefore correct the number of seats each party wins – in simplest situation, when there are no multimember or overlapping districts, simply calculate the seats in each district as the number of votes divided by the mean number of voters across all districts. An alternate version of DPIx can then be calculated as the expected value if seats actually reflected the number of votes.

$$\frac{(S'_1 - V_1) - (S'_2 - V_2)}{2}$$

The asymmetrical disproportionality caused by voter underrepresentation is therefore the DPIx minus the expected value of DPIx. This can be shown simply by combining these equations. Since votes in each district are identical, they cancel each other out, leading to the electoral bias caused by voter underrepresentation being nothing more than the relative difference between the relative percent of seats won by the two sets of parties compared to the relative percent of seats that would have been won had the allocation of seats actually reflected the number of people voting in each district:

$$\frac{(S_1 - S_2) - (S'_1 - S'_2)}{2}$$

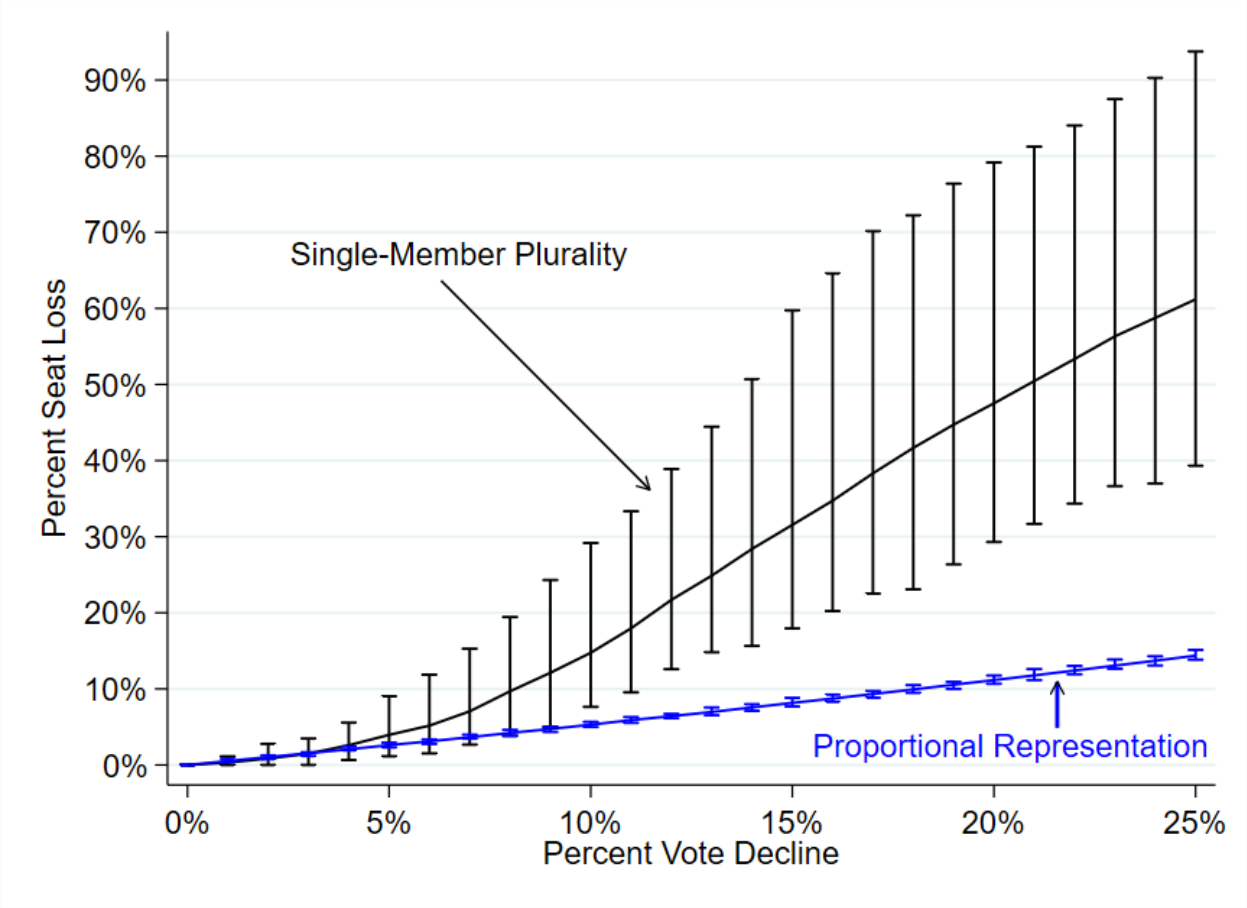
In other words, the impact of voter underrepresentation on electoral outcomes is the difference between percent seats won by each party and the percent seats each party had won had the number of seats won per district reflected the variation in the number of votes per district. Since malapportionment has been outlawed in US legislative elections, the critical factor causing voter underrepresentation in elections below the senatorial level is variation in turnout, which in turn is influenced by voter suppression. In this way, this paper is based on a chain of logic. While it cannot show directly how many seats are lost because of voter suppression, it can show how differing turnout levels between supporters of the Republican and Democratic parties impacts electoral outcomes, and therefore it can show how an increased impact of voter suppression on Democratic voter turnout can lead to increased seat loss by that party.

Geographically Uniform Voter Suppression:

The simplest approach to analyzing the relationship between voter suppression and electoral outcomes within the context of different electoral systems is to assume that voter suppression is geographically uniform. In this scenario, if a certain percent of supporters of a particular party are kept from the polls because of a new set of voting restricts, then this impact would be largely uniform across districts. For example, in a two-party system, if voting restrictions are geographically uniform, then a 1% decrease in turnout of supporters of the first party relative to the supporters of the second party would be largely the same across all districts. This assumption is largely consistent with the assumptions behind the vote-seat curve (Tufte, 1973), which also assumes that two-party vote shifts are general uniform across legislative districts (Gelman and King, 1994).

A Monte Carlo simulation provides one approach to analyzing the different impact of voter suppression between PR and SMP systems. In the simulation results presented in Figure 1, an imaginary political system was created with only two parties (Party A and Party B). It is also divided into 500 districts, each containing 10,000 voters. In each simulation run, a percent of votes was randomly selected for each party in each district. To keep the results realistic and useful in an analysis of American politics, the randomizing function began by first selecting the vote for candidates nominated by Party A in each district, which then meant that the vote for each candidate nominated by Party B would simply be 10,000 minus the Party A vote in each district. To reflect a system in which there are few marginal districts, a second randomization was added that skewed the results in favor of the Party A or Party B candidate by between 0% and 3% of the vote.

Figure 1: Simulated Impact of Voter Suppression on Seat Loss By Electoral System



Once the votes were calculated, the party winning each seat in the 500-member assembly was calculated two ways. The first was in a PR system employing the D'Hondt method with a 1% minimum vote threshold. (In truth, since there are only two parties, it is unlikely that the type of method used would make any difference in the results, and both parties consistently received far more than 1% of the vote, making the minimum vote insignificant in the results moot.) To maintain simplicity, this was assumed to be a national PR system, like Israel, with the entire country acting as a single, multimember district. The second was a simple SMP system in which the candidate receiving the most vote in each district won the seat in that district.

This initial simulation results also assumed full turnout. Every district had exactly 10,000 voters. But, once the initial results were calculated for each run, then geographically consistent voter suppression was used to incrementally reduce the number of votes for Party A while keeping the votes for Party B identical. That percent reduction was always based on the number of voters for Party A in the district, not the overall vote for both parties in the district or the total vote across districts for Party A during each election. In this way, if Party A initially received 8500 votes in a district (and Party B therefore received 1500 votes), then during the first iteration (when 1% of Party A supporters are kept from voting), Party A support would be reduced to 8415 votes. During the second iteration (when another 1% of Party A supporters are kept from the polls), Party A support would be reduced to 8331 votes. Meanwhile, Party B votes would remain at 1500. During each iteration, the number of seats won by Party A and Party B were recalculated using both the PR and SMP methods. The critical statistic, shown in Figure 1, is the

additional percent of seats that Party A would lose, using both the PR and SMP methods, with each additional percent of its supporters that are kept from voting.[2]

As Figure 1 shows, in the PR system, Party A slowly but steadily lost seats as its supporters were removed from taking part in the election, one percent at a time. It did not matter how the votes were distributed across districts, or what percent of the vote Party A and Party B began with before voters were removed. In every case, for every 1% of Party A supporters removed (or obstructed/suppressed), that party lost around one-half of a percent of its seats. In truth, while this relationship looks like a straight line, it is actually a very slowly rising curve. As the percent of Party A supporters being removed increases towards 100%, this curve shifts upwards. Once 100% of Party A supporters are removed, Party A loses 100% of the seats it had initially won during the election. This pattern remained consistent regardless of the details in how the simulation data was set up.

There is also very little variation in the percent of seats lost related to the percent of Party A voters kept from the polls, as is shown by the tight confidence intervals for PR systems in Figure 1. The relationship between vote reduction and seat loss is almost mathematical for the relationship between seat losses and vote reduction in PR systems, but not quite. The results

[2] My initial plan was to run each election 5000 times, in order to produce a good sample of the simulated relationship between vote reductions and seat reductions using the PR and SMP systems. However, this approach led to two problems. (1) The lines showing the average seat loss caused by a percent vote loss became extremely smooth, even though the data suggested a considerable amount of jaggedness, especially in the SMP elections. This produced an artificial smoothness that did not properly reflect the actual change in seats being produced in the simulation. (2) Theses added number of elections also caused the confidence intervals to tighten (and even seem to disappear in the case of PR elections), which effectively hid information and thereby reduced the explanatory power of the approach. For these reasons, I reduced the number of elections in each test to only twenty.

showed a great deal of consistency with a very small amount of variation regardless of how the votes were distributed, including the overall percent vote for Party A in relation to Party B.

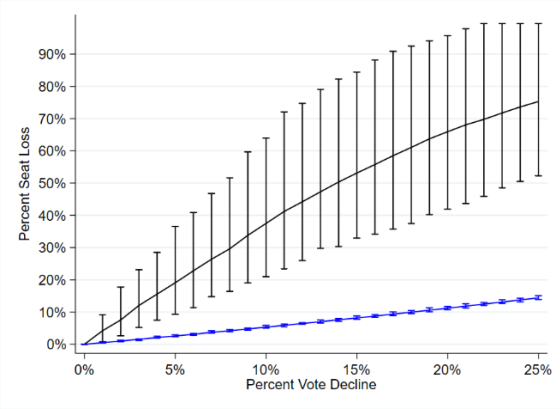
In contrast, the relationship between vote reductions and seat loss were very different in SMP systems, as is indicated in Figure 1. As compared to PR, and as is shown by the much wider confidence intervals, there is a great deal of variation in how many seats a party will lose because of its voters being kept from the polls. Indeed, with SMP, even if the vote reduction is consistent across districts, there is no way to predict with great accuracy what the impact would be in terms of actual seat loss.

Nonetheless, with SMP systems, there tends to be a curved pattern in the impact of vote reductions on seat losses, as is suggested in this graph. When only a small percent of supporters of a party are kept from the polls, the impact on actual seat loss can be low, depending on how many marginal districts there are. If the party having voters being blocked from the polls wins most of its seats by a large margin, then the impact will be minimal and potentially lower than for a PR system. But as the percent of voters being kept from the polls is increased, there is an increased likelihood that more seats will flip. At this point, while the impact of voter suppression in PR systems remains stable and mostly limited, with SMP systems the impact could be much larger. In this way, depending on how votes are distributed across districts, the impact of voter suppression could be catastrophic.

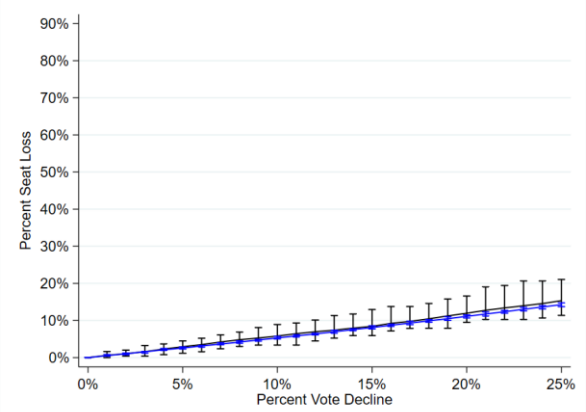
However, it is important to emphasize that this result is heavily influenced by the way that votes are distributed across districts, as mentioned above. This is shown in Figure 2, in which the same simulations are run again but the underlying assumptions about the vote distributions are changed. Figure 2a, for example, shows the impact of voter suppression when there tends to be more marginal seats -- that is, when the system is considered responsive to vote

Figure 2: Other Simulated Impact of Voter Suppression on Seat Loss By Electoral System (SMD in black, PR in blue)

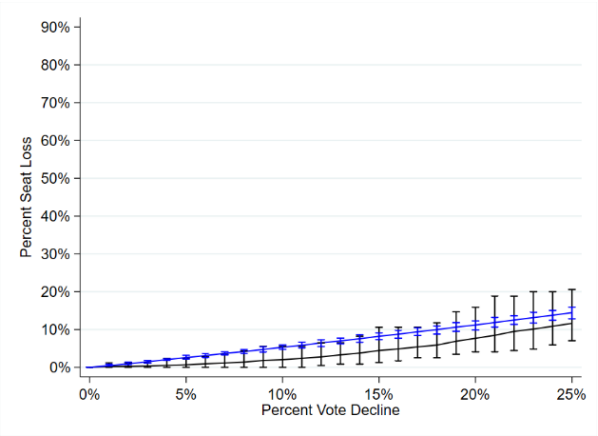
2a. Responsive



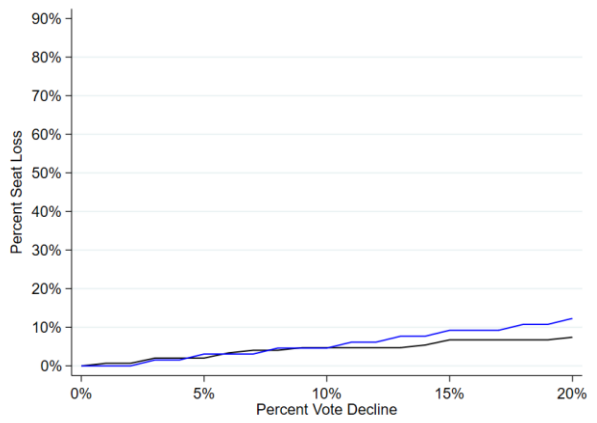
2b. Normal Distribution



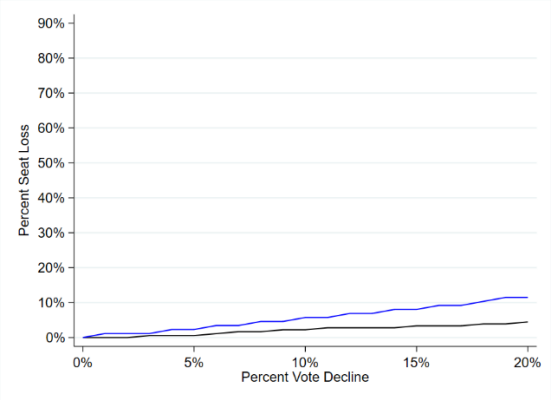
2c. Very Gerrymandered



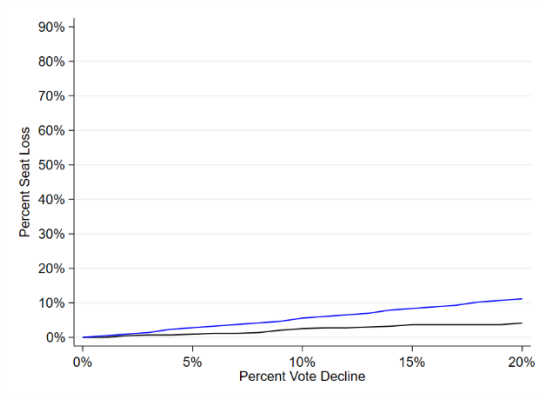
2d. Texas House



2e. Georgia House



2f. US House



shifts. (The model's assumptions were identical to those in Figure 1, except that there was no randomized skewing of results, which led to most districts being more competitive.) As the graph suggests, an SMP system that is responsive to shifts in the vote, which is generally considered a good thing, is also responsive to voter suppression, which most would agree is a danger. In this scenario, if 10% of a party's supporters were kept from the polls, then while that party would have lost around 5% more seats using a PR system, it would lose around 37% more seats using SMP. By the time it reaches a 15% reduction of a party's supporters, that party would have lost over 50% of the seats that it had won without the voter suppression.

Figure 2b shows the relationship between percent seat loss and percent vote reduction when the distribution of votes across districts is uniformly random. (In other words, while in the last two simulations the vote distributions were based on normal distributions with the mean votes and standard deviations also being chosen randomly, for this graph the vote in each district was selected as a uniform random distribution.) In this case, the difference between SMP and PR systems is almost indistinguishable, with the average seat losses for the PR system falling well within the confidence intervals for the SMP system at every level of voter suppression.

Figure 2c shows the relationship between percent vote reduction and percent seat loss when the distributions are very skewed in each party's favor – for example, when the districts have been significantly gerrymandered. In other words, the assumptions in this simulation were the same as the simulation shown in Figure 1 as well as in Figure 2a, except that the skew was selected randomly to be between 0% and 25%. So, if Party A won a district by 55% of the vote, this simulation would add anywhere from 0% to 25% to that vote. If on the other hand, Party A lost a district with 45% of the vote, then the simulation would reduce that vote even farther by

0% to 25%, producing a starting vote between 20% and 45%, but never below 0% or above 100%.

The graph shows that when most seats are safely won by one of the two major parties, the impact of voter suppression is even weaker for SMP systems than for a PR system. Within this simulation, the impact of voter suppression on vote loss was always lower for SMP than PR, and with the former sometimes creating a quarter of the impact on seat loss than the latter. At the same time, the impact of voter suppression on the SMP system rose steadily in comparison to the impact on the PR system, and by the point when 25% of Party A's supporters are kept from the polls the results for the PR system are consistently within the confidence intervals for the SMP system, though again, the average SMP results are always lower in this test.

Figure 2c is important because it might best reflect the current circumstances in states currently enacting voter suppression laws as well as the impact on congressional elections. The last set of graphs (Figures 2d, 2e, and 2f) show the same analysis using actual results in legislative races instead of simulated results – in this case, based on the Texas House of Representatives, Georgia House of Representatives, and US House of Representatives elections in 2020. In each case, like with the other simulations, 1% of the vote was removed from Democratic candidates in each district during each iteration, thereby showing how many Democrats would have to be blocked from voting before it had a significant impact on the legislative election outcomes. As the graphs demonstrate, for these elections, the number of Democratic voters kept from the polls would have to be substantial before there was a significant impact on overall electoral outcomes.

Geographically Varied Voter Suppression:

While the analysis above can help explain the logic behind how voter suppression and the electoral system can interact, it is also artificial in two important ways. The first, and most obvious, is that voter suppression strategies are very unlikely to be capable of pinpointing the supporters of a single party. Instead, the strategy is much more likely to target groups most likely to vote for a particular party (or set of parties), but that the tactics would produce a significant amount of collateral damage. For example, approaches that focus on limiting the vote of poorer people, such as by banning former felons from participating in elections or increasing requirements that weigh more on those without resources, might decrease the vote for Democratic candidates more than Republican candidates, but will nonetheless affect both, if to different degrees.

Second, the analysis above also assumes a geographically uniform attack on voter participation. In other words, it not only assumes that voter suppression would decrease the vote for one party alone, but also that level of impact on that party would be largely equal across all legislative districts. While this may be true for legislative elections in general, for voter suppression the opposite assumption is more appropriate, that there is considerable variation across districts. (1) To the degree that voter suppression targets attacks particular sociological groups, such as those based on ethnicity or class, and since these groups tend to cluster instead of be uniformly distributed across geographic space and therefore legislative districts, the impact of these efforts will also affect some districts more than others. (2) Voter suppression strategies can also be explicitly geographic in nature, such as when states attempt to make it far more difficult to vote in urban areas than rural areas, for example, by determining the number of polling places based on county instead of population density. (3) In the US, many of the laws that produce voter

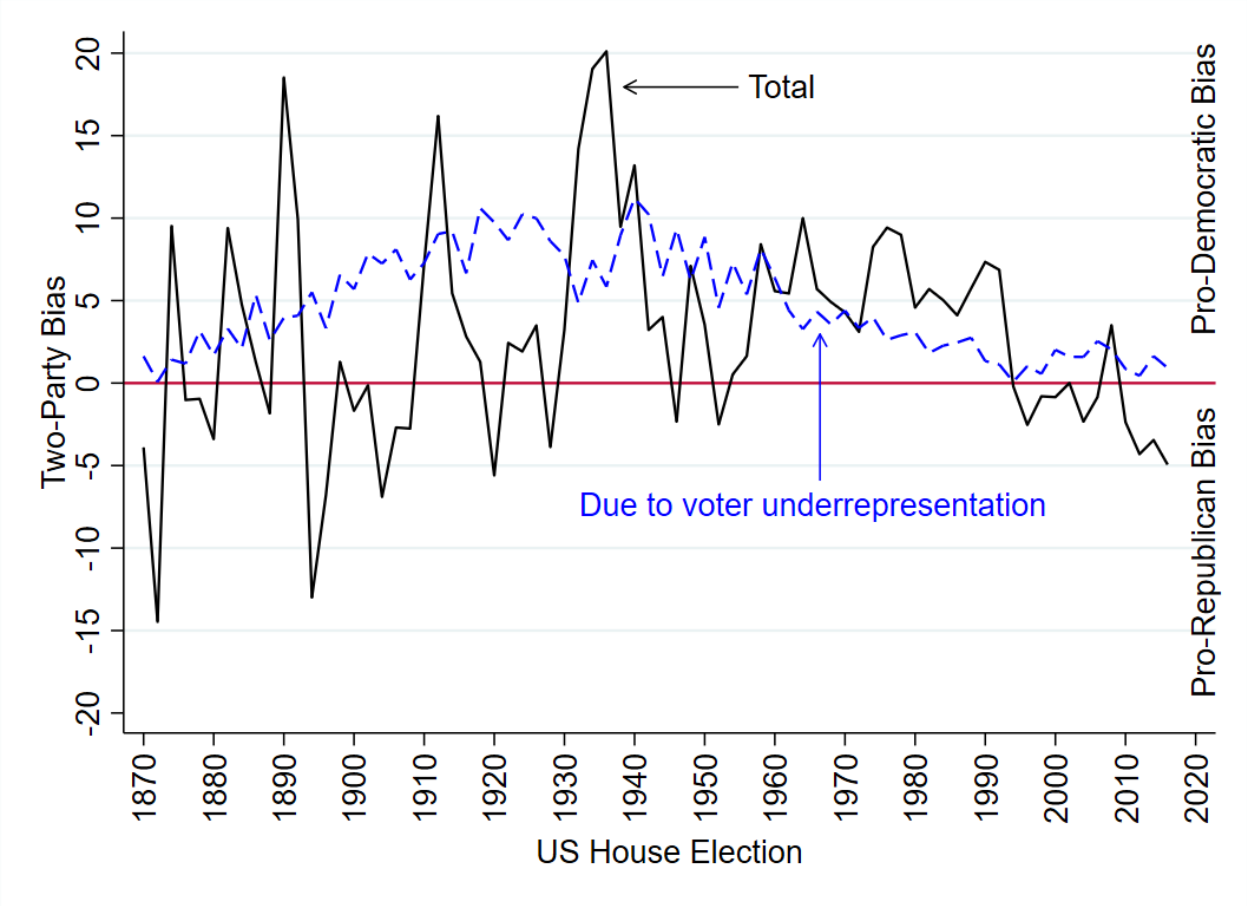
suppression are enacted by state governments. For federal elections, this translates into voter suppression having greater impact in some districts than others.

In order to take these issues into consideration, I also analyzed the relationship between voter suppression and seat losses in US House elections since 1870 by employing DPIx. (I also expanded this aspect of the analysis to include all forms of voter underrepresentation, not just voter suppression, since it would be virtually impossible to isolate only that aspect of turnout variations in election results, especially going back a century and a half.)

Figure 3 shows the two-party bias in elections to the US House of Representatives from 1870 to 2016. The solid black line shows the DPIx, with positive numbers showing pro-Democratic bias while negative numbers showing pro-Republican bias. The jagged blue line shows the bias caused by voter underrepresentation, measured as the impact on seats caused by variation in the number of voters in the district during the election.

The black line shows significant variation bias over the past 150 years, and it also shows a shift in that bias towards the Republican Party after the 2010 reapportionment. For our purposes, the blue line is far more important. As the blue, jagged line shows, a major reason for this electoral bias during the twentieth century was voter underrepresentation. The electoral bias caused by voter underrepresentation has been consistently pro-Democratic over this entire 150-year period. The level was around zero just after the Civil War (and the end of Reconstruction), and then rose steadily, reaching nearly 10% around 1912, remaining high through the 1940s, and then starting decline in the 1950s. It finally reached around a 1% pro-Democratic bias in the 1990s. Since around 1990, this electoral bias has almost completely disappeared, but retains a small, pro-Democratic lean.

Figure 3: Electoral Bias Due to Voter Underrepresentation (US House Elections, 1870-2018)

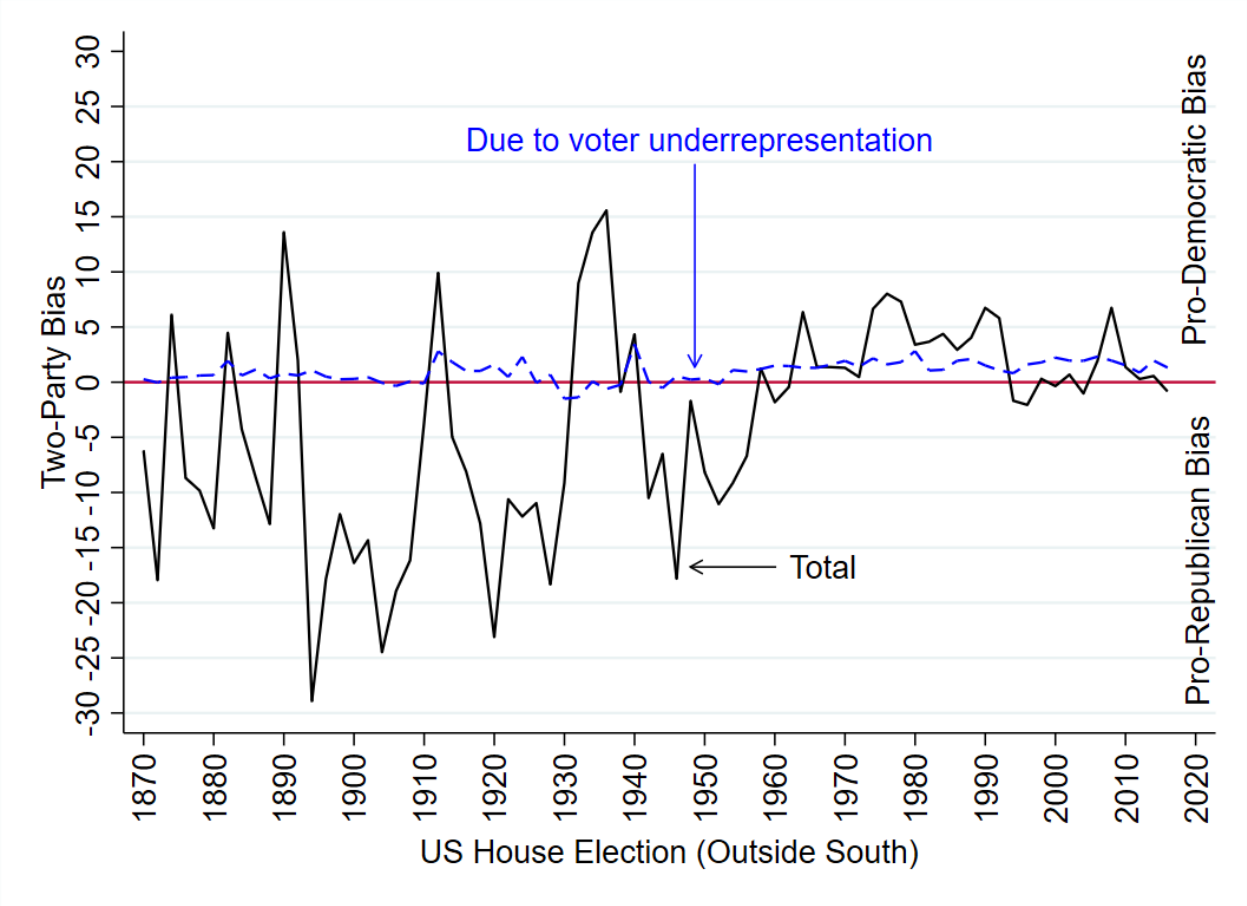


The graph does, however, show clearly that voter underrepresentation, whether in the form of malapportionment or voter suppression, can lead to electoral bias not unlike what has been caused by gerrymandering over the past decade. Figure 3 clearly shows that underrepresentation (whether in the form of voter suppression, malapportionment, or simply lagging turnout) substantially increased the number of Democratic seats in the House of Representatives during the twentieth century, and likely inflated Democratic majorities during the New Deal era.

The evidence suggests further that the primary cause of this asymmetrical disproportionality due to voter underrepresentation was severe voter suppression combined with malapportionment in the Jim Crow South. This is suggested in Figure 3, with the way that the shift in the DPIx rising in the late 1800s just as repressive policies are beginning following Reconstruction, reach their zenith in the middle of the century, and begin declining as the Civil Rights movement begins taking hold. (It's also worth pointing out that this decline happens gradually starting around 1960 and does not simply disappear in 1966, after the Supreme Court forced states to redraw district lines to require each legislative district in a state to have equal population, suggesting that voter suppression was a critical factor as well as malapportionment.)

Figure 4 shows this point more explicitly by removing states that had been in the Confederacy: Arkansas, Alabama, Georgia, Florida, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas and Virginia. Once the South is removed from the analysis, the extent of the pro-Democratic bias drops dramatically. It almost completely disappeared during the middle of the century but remains as a smaller bias in favor of the Democratic Party over the past half century, including in recent elections.

Figure 4: Electoral Bias Due to Voter Underrepresentation Outside South (US House Elections, 1870-2018)



Why does this pro-Democratic bias persist? Technically speaking, this pro-Democratic bias based on voter underrepresentation can be interpreted one of two ways. Either Republican voters are turning out in lower numbers in competitive districts, leading these districts to flip in the Democratic Party's favor, or supporters of the Democratic Party are turning out in lower numbers but the impact of this turnout reduction is being partially insulated. In other words, there are 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. While US House elections have overall been biased in the Republican Party's favor since the 1990s, that bias has been partially counteracted by how Democratic voters are geographically distributed across House districts.

This analysis paints a picture similar to that shown in the simulations above. Under certain circumstances, including when gerrymandering and other factors lead to few competitive elections, SMP can insulate the electoral system from the impact of voter suppression. But the impact of voter suppression in this system is generally curved and can increase exponentially as the percent of voters kept from the polls grows. This phenomenon can be seen with the voter suppression in the Jim Crow South, which dramatically increased the seat gains in the US House mid-century.

Conclusion:

Combined, the analysis in this paper suggests that current Republican efforts to suppress the Democratic vote will likely have limited impact—at least for now. To substantially increase their winning percent in lower level elections, including legislative elections, the voter suppression techniques would have to block a much larger percent of voters than seems likely

with techniques like requiring government identification cards to vote and significantly increasing wait times in urban polling locations. The greater immediate danger is likely to be statewide races where the vote is evenly divided between Republican and Democratic candidates, like in Georgia, or in presidential elections, where a few thousand votes in swing states may decide which party controls the executive branch at the federal level. But here, the high intensity and exposure of these elections are a significant counterweight against these attempts to keep voters from the polls.

But this analysis does not suggest complacency. Instead, the framework presented here suggests that voter suppression is in SMP systems is much more dangerous than in PR systems. Under all circumstances, with PR, every 1% of a party's supporters kept from the polls yields only ½% seat gain in a legislative body. In SMP systems, the best-case scenario is largely equivalent to circumstances in PR systems. However, after a certain threshold is passed, or if voter suppression becomes highly concentrated in specific regions, the impact can be devastating.

A useful analogy to use here may be that current voter suppression strategies are akin to being diagnosed with stage one cancer. At this stage, the most serious consequences are not imminent. But if ignored, the impact could be devastating. Hence the conclusion in this paper is not that voter suppression is not a threat because the US uses a majoritarian electoral system. Quite the opposite, the framework applied here leads to conclusion that voter suppression is far more dangerous in majoritarian than proportional electoral systems. In PR systems, the impact of voter suppression will always be muted, but in SMP the impact could be catastrophic.

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