

How the New Math of Gerrymandering Works

By NATE COHN and QUOCTRUNG BUI OCT. 3, 2017

The Supreme Court is considering a gerrymandering case in Wisconsin. At the core of the debate is a new way to measure gerrymandering. Here's the simple math behind it. [RELATED ARTICLE](#)

Ever since Justice Anthony M. Kennedy left the door open to a “[workable standard](#)” to limit partisan gerrymandering, political scientists have sought to construct a measure to satisfy him. On Tuesday, the Supreme Court will [hear a case](#) that will test whether they've pulled it off.

At the center of the case is the “**efficiency gap**,” a relatively new measure of partisan gerrymandering. A federal court in Wisconsin ruled in November that the state's [Republican](#)-controlled legislature had discriminated against [Democratic](#) voters, and it partly relied on the efficiency gap to find that the Wisconsin State Assembly map was an unconstitutional partisan gerrymander.

Whether it's persuasive to Justice Kennedy — expected to be the key swing vote in the case — is another matter. The efficiency gap is not a perfect measure. But it would probably address many of gerrymandering's problems, with few downsides.

Here's what the efficiency gap is, what it does well, what it doesn't do so well — and what it might ultimately mean for American democracy.

What Is It?

In general, the goal of a partisan gerrymander is to force the other side to “waste” votes, and that's exactly what the efficiency gap measures.

A wasted vote is one that doesn't contribute to winning any additional districts. All of the votes beyond what's necessary to win a district are

"wasted" in victory. All votes are wasted in defeat, since they didn't result in any seat at all.

There are two types of wasted votes:

- 1 All the votes cast for the losing candidate
 - 2 All the "extra" votes for the winning candidate
-

Partisan gerrymandering follows this logic by employing so-called packing and cracking, two tactics to force the other side to waste votes. With packing, one party's votes are concentrated into a district, resulting in wasted votes in lopsided victories. With cracking, one party's votes are split among several districts that lean safely to the other side.

The efficiency gap measurement aims to summarize the effect of gerrymandering by identifying all of the wasted votes in victory and defeat for both parties. It then adds them up, finds the difference between the two sides, and divides that by the total number of votes in a state. This yields a single percentage figure: the efficiency gap. The creators of the measurement, Eric McGhee, research fellow at the Public Policy Institute of California, and Nicholas Stephanopoulos, professor at the University of Chicago Law School, propose that a gap of 7 percent or higher should be enough to find that a state may have committed an unconstitutional partisan gerrymander.

What do wasted votes look like?

Let's look at Maryland's Sixth Congressional District, which extends to the D.C. suburbs to give Democrats an additional seat.

- 1 Democratic votes: 186k
- 2 Republican votes: 133k
- 3 Votes needed to win: 159k

Democrats won. They received 186,000 votes, but needed only 159,000 to win, so those roughly 26,000 votes are considered wasted.

Republicans lost, so all those 133,000 votes are considered wasted.

How does this play out in the rest of the state?

District	Dem. votes	G.O.P. votes	votes to win	Wasted Votes		
				for Dem.	for G.O.P.	Net
01	104k	243k	173k	104k	69k	34k Dem.
02	192k	103k	147k	45k	103k	58k GOP

				Wasted Votes		
03	215k	115k	165k	50k	115k	65k GOP
04	238k	69k	153k	84k	69k	16k Dem.
05	243k	106k	174k	69k	106k	37k GOP
06	186k	133k	159k	26k	133k	107k GOP
07	239k	70k	154k	85k	70k	15k Dem.
08	221k	125k	173k	48k	125k	77k GOP
TOTAL	1,636k	962k	1,299k	510k	789k	279k GOP

1 510,000 Democratic votes and 789,000 Republican votes are wasted in Maryland.

2 Which means that, on net, Maryland wasted 279,000 Republican votes.

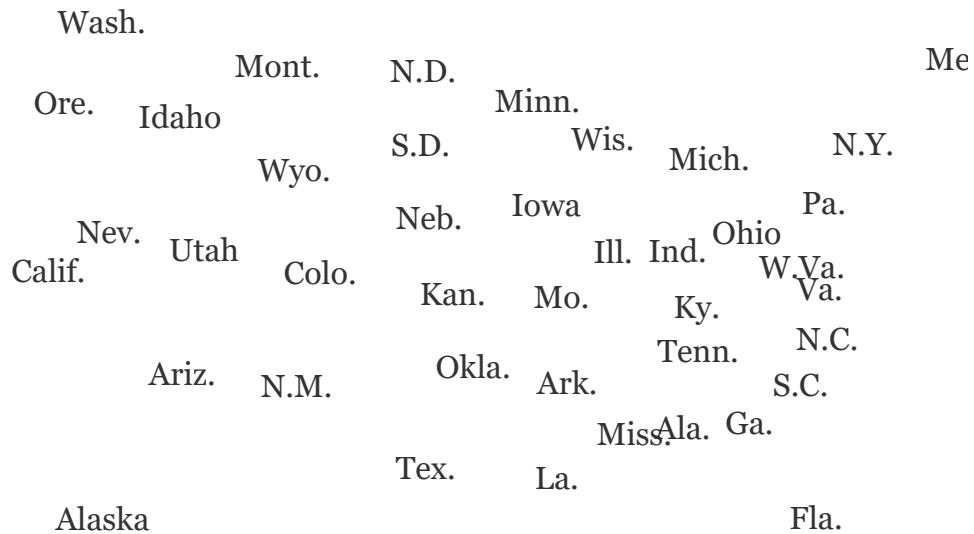
3 **The efficiency gap** is net-wasted votes as a share of a state's total vote, which means that Maryland has **a 10.7 percent efficiency gap that favors the Democrats.**

This process of adding up the wasted votes in each district is a little cumbersome. But this formula can be simplified to a theoretical relationship between vote share and the number of seats that a party should win.

Over all, it's a simple measure that elegantly follows the logic of partisan gerrymandering. And it satisfies many of Justice Kennedy's requirements for a gerrymandering test. It does not, for instance, require an analysis of hypothetical elections, and it's straightforward enough to understand.

What Works Well

Does it work? Well, the results do look about right.



Congressional maps that would violate a 7 percent efficiency gap threshold

(in states with at least five districts)

in favor of Republicans in favor of Democrats

The congressional and state legislative maps that have been [considered most notorious](#) are found to be in violation using this standard.

Exactly which states violate the efficiency gap depends a bit on the details. Wisconsin's state legislative districts are in question in the case, but the basic issues are the same for congressional maps, and we'll focus on those here.

There are two potential standards for whether a state's congressional map is in violation: the 7 percent threshold suggested earlier, or if the plan costs a party two seats in a state. Small states are likelier to fail the percentage threshold test, while the two-seat threshold is more likely to trip up big states. There are also judgment calls needed on how to handle uncontested elections — here, we impute the results and turnout using a model based on recent congressional and presidential election results. But the conclusion is basically the same no matter the approach.

In looking at the 2016 congressional elections, there are five states in violation by both the seat and percentage measures: Pennsylvania, Texas, North Carolina, New York and Michigan. With the exception of New York, no one would dispute that these lines were ruthlessly drawn to favor the Republicans.

In addition, there's a longer list of medium-size states that violate the percentage measure but don't quite hit a two-seat threshold. Ohio, Georgia, Maryland, South Carolina, Virginia and Alabama all have efficiency gaps over 10 percentage points in favor of the party that controlled redistricting, while Indiana has a 9 percent efficiency gap. All of these congressional maps could be vulnerable to a legal challenge under the proposed standard.

These results would largely pass the "gut-check" test for most fair-minded observers. But they're not quite perfect either, and they hint at some of the limitations of the test. Illinois, where Democrats plainly used the redistricting process to their advantage, is considered well balanced by this measure. It actually has a Republican-leaning efficiency gap. And New York, drawn by a court-appointed magistrate, is considered a Republican gerrymander with a 10 percent efficiency gap in favor of the Republicans. But in truth, few would argue that New

York's map is balanced against the Democrats at all, let alone by so much.

So what's going on? Political geography.

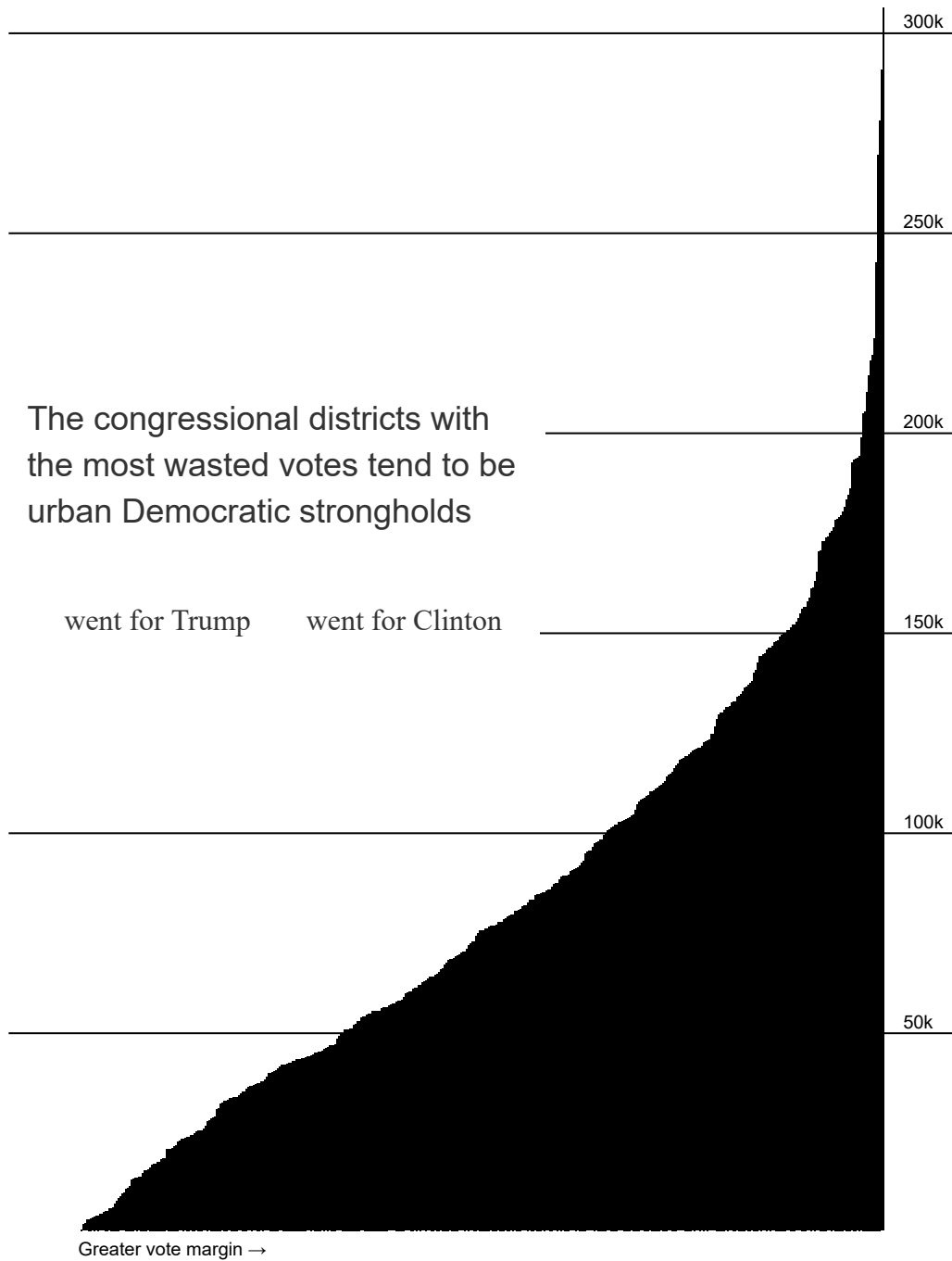
What Doesn't Work Well

Gerrymandering isn't the only reason one party might "waste" many more votes than the other. Parties can naturally "pack" or "crack" themselves, simply because of how their voters are distributed geographically.

The efficiency gap doesn't distinguish between votes wasted by gerrymandering or by natural causes. That's probably the biggest practical limitation of the measure.

It's not a small issue. Democrats routinely win major cities with more than 80 percent of the vote. Nationally, virtually all of the seats with the most wasted votes in victory are Democratic-held urban districts. For the most part, they're not gerrymandered at all.

Number of wasted votes in victory by congressional district
2016 presidential election



The effect of all of these wasted Democratic votes in urban areas is considerable. It's enough, for instance, to make a fair map in New York look like a partisan gerrymander. There, Hillary Clinton won more than 75 percent of the major party vote in 10 of the state's 27 districts. But no gerrymandering was required as Mrs. Clinton won 81 percent of the major party vote in densely populated New York City.

Similarly, the efficiency gap measure makes Illinois's Democratic gerrymander look like a balanced map. Mrs. Clinton won 78 percent of the major party vote in Cook County, which includes 40 percent of

Illinois's population. The Democrats made a herculean effort to undo this disadvantage. They unpacked Chicago and Cook County as best they could, spoking the city's districts out to the suburbs, exurbs and even the countryside. But even this was insufficient to give the Democrats a real advantage. Republicans and Donald J. Trump still won seven of Illinois's 18 congressional districts, even in a state Mrs. Clinton carried easily.

Geography is probably the biggest reason Republicans are skeptical of the efficiency gap. Various amicus briefs contend that the measure is biased against Republicans. They argue that a remedy could even require maps that violate nonpartisan criteria, like those districts that spoke out of Chicago.

There's some merit to the Republican argument. If Democrats are at a geographic disadvantage compared with the Republicans, Democrats would generally have more flexibility to draw maps that deviate from nonpartisan standards, like compactness or following jurisdictional lines, without generating a 7 percent efficiency gap violation as they have in Illinois. Republicans, meanwhile, might draw relatively fair maps that might seem to disadvantage Democrats. Indiana is a good example.

One could argue that the courts shouldn't view Democratic gerrymanders as especially troubling if they don't create the same burden on Republican voters to translate their votes to seats, but Republicans are unlikely to see it that way.

Making matters worse for the Republicans: The efficiency gap isn't great at measuring the one big Democratic geography advantage: Hispanic districts. Here, the Democrats' advantage is that they can translate votes to seats at an efficient rate, thanks to the extremely low turnout-to-population ratio of Hispanic areas, which, for good measure, are not always overwhelmingly Democratic. The efficiency gap, if anything, gets this backward. It's measuring wasted votes, after all, and the low turnout of these districts means that the Republicans waste very few in Hispanic districts.

Right now, Illinois and New York are probably the only two states where the efficiency gap is misled by geography. But it could be a much bigger issue in the future. An easy way to tell is to look at the 2016 presidential race rather than U.S. House races. Based on presidential results, efficiency gap violations would spread to 18 of the 26 states with more than five congressional districts. The nonpartisan maps in Arizona and Minnesota, the bipartisan map in New Jersey, and, incredibly, the Democratic-drawn map in Illinois would all violate the 7 percent threshold in favor of the Republicans.

It's worth noting that there isn't much danger that "fair" maps will be found to be unconstitutional gerrymanders, even if they fail the efficiency gap. Under the test proposed by the plaintiffs, the courts would have to find motive as well. Similarly, the state would have the opportunity to show that the imbalance was because of political geography.

But the presidential election results nonetheless show how significant the Democratic geography disadvantage has become. It can easily create the appearance of a partisan gerrymander. It is directionally consistent with the notion that the Democratic geography disadvantage would somewhat bias the efficiency gap measure against the Republicans. And it hints at a core challenge for the plaintiffs: The efficiency gap isn't as easy as it looks.

The Role of the Courts

The courts would have to assess whether geography explains the “efficiency gap” in just about every case.

In the Wisconsin case, the federal court concluded that political geography did not explain the entirety of the Republican edge because there were alternative plans with a smaller Republican advantage.

If this ultimately becomes a standard way to rebut the geography argument, as it has in racial gerrymandering cases, gerrymandering opponents will probably be well off. It is usually possible to draw a relatively fair map, even in states where geography really does significantly burden one party.

But things get more complicated if the courts don't simply accept the presence of an alternative, fair plan as proof that geography isn't responsible. After all, the fact that a more balanced map was possible doesn't prove that a less balanced map was a result of partisan gerrymandering, as the New York and Minnesota maps plainly show.

The difference between the presidential election results and congressional election results hints at another problem: The efficiency gap is very noisy. It can shift back and forth from cycle to cycle. That's mainly because the efficiency gap emphasizes the difference between winning and losing a district. If you win by one vote, all of your opponents' votes are wasted, and just one of yours; lose by one vote and the opposite is true.

As a result, the courts would probably need to look across many elections to assess whether a map is in violation. They would also probably check to see whether the result would be very different if the election had gone a little differently. The courts will undoubtedly consider other potential measures of partisan symmetry or gerrymandering, including whether the map violates nonpartisan criteria like compactness or violating jurisdictional lines.

None of this represents an insurmountable challenge to the efficiency gap. But it means that the efficiency gap isn't really what it seems. It is not a test of partisan gerrymandering. It is a test of whether a congressional map burdens the voters of a political party to an extent that is likely to be persistent for a decade. Whether voters were burdened because of an unconstitutional partisan gerrymander, geography or bad luck is another matter. It's the sort of matter that the courts have been resolving for decades in racial gerrymandering cases, but that doesn't mean it's easy or clear.

What Might Be Coming in 2020

The efficiency gap has real limitations. But from a practical standpoint, this is not necessarily a deal breaker. The efficiency gap is not the entirety of the plaintiff's proposed legal test. The standard of motive would probably prevent fair, nonpartisan maps from being struck down. The opportunity to show that geography, not gerrymandering, was responsible for the bias would most likely protect those states as well. And the courts could consider other measures, as the federal courts did in the Wisconsin case.

There is a better chance that the efficiency gap will fail to capture some maps that deviate considerably from [nonpartisan](#)

[standards](#) like [preserving communities of interest](#). These maps are likelier to be Democratic-led gerrymanders, given the party's distinct geographic disadvantage.

But anyone afraid of letting, say, the Democratic gerrymander in Illinois get by should be concerned about what might be coming in 2020.

In 1986, Justice Sandra Day O'Connor wrote that gerrymandering was a "self-limiting" enterprise. A majority party must weaken some of its safe seats to win additional seats; therefore, gerrymanders can wind up increasing the number of vulnerable seats. This was probably right in 1986. The country's political geography wasn't so reliably and deeply polarized, and that limited what a gerrymander could accomplish.

But this wasn't so true by 2010, and it is even less true today. There are now strong incentives for parties to pursue gerrymanders that go much further than they did in 2010. In 2020, many states could all but end competitive congressional districts in their state.

Take Pennsylvania. Today, Democrats hold only five of the state's 18 congressional districts. It's hard for Democrats to imagine that it could be worse. But it could be. After all, there are still five competitive, Republican-held districts in southeastern Pennsylvania outside Philadelphia.

Why are there competitive districts in southeast Pennsylvania? At the time Pennsylvania Republicans redrew the map, Justice O'Connor's point about self-limiting gerrymandering was quite relevant. Democrats had a record of competing across rural and post-industrial Pennsylvania, even though President Obama didn't fare especially well on traditionally Democratic turf. Republicans had little incentive to dilute the Philadelphia suburbs further, and they would have been endangering their central Pennsylvania seats anyway.

That logic may not hold today. In fact, it's not a given that there have to be competitive districts in the Philadelphia suburbs anymore. Mrs. Clinton won 41 percent of the major party vote in the 14 districts outside of Philadelphia and Pittsburgh, including the fifth Democratic

district in northeast Pennsylvania. Republicans could probably figure out a way to make several or even all of the competitive districts in southeastern Pennsylvania safely Republican. There would be a practical challenge in spoking the Philadelphia suburbs to such an extreme extent, but it could probably be done, and even if it couldn't they could still greatly improve on the map they have now.

It's not wholly different from the way Republicans currently treat the Philadelphia suburbs, or how they treat Salt Lake City or Austin, Tex. — the latter of which is split among a staggering six congressional districts. If Democrats adopted a similar approach, they could easily erase the last Republican districts in states like Maryland or Oregon. The Republicans could end the Democratic districts in Kansas City, Mo; Louisville, Ky.; or Indianapolis. Absent a Supreme Court affirmation of a measure like the efficiency gap — and there's no telling how the court will decide — the Voting Rights Act would be the only meaningful limit on partisan gerrymandering. Otherwise, only a vague, lingering attachment to the norms of the past might hold states back.