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Behind the Lines

Investigating the Efficiency Gap in Redistricting Cases

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Introduction

The concept of "gerrymandering" is familiar to most everyone who has been through a grade school social studies class. For as long as there have been electoral districts, politicians have been trying to draw boundaries that are of the most benefit to them and those politically aligned with them. But while it is easy to point to maps with squiggly and snaking boundaries and call them gerrymandered, actually defining the concept has proven far more difficult.

One measure of gerrymandering that has become more and more common in academic and legal circles is known as the "Efficiency Gap." This statistic attempts to quantify gerrymandering and provide an objective, testable definition for the practice. First conceived of by legal scholar Nicholas Stephanopoulos and political scientist Eric McGhee in a 2014 paper,[1] the efficiency gap has been used as evidence of gerrymandering in a number of court cases.[2] This includes a number of challenges to Wisconsin maps based on the simulations of Political Scientist Jowei Chen that make use of the concept.[3] But what is the efficiency gap? And is it unimpeachable enough to be used as the basis for overturning legislative maps? This paper attempts to answer these questions.

The Efficiency Gap

The efficiency gap tries to quantify how "efficiently" one party's votes are spread over their winning districts, the idea being that gerrymandering is when a party "wins a lot of districts by a little," while their opponents win only a few districts by a lot.[4] The efficiency gap attempts to quantify this by counting how many votes in some election each party "wasted."

For example, consider an election in which 100 people cast a ballot, and the breakdown of the vote is as follows:

Table 1. Hypothetical Election Results

Party Name	Total Votes
Party A	60
Party B	40

For the Party B candidate, all of these votes are considered "wasted": they lost and may as well have not voted at all. But there are also wasted votes for Party A: the number of votes needed to win an election of 100 voters (like this one) is 51, meaning that Party A received 9 votes more than were needed. In this one race, therefore, Party B notched 40 "wasted' votes, while Party A had only 9.

To calculate the efficiency gap for an entire legislative map, first, one finds the numbers of wasted votes for each party over all of the elections in that map (whether the map is the one for state senate, or congressional delegation, etc.). This would look like the above computation, done for each contested race.

Let's assume, for simplicity, a few more things: that there are 10 assembly seats in a hypothetical state, that every seat's district has 100 voters, and that all of them produced the same result as our example above. Party A wastes 9 votes in each of 10 districts for a total of 90. Party B wastes 40 votes each time for a total of 400.

The efficiency gap looks at the difference in each party's total wasted votes over all the districts in a state. Of course, if we just did that, bigger elections would yield higher efficiency gaps just because more votes were at play; that number needs to be scaled. Therefore, in order to scale the difference to the size of its particular electorate, we divide by the number of total votes cast.

For this simple example, we find this efficiency gap.

$$\frac{(400-90)}{1{,}000} = 31.0\%$$

Our simple example finds an efficiency gap that would count as extreme by any measure. Many court cases have argued that an efficiency gap greater than 7.0% should be the rule of thumb for identifying gerrymandering.[5]

The allure of this metric is obvious. By providing a single number that is comparable across sets of maps, the efficiency gap is cleaner and simpler than most attempts to measure gerrymandering—but the metric is not without its issues. Those will be discussed in the following sections.

Problem #1: Arbitrary Cut Points

As others have noted in criticisms of the efficiency gap, there is no inherent "right" answer as to what the efficiency gap should be.[6] We mentioned the 7.0% cutoff above, but it isn't special: there is no clear reason why this number is preferable to 6.0% or 10.0%. It's a rule of thumb.

Importantly, it can't be zero: America's election system in most states is based on the premise that electoral majorities should be able to govern, while being held in check by a minority. Scholars have long recognized that majorities will necessarily expand as they near the 50% threshold in order to form a viable government. For example, Harvard political scientists Robert Browning and Gary King wrote:

"The final form of representation . . . is majoritarian. (I)t reflects an important principle of the United States two-party, democratic system. It helps majorities form, yet protects the minority

party. Once a party approaches the 50% point, it easily gains additional seats helping it form a governing, legislative majority. Others have termed this the "balloon effect."[7]

Because the necessity and usefulness of this "balloon effect" is recognized, claims that we should find an efficiency gap of zero are rendered absurd. The acceptable extent of the gap, all told, is not a number that (like the gap itself) could be derived mathematically or objectively found with any precision. It amounts to drawing a line in the sand.

Problem #2: Wide Swings Based on a Few Districts

Gerrymandered maps are supposed to hinge on relatively close elections—but if one district in one election goes the wrong way, the efficiency gap of the map can change wildly. This could happen on a larger scale as well: people have even coined a term, "dummymandering,"[8] to describe exactly this kind of a backfire. When a map-drawer reaches for such a big electoral majority from such narrow victories that a "bad" year results in the opposition winning many races they weren't "supposed" to win, that's dummymandering. Suddenly, an "unfair" gerrymander (as measured by the efficiency gap) becomes a normal one.

This happens more than you might think. One statistician noted that "In 580 pairs of consecutive *EG* [Efficiency Gap] measures, the probability that each *EG* measure has the same sign is 74%."[9] In other words, from one election to the next, the efficiency gap "changes its mind" about which party is benefiting from the maps more than a quarter of the time. Ironically, this statistic was cited to advance the argument that the efficiency gap is "stable" from one election to the next.

Returning to what we recognize gerrymandering as, this is absurd. A map that is gerrymandered should benefit the same party from one election to the next; it should not count as gerrymandered for Party A one election and Party B the very next. In trying to put a number on this, the efficiency gap tallies a lot of normal electoral volatility that doesn't speak to anything wrong in the map-drawing process.

Problem #3: Uncontested Races

Uncontested races also present a problem for efficiency gap measurements. While political parties generally fail to contest a race if they see the result as a foregone conclusion, any hypothetical candidate they fielded would still garner *some* votes even in these "uncompetitive" races. The absence of any candidate skews the efficiency gap measure. This is common in Wisconsin: in the 2022 elections, there were 25 Assembly districts (out of 99) that did not have both a Republican and Democratic candidate.[10]

In most instances, efficiency gap proponents could use the existing data from other districts to fill in the expected vote totals for uncontested districts, a process known as "imputation." Imputation, which is common in many statistical contexts, is making informed statistical

guesses about what "missing" data should be; in this context, it would predict the outcome for a particular uncontested race as though it had been contested.

But there is no one right way to impute data. There are different reasonable options, which could lead to different final statistics. In one analysis of the 2012 election maps in Wisconsin, two different imputation methods led to a variation of the efficiency gap from 9.0% to 13.85%. That's a very significant shift when evaluating the fairness of maps, and that's basically the result of several minor judgement calls.[11]

Problem #4: Majority-Minority Districts

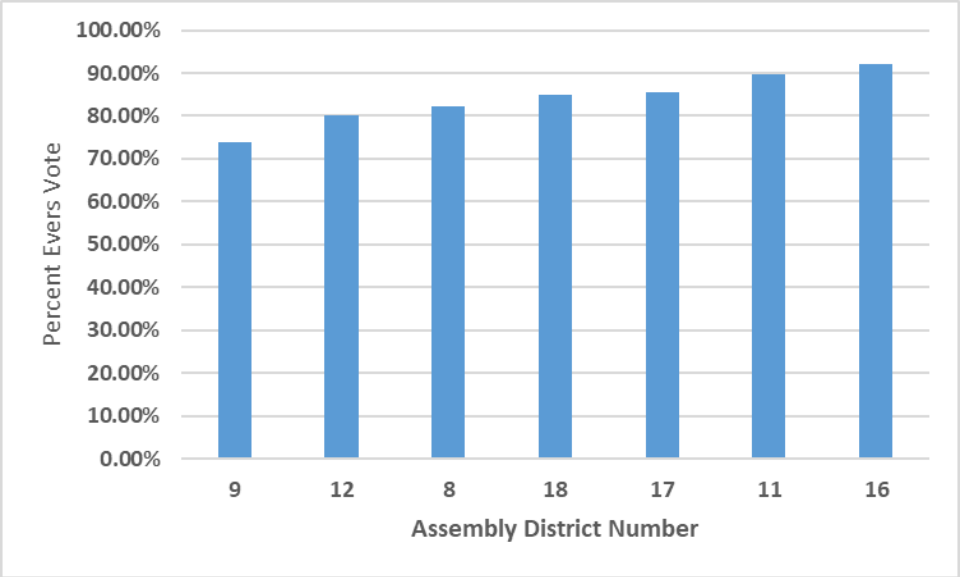
One other wrinkle with relying on the efficiency gap comes from the Voting Rights Act (VRA). This federal law requires that some districts be created that have a majority of residents who are from minority backgrounds.[i] This is designed to protect the ability of members of minority groups to elect members from similar ethnic backgrounds and to ensure that racial minorities are not shut out of political power. In order for these districts to be guaranteed to be effective, these districts often have sizeable majorities of racial minorities rather than, say, 51%. But that same district composition also leads to a large number of "wasted" votes—primarily for the Democratic Party.

According to data from the Legislative Technology Services Bureau,[12] Wisconsin currently has five Assembly districts that are majority African American and two districts that are majority Hispanic. These "majority-minority" districts are heavily skewed towards the Democrats. Figure 1 shows the percentage of vote for the Democratic Gubernatorial Candidate Tony Evers in each of these districts in his successful 2022 re-election.

The lowest share of the vote for Evers in one of these districts was in Assembly District 9 where he received about 73% of the vote. In all of the other districts he received more than 80% of the vote. This is exactly the kind of district that, predictably, adds to the efficiency gap's tally of "wasted" votes, and they are drawn as a result of federal law. Every one of these large margins contributes to the efficiency gap.

[i] Precisely, Section 2 of the VRA was held by the Supreme Court in *Thornburg v. Gingles* (1986) to invalidate legislative maps that, under certain criteria, operated "to impair the ability of geographically insular and politically cohesive groups of black voters to participate equally in the political process and to elect candidates of their choice."

Figure 1. Percent of the Vote for Evers-MM Districts



We can examine the effect of these districts on the efficiency gap using election data for the 2022 election. To avoid the problem of districts without candidates of both parties and the need for imputation, we use data from the Governor's race. The first row of the table includes all 99 of the state's districts, while the second row excludes the seven majority-minority districts.

Table 2. Efficiency Gap, With and Without MM Districts

	Dem "Wasted"	Rep "Wasted"	Efficiency Gap
All Districts	1,069,734	580,333	18.42%
Majority-Minority Excluded	993,304	567,853	16.01%

Excluding these districts, the efficiency gap drops from 18.42% to 16.01% in the 2022 Gubernatorial election. This means that two and a half percentage points of the efficiency gap are owed to this facet of federal law, and the statistic is increased by 15.1%. Of course, if the entire map were redrawn without this VRA consideration in mind and then all 99 new districts included in a calculation, the efficiency gap would not equal 16.01%; it would be some other number, but clearly a lower one than the 18.42% resulting when these kinds of efficiency gap-boosting districts are drawn.

This paper takes no position on whether or not such districts are beneficial; we merely note that this result of federal law must be taken into account when evaluating

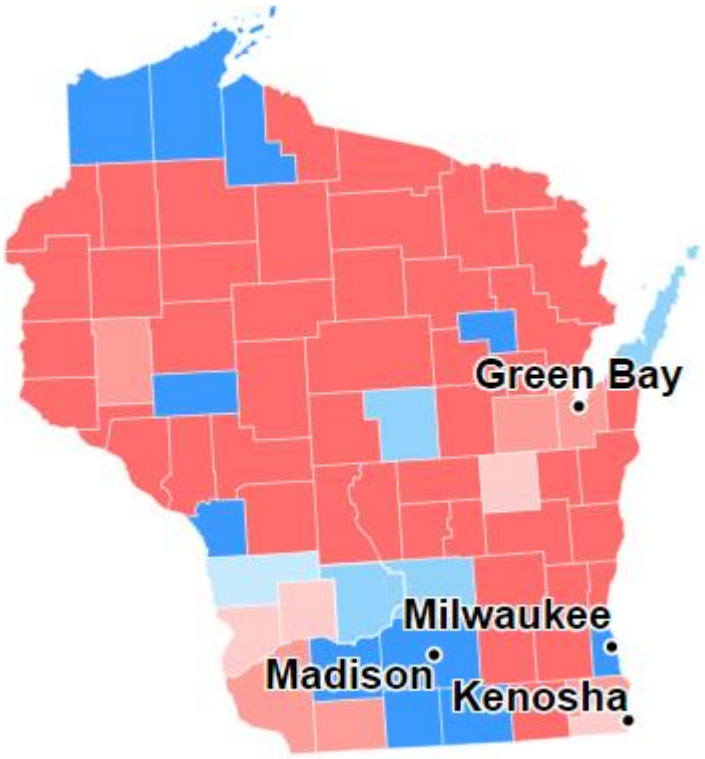
gerrymandering. The efficiency gap, which looks more severe as a result of them, does not come with any kind of a caveat when they, rather than nefarious map-drawing, are the reason for "wasted" votes.

Problem #5: Political Geography

One other huge consideration is, naturally enough, political geography. The modern partisan divide in the United States tends to fall along lines of urbanicity.

Democratic voters tend to be more concentrated in urban and (increasingly) suburban areas, while the largest Republican advantages are in rural areas. Wisconsin is no exception to this. Figure 2 shows Governor Evers' 2022 election victory at the county level. Despite the Republican candidate winning a majority of counties, the Governor ran up the margins sufficiently in (more heavily populated) urban and suburban areas to be victorious.

Figure 2. 2022 Gubernatorial Election Map (CNN)[13]



Even research that is used in court cases challenging the legality of Wisconsin's maps, like that of Dr. Jowei Chen, has had to concede this point. Chen's simulations consider equal district population, municipal and county contiguity, geographic compactness, and the preservation of majority-minority districts in creating simulated district maps. Yet despite only considering such factors, most of the maps created through his simulations show a

Republican edge. It is important to note that all these simulations have an efficiency gap less than that produced by Act 43. But the bottom line is that a Republican advantage is likely baked into any fair plan.

This reality extends to the maps put forward by Governor Evers and his "People's Map Commission." Under the three maps they put forward, Republicans were likely to win 55, 56, and 58 of the 99 state Assembly seats based on the 2018 Gubernatorial election results.[14] These maps had efficiency gaps of more than 8% for the Assembly[15] and 12% for the Senate.[16] While the majority for Republicans would be smaller than under the current maps, the realities of political geography are difficult to fully overcome.

Conclusion

The standard for gerrymandering cannot be the same as the sentiment famously expressed by Justice Potter Stewart in *Jacobellis v. Ohio* that "I know it when I see it."[17] What has plagued gerrymandering and kept it from being a justiciable issue is that attempts to define it with a numerical measure have been elusive. Just so, the efficiency gap represents another attempt to define exactly what it means for a map to be gerrymandered: if a map has a bad efficiency gap, it is gerrymandered and a court may spring into action, but if the efficiency gap is ok, the map passes muster. So the theory goes.

It's fair to say that the efficiency gap provides some information about a map, or to be precise, about how one given election played out on a map. The efficiency gap's limitations, however, are far too much for it to earn the status of a definition of gerrymandering. As discussed, it can only be calculated in hindsight for a given election, and even that is fraught with the subjective decisions behind imputing data for uncontested elections. The federally mandated priority of Majority Minority districts requires exactly the kind of map drawing that makes an efficiency gap look worse—and even without that top-down mandate, the bottom-up reality of where voters live contributes to the efficiency gap.

All told, the efficiency gap could be compared to the body mass index (BMI) in medicine: it's a statistical measure you can calculate that does provide some information about a person in the form of one clean number, but that cannot be relied upon as a definition of health or even of healthy weight. (The CDC stresses that "Muscular individuals, or highly-trained athletes, may have a high BMI because of increased muscle mass."[xvi]) There are important caveats that the number does not include, there is information that is outside its purview, and the thresholds for what constitutes "normal" versus objectionable are ultimately lines in the sand. The bottom line is that the efficiency gap cannot be used as a tool to disqualify maps on the grounds of gerrymandering.

Endnotes

[1] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2457468
[2] https://public.websites.umich.edu/~jowei/Wisconsin_Act_43_Analysis.pdf
[3] https://www.vox.com/the-big-idea/2017/7/11/15949750/research-gerrymandering-wisconsin-supreme-court-partisanship
[4] Jordan Ellenberg, *Shape*.
[5] https://campaignlegal.org/sites/default/files/WI%20whitford%2020150708%20complaint%20exh3.pdf
[6] https://www.aei.org/wp-content/uploads/2019/06/Whats-Wrong-With-The-Efficiency-Gap.pdf?x91208
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