Randomized Electoral Districts

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Abstract: We introduce a novel voting rule that could change the complexion of politics by reshaping the incentives of its legislators. Traditionally, legislators who seek reelection have a strong incentive to cater to their respective local interests, often at the expense to the broader national interest. The result is inefficient national policy. In this paper, we propose randomizing the district in which a legislator would run for reelection. Our paper describes this rule in detail, including its philosophical and economic underpinnings, and subsequently demonstrates analytically how the rule changes each legislator's incentives, better aligning them with the broader public interest. Further, we explore additional implications of district randomization, which include more stable policy outcomes, broader consensus among policymakers, greater equity across districts, a moderating influence on ideology, and a reduction in the power of interest groups.

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1.   Introduction

One of the most puzzling stylized facts about democracy in the United States is that voters tend to overwhelmingly disapprove of the legislature as a whole, but consistently approve of (and reelect) *their* respective legislator in strikingly large numbers. In 2012, Congress had only a 10% approval rating by Americans polled by Gallup in August, yet 90% of U.S. House of Representatives incumbents who sought reelection won that same year (and 91% in the Senate).[1] Historically, 2012 was consistent with the broader trend of high reelection rates (regularly exceeding 80% or 90%) of individual legislators, and low overall approval rating (averaging approximately 33%, according to Gallup) for the legislative body.[2] Many of the problems that create this disconnect are well documented, but solutions that address the incentives that contribute to this disconnect are scarce. The purpose of this paper is to introduce a novel rule that changes how legislators are (re)elected, and, subsequently, show how such a change will better align the incentives of the individual legislator with the broader interests of the nation as a whole.

We can identify a key source of this popularity puzzle by simply looking at the legislator's incentives and the policymaking that stems from those incentives. In order to be reelected, each legislator only needs to satisfy his or her district's constituents. Indeed, fighting for one's own constituency's interest is a basic tenant of representative democracy. However, if reelection is a major concern of our legislators (and there is ample evidence to show that this assumption is by no means heroic), then each legislator has a strong incentive to cast votes and broker deals that his or her district's constituents would favor, irrespective of whether the policies (or lack thereof) make sense for the nation as a whole. Individual legislators simply do not have a very strong incentive to function well as a group and construct efficient or coherent national policy, leading to the dysfunctional body of which voters (nationally) generally disapprove. This incentive misalignment represents a fundamental problem of representative democracy.

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[1] Gallup: http://www.gallup.com/poll/1600/congress-public.aspx
Center for Responsive Politics: http://www.opensecrets.org/bigpicture/reelect.php
[2] Gallup: http://www.gallup.com/poll/166838/congress-job-approval-starts-2014.aspx

While no single measure can solve all of the issues with representative democracy, a relatively simple change to the way we elect our legislators ameliorates this particular problem by better aligning a legislator's interests. Rather than going up for reelection in the same district over and over, we propose an alternative rule to the status quo: legislators run for (re)election in districts chosen at random. A simple rule change has profound implications. Once elected, members of Congress would no longer know the district in which they would run for reelection, placing them behind what we describe later in the paper as a *veil of randomness*, analogous to the Rawlsian construct of a similar name. Indeed, because legislators may draw any district in the country, they now have an incentive to formulate policy that can be justified on the campaign trail in *any* district, as opposed to merely a single, home district. Thus, rather than cater to the median voter of a single district, election after election, legislators would then have a much stronger incentive to function more effectively as a group and craft policies that make sense to voters nationally. In this paper, we show, analytically, how the resulting political equilibrium produces more optimal national policy.

While we recognize that a constitutional-level change may seem ambitious, even radical, our goal is not to present a change that will be welcomed by all and adopted immediately. The primary contribution of this paper is to present a novel idea and its implications, making a meaningful impact on the broader discussion of improving democracy at its core. At a minimum, consideration of our proposal would help clarify what we want our legislative process to accomplish and how well our current institutions accomplish this.[3] Indeed, a seemingly simple, unusual change of the rules can make significant contributions to the political process and address fundamental problems with representative democracy. We will show this by first outlining the rule change and its philosophical underpinnings in the new two sections. Then, in the proceeding sections, we summarize the key problem of distributional policy outlined by Weingast et al (1981) and proceed to model the economic incentives of legislators within a formal framework, showing how district randomization leads legislators to internalize certain externalities and leads to more optimal national policy. The final section concludes.

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[3] Other thought experiments have shed light on related issues. We have in mind such examples as Bruce Ackerman and James Fishkin's call for a "deliberation day" (Ackerman and Fishkin 2005); Fishkin's idea of randomly assigning children to parents at birth so as to achieve equality of opportunity (Fishkin 1983); Buchanan and Tullock's (1962) idea that representation could be based on the first letters of an individual's surname; and Andrew Rehfeld's proposal to assign citizens randomly at birth to congressional voting districts (Rehfeld 2005). Not coincidentally, many of these thought experiments involve random selection of various kinds.

2.   District Randomization – The Rule

A.   *How District Randomization Works*

The proposed rule can be summarized as follows: legislators go up for reelection in a district picked at random at the beginning of each election season. At some initial stage, each legislator would be elected by their respective districts exactly as they are elected under the current system. However, once the new rule is implemented, the game changes. Legislators who wish to seek reelection, along with their respective opponent(s), will be assigned *randomly* to another district to run for reelection at the beginning of that campaign season at some predetermined date.[4] If a legislator should succeed in his or her reelection bid, then the process would repeat itself upon her next reelection, *ad infinitum*.

An example might clarify how exactly this process would play out. Though this particular electoral process has wider applicability, we will illustrate our rule with an example from the political system in the United States, and the U.S. House of Representatives in particular. Suppose Jane Doe—say, a Congressman from Ohio's 9th District—was elected by popular vote in 2014. In early 2016, Jane Doe along with the challengers from the district in Ohio that elected her in 2014 would complete the necessary formalities to declare their respective runs for office. The group of candidates will then move onto a district that is selected at random by a public drawing, where this drawing could be modeled like state jackpot lotteries or some auditable, transparent random generating process. The primaries will be conducted in the new district, and the primary winners and Jane Doe (assuming Jane Doe makes it past her own party's primary) proceed to campaign in the newly selected district[5]—say, the 21st district of California—during the entirety of election season. The newly selected district chooses among those candidates on Election Day in 2016. The process repeats itself during the next election in 2018 and beyond.[6]

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[4] The beginning of "campaign season" can be determined by the electorate who would decide to adopt this rule. The decision of the date has its own tradeoffs. The campaign season should be short enough to preserve the kind of incentives a rule like is trying to achieve. That is, a short campaign season would limit an incumbent's ability to use her office to cater to her new constituency legislatively. But it should be long enough to allow candidates to get to know their new districts and vice versa.

[5] The district need not be a new district, though it is very likely it will be a different one than the current district. That is, our rule allows for the possibility of representatives drawing their current district because it is a random draw of all districts.

[6] This example can be modified slightly to fit the electoral process of U.S. Senators or any other political office by simply changing the dates to coincide with their terms.

B. *Primaries under District Randomization*

Primaries may work in much the same way as they do under the current system. For each election, political parties choose their candidates as they do currently (usually at the polls in the winter/spring during in an election year). However, primaries would be held in each district after the randomization is announced for that particular election year. Each district not only sends an incumbent Congressman (if she chooses to run again) and her party's primary challengers to another district selected at random, but they also send challengers from the other political party (or parties). That is, both the primary and general election take place in the "new" district selected at random.

Conducting the primary in the "new" district would serve at least two purposes. First, this would give the new district additional familiarity with candidates by effectively extending the campaign season in their district, perhaps even generating additional interest in the candidates themselves before the general election. Second, perhaps most importantly, the incumbent legislator will be further shielded from partiality to her current district. If the primary was conducted in her current district, one can imagine a scenario where an incumbent loses her primary because the challenger emphasized the missed opportunities for reeling in special benefits and earmarks for the district she currently represents. One of the chief goals of this rule is to change the incentive of legislators catering to the specific interests of a particular home district.

There are certainly other possibilities. The district chosen at random could run its own candidate(s) against the incumbent who has been selected to campaign there. But, we believe this would distort the overarching purpose of this kind of electoral process. The purpose of this is not to make it as difficult as possible for an incumbent to win (though it could be difficult for her to win regardless). Our worry is that pinning a "foreign" incumbent Congressman against a hometown politician would make the campaign even less about substantive policy issues and create an inherent and unnecessary bias against incumbents. Hence, we believe an election of all "foreign" candidates has the distinct advantage over the latter possibility because the election becomes less about "Us versus Them" and (ideally) more about substantive issues. Nonetheless, each variation of district randomization proposal may come with different tradeoffs, and the

electorate adopting this rule will ultimately have to decide on which variation fits best with their objectives and preferences.

3. Philosophical Underpinnings, Alternative Proposals, and Related Literature

A. *Randomization and Democracy*

Historically, partiality and favoritism have been viewed as a feature of representative government, not a bug. One view of legislators in representative democracy is that they represent the interests of their respective home districts, and it is their explicit goal is to "bring home the bacon" so-to-speak, fighting for local interests nationally, particularly on (but not limited to) issues related to distributive policy. In this view, optimality or even coherence of national policy is not the point. But, what if we as a society wanted a more optimal, coherent national policy from representative government at the national level? What if we wanted our legislators to evaluate national policy from a more objective, impartial standpoint, in the interests of the nation as a whole?[7] By changing their incentives, district randomization fundamentally changes our conception of legislators in a representative democracy along these dimensions.

While district randomization seems like a radical change, it is worth noting that the use of randomization in civil service is not new. The American legal system has a long tradition of seeking objectivity and impartiality through randomization or lotteries (Samaha 2009).[8] The chief example of this is the use of random selection of juries in common law countries.[9] Jurors are chosen at random for a variety of reasons, one being that objectivity can be obscured if the jurors actually knew the defendant or victim, or otherwise have some stake in the result of the trial. One can imagine the conflict of interest if a juror was the victim's neighbor or family member. Surely this kind of knowledge would obstruct a juror's objective decision-making process, which should be based on purely the facts presented at the trial and her own judgment. Indeed, the modern legal system goes to great lengths to ensure objectivity through random selection, implicitly acknowledging the desirability of the kind of judgment more objective third

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[7] Relatedly, what if we wanted a system where voters largely approve of Congress nationally, but are somewhat less likely to approve of *their* own respective Congressman than under the current system?

[8] For additional discussion of randomization and lotteries, see Stone (2009) and Stone (2011).

[9] The Jury Selection and Service Act of 1968 states, "It is the policy of the United States that all litigants in Federal Courts are entitled to trial by jury shall have the right to grand and petit juries selected at random from a fair cross section of the community in the district or division wherein the court convenes." 28 U.S.C. Part V 121 § 1861.

parties are in the position to deliver.[10] Another way to frame district randomization is that, by analogy, legislators are on "trial" during an election, and the "jury" is simply the electorate. Just as we select jurors at random, we may similarly select districts at random to hear the facts of such a "trial." While the analogy is not perfect, the idea is simply that a seemingly radical rule is not entirely out of sync with traditional democratic institutions.

B.   *Justice and the Veil of Randomness*

In theory, randomization is not the only way to achieve impartiality. Consider, for example, John Rawls' *A Theory of Justice* (1971), famous for his articulation of the "original position." Rawls argued that if individuals were in a setting where they were completely ignorant of whom they are (i.e. their place in society, social status, abilities, intelligence, strengths, etc.) they would be in a unique position to agree upon just rules for society. Rawls describes the goal of the original position as, "set[ting] up a fair procedure so that any principles agreed to will be just" (Rawls, p. 136). He illustrates this fair procedure conceptually with a hypothetical construct which he calls the *veil of ignorance*. Individuals in the original position who find themselves behind a veil of ignorance are not in a position to mold rules to their own advantage (or the groups they are representing) because they simply do not know enough about themselves (or their constituencies) to do so. To Rawls, this theoretical position of objectivity is necessary to conceive of just rules for a social contract.[11]

James Buchanan and Gordon Tullock's classic book *The Calculus of Consent* (1962) makes a similar productive use of ignorance without randomization. Buchanan and Tullock postulate that the nature of constitutional design generates decision-making that is fundamentally different from ordinary lawmaking. Constitutions have wide-ranging effects over an indefinite period of time. The framers of the constitution will have difficulty anticipating the impact specific constitutional features will have upon themselves and their descendants. Ideally, their intent is to design constitutions with an eye toward maximizing the well-being of society over time.

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[10] This reflects a radical departure from the earliest understandings of the common law jury, which placed a premium upon the "local knowledge" of the jurors—including personal knowledge of the parties involved. See Abramson (1994).

[11] Proponents of lottery use (e.g., Goodwin 2005) have recognized the similarity between Rawls' veil of ignorance and random selection.

These examples demonstrate that there are ways of generating the sanitizing effects of ignorance without randomization. Buchanan and Tullock postulate that ignorance follows from the vagaries of the future. Rawls artificially constructs ignorance through a hypothetical framework in which very little is known. Adrian Vermeule (2007) documents a number of similar mechanisms; following Rawls, he speaks of a "veil of uncertainty" that can have desirable democratic effects. However, more practically, it can prove difficult to ensure ignorance without randomization. Critics of Buchanan and Tullock, for example, note that the uncertainty posed by constitutional moments is far from total. For example, white citizens know that they and their descendants will likely continue to be white. This knowledge can frustrate efforts to ensure impartiality and prevent favoritism. Randomization precludes such possibilities in an admittedly heavy-handed way. It therefore deserves serious consideration whenever the veil of ignorance or uncertainty can prove hard to secure by other means.

Our district randomization rule parallels the Rawlsian conception of the veil of ignorance in an important way: once elected, the legislator is ignorant of his or her own interests in any specific sense, as she no longer has an incentive to play favorites. Hence, the district randomization rule places legislators behind a *veil of randomness*. Behind this veil, such individuals are blinded by a randomized procedure, creating uncertainty about exactly to whom they will be accountable and that electorate's preferences. Again, each legislator is equally likely to be assigned to any district in the United States (as in the previous section's example). Because her next constituency will be chosen at random, a rational representative could approximate the make-up of her constituency only probabilistically. Hence, this veil of randomness creates an incentive to express concern for all districts in some general sense, much like the Rawlsian construct. If representatives want to be reelected, they would choose policies/platforms that would effectively align their own (what would traditionally be) constituency interests with the interests of the country. Hence the parallel between Rawls' theoretical construct and our district randomization is clear: without knowledge of *who* to favor, one has little incentive to play favorites.

In one sense, randomization induces a near complete form of ignorance. It precludes any form of valid prediction that one state of affairs, rather than another, will obtain. But it does not prevent the assignment of probabilities to outcomes—indeed, by definition true randomization

generates outcomes in an equiprobable fashion. This is different from Rawls' veil of ignorance, which assumes a radical form of uncertainty under which agents cannot even guess the likelihood that they will possess certain characteristics. Indeed, the veil of ignorance and the veil of randomness are not identical, although both work to exclude certain kinds of reasons or partiality from decision-making. While the ignorance of such agents is arguably not as pure as in Rawls' hypothetical scenario,[12] an advantage of our randomization rule is that it can be implemented in the real world, while Rawls' theoretical construct cannot.

C.   Alternative, Related Proposals

Alternative proposals have also introduced something like the idea of randomization into the context of electoral democracy. For example, both Rehfeld (2005) and Buchanan and Tullock (1961) propose constructing electoral districts in ways that deny a special place to geographic representation. Rehfeld proposes assigning citizens at random to different constituencies when they reach voting age, while Buchanan and Tullock propose to place people into constituencies based upon the letters in their names. These proposals might well mark an improvement over geographically-defined representation. But they have three shortcomings when compared to our proposal. First, Buchanan and Tullock's proposal does not so much randomize as employ a predictable method that is supposedly uncorrelated with any relevant political features. We say "supposedly," because names do in fact correlate with race or ethnicity. A legislator representing people with surnames ending with "n," for example, might expect to have a disproportionate number of Jewish constituents (with names like "Feldman," "Wiseman," "Goldman," etc.).[13] This sort of (perfectly rational) expectation might well influence political behavior in ways contrary to pure impartiality. However, it may be harder to devise ways to favor the "special interest" constituted by a group of people with similar letters in their names than to favor geographically-defined constituencies, but it is far from impossible.

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[12] This is not necessarily a bad thing. There is no clear consensus as to how agents ought to make decisions under the radical uncertainty postulated by Rawls. For this reason, Rawls' specific recommendations are vulnerable to attack by anyone with a competing theory of uncertainty. Our proposal more closely resembles that of John Harsanyi (1955), which requires an agent to imagine having an equal probability of being each member of a society. Harsanyi's proposal relates ignorance to randomization in a more direct manner than that of Rawls.

[13] In the past, jury panels have been selected on the basis of the fifth letter of the potential juror's last name. This process did indeed produce patterns in the racial and ethnic composition of juries (Elster 1989, p. 46).

Rehfeld's proposal, which employs genuine randomization, avoids this problem. But both his proposal and that of Buchanan and Tullock are vulnerable to a second objection. Both proposals induce a certain level of ignorance at the level of selection; no bad reasons (or, in the case of Buchanan and Tullock, fewer bad reasons) can influence the assignment of one citizen to a particular constituency. But once the assignment is made, every legislative candidate knows exactly who she will be representing. She therefore has reasons to try and favor her constituency as best she can, even at the expensive of the wider polity. This may prove very difficult, especially in the case of Rehfeld's proposal, but it is not conceptually impossible. In other words, there is no veil of randomness under these proposals. Random reassignment at the level of specific elections, which is what we propose, would eliminate this possibility entirely.

Finally, and perhaps most practically important, the alternative proposals throw away geographical representation altogether, which may not be desirable for practical purposes. Geographical representation allows the electorate to be concentrated in way that makes the dissemination of information during an election (at the primary or general election stage) more efficient. Candidates organize locally, making stump speeches and campaigning in a particular area in a way that voters can physically see (and meet) their candidates, which is an important aspect of democracy and civil society more generally. Candidates can disseminate their messages via local television, radio, and other media that are more geographically defined. Congressmen still campaign door to door in the 21st century. One might be able to envision web-conferencing with a Congressman under either of the alternative proposals, which is certainly possible, but may not have wide appeal in all practicality. An advantage of our proposal is that the change would both be simpler and more incremental, in the sense that we would not have to do away with the efficiencies of geographical representation altogether, while remaining similarly transformative as the alternative rules.[14]

4. Modeling Optimal Distributive Policy with (and without) a Randomization Rule

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[14] Nor does our proposal scrap multi-district representation in favor of a proportional representation system, or some system with a national constituency. The debate over single-member districts vs. proportional representation systems and their respective merits is voluminous and falls outside the scope of this paper. For our immediate purposes, we are considering a change to enhance single-member district systems, which may, or may not, be the single best way to elect a legislature. Our aim is to introduce a new idea specifically aimed at improving single member district democracies, not necessarily craft the final word on how to elect legislatures more generally.

In this section, we build on the Weingast et al (1981) framework to illustrate the implications of our randomization rule and to subsequently show how district randomization offers a novel solution to a critical issue raised by their paper. Their approach to modeling distributive policy considers the benefits and costs of a particular geographically targeted policy from the standpoint of a legislator. Weingast et al (1981) employ this approach to show a foundational problem with the (in)efficiency of distributive policies (i.e. policies that have concentrated benefits within specific geographical areas, which include "pork barrel" projects like sewage treatment plants, bridges, urban renewal projects, etc.). Specifically, Weingast et al (1981) demonstrates that legislators have an incentive to choose an inefficient level of public expenditure when legislatures are composed of multiple single-member districts.[15] We summarize this contribution here, outlining the core problem, and proceed to show how district randomization effectively realigns legislator's incentives with more optimal national policy.

A.   Modeling Distributive Policy and the National Baseline

The standard model begins with a distributive policy or project, *j*, for an *n*th district, $P_j(x)$, being considered, where *x* is a decision parameter concerning the size or scale of the project. This project has both costs, $c(x)$, and benefits, $b(x)$, associated with its implementation. The benefits, $b(x)$, can be thought of as the present value of the economic benefits enjoyed by the constituency who is awarded this project by the national legislature.[16] The costs, $c(x)$, are the total resource costs incurred in the project's implementation. According to Weingast et al. (1981), this cost can be decomposed into three parts:

- $c_1(x)$: the real resource expenditure for project inputs spent *within the district* in which the project is located,
- $c_2(x)$: the real resource expenditure for project inputs spent *outside the district* in which the project is located,
- $c_3(x)$: the nonexpenditure real resource costs imposed on the district (i.e. negative externalities),

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[15] See Levitt and Poterba (1999) for empirical evidence that distributive politics has substantial effects on local economies.

[16] We recognize that constituents care more about simply economic benefits, but keeping in line with Weingast et al (1981) we use their definition for simplicity. In section 5.D we discuss non-economic benefits and the role of ideology in this context.

where $c(x) = c_1(x) + c_2(x) + c_3(x)$. Like Weingast et al. (1981), we make the following assumptions about the benefit and cost functions:

Assumption 1: $b'(x) > 0$, $b''(x) < 0$

Assumption 2: $c_i'(x) > 0$, $c_i''(x) \geq 0$, $i = 1, 2, 3$

The expenditure for $P_j(x)$ is financed through a tax system, where the total tax bill, $T(x)$, is $c_1(x) + c_2(x)$. For simplicity, we assume that such a system covers all expenditures for this project, as the ith district has a tax share t_i where $\sum_{i=1}^{n} t_i = 1$, and n is the total number of districts. The tax bill is shared equally among all the districts, which means that the tax bill for the ith district for the project will be $t_i[c_1(x) + c_2(x)]$.[17]

A key contribution of Weingast et al. (1981) that they show how local incentives are fundamentally misaligned with national outcomes, proving analytically that legislatures composed of n districts will tend to choose a project of size or scope x that is inefficiently larger than the optimal project under a legislature with a single, national district. To illustrate, they examine the optimal x under a single political constituency objective function ($P(x)$) and then under a multiple constituency legislature objective function with n districts ($N(x)$). Formally, in the single political constituency, the legislator (and single district's) objective function is

$$P(x) = b(x) - c_3(x) \qquad \textbf{(1)}$$

where the total real resource expenditure, which equals $c_1(x)$ (as there is no outside district that requires a $c_2(x)$), is paid for in its entirely by the single, project district. One can see that the $c_1(x)$ expenditure and funding cancels in the equation leaving equation (1). In this context, we may think of this benchmark as national policy, absent distributive politics, where incentives are aligned in a way that all costs and benefits are optimally chosen and borne by a single, national district.

When maximizing their objective function in equation (1), it is easy to see that the legislature chooses an optimal size and scope of x such that they maximize the nation's net benefits, or to the point in which the marginal benefit equals the marginal cost. Again, note that

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[17] It is clear to the authors that taxes are not equally borne by all districts, in light of Albouy (2009). However, the conclusions from this study do not depend on this assumption.

$c_1(x)$ only cancels because Weingast et al (1981) assume that constituents often mistake the resource costs of projects for benefits,[18] which makes the political calculation different from the pure economic calculation.[19] However, neither the conclusions of Weingast et al (1981) nor this paper depend on this assumption. Modeling it this way merely reflects a more practical political reality, but can easily be changed to model voters as making judgments about costs and benefits more like *homo economicus*. As a result, equation (1) represents a benchmark for national policy.

B.   *District Externalities and the Inefficiency of Multidistrict Legislatures*

The nature of the problem of distributive politics becomes clearer when we look at the objective function of legislators within a multidistrict legislature, which characterizes many of the world's democracies. The legislator's objective function is based on likelihood for reelection. Likelihood of reelection depends on the expected net benefits from project *j* in the district where the legislator goes up for reelection. Given the non-heroic assumption that legislators generally desire to be reelected and liked by their constituents, Weingast et al. (1981) point out that a legislator from district *j* has the following objective function:

$$N(x) = b(x) + c_1(x) - t_j^n[c_1(x) + c_2(x)] - c_3(x)] \qquad \textbf{(2)}$$

Substituting from (1), we can see that:

$$N(x) = P(x) + c_1(x) - t_j^n[c_1(x) + c_2(x)] \qquad \textbf{(3)}$$

where, if $c_1'(x) > t_j(c_1'(x) + c_2'(x))$, then the optimal x (scope of the project) from the multiple constituency x^N is greater than the optimal x from the single constituency x^P.[20] The degree to which x^N is greater than x^P is an inefficiency from the externality under the multiple constituency regime. Essentially, a legislator in a multidistrict legislature has an incentive to choose a size and scope of a project that is inefficiently large, because the legislator's district (and hence the

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[18] Weingast et al (1981) say that, "Put simply, a dollar's valuation of a project may come in either of two forms: a pecuniary gain to a factor owner or a benefit to a project consumer. Partly as a consequence of these distributional effects, and partly for additional reasons enumerated below, the political evaluation of pecuniary effects diverges from their economic treatment." (Weingast et al, p. 647). This may be a flaw of democracy from that voters may not evaluate the true net benefits of public projects like an economist, but a longer discussion of this issue falls outside the scope of this paper.

[19] The true economic calculation efficiently maximizes $b(x) - c(x)$, which is only relevant if constituents do not mistake certain costs for benefits (that is to say, that voters think more like *homo economicus*).

[20] Specifically, this follows from the proof for Theorem 2 on p. 652 in Weingast et al. (1981).

legislator) does not necessarily internalize the true cost of the project. The resulting externality represents an important defect in representative democracy with multiple districts.

The Weingast et al. (1981) framework helps explain why voters may be unsatisfied with the inefficiency of national policy while content with their individual legislator. When the benefits from a particular distributive policy are geographically concentrated, and the costs are dispersed in a politically relevant way, legislators generally have an incentive to choose inefficient national policy. Underlying their objective function, and the root of the legislators' inefficient incentives, is their political ambition to be reelected and their accountability to the same geographically defined district that votes for them. Local gains and losses are politically more important to a legislator's objectives, and as Weingast et al. (1981) point out, representatives have a strong incentive to use whatever influence they have to satisfy those who would hold them accountable (i.e. the voters in their respective districts).[21] The result contributes to the tendency of voters approving their respective representative, but disapproving of the dysfunction and waste at the national level.

C.   Incorporating a Pecuniary Cost of Logrolling

In order to maximize their service to their respective constituencies, legislators may engage in logrolling to ensure that the policy priorities of their respective districts are satisfied. These policy priorities may not simply be so-called pork barrel projects, but also other economic and non-economic (ideological) preferences. Logrolling may include explicit vote trading or implicit reciprocity among legislators, or even outright transfers or special earmarks that are designed to make it politically enticing for other legislators to join a coalition to vote for a particular distributive policy.[22] To simplify this process mathematically, we incorporate a transfer mechanism into the Weingast et al. (1981) framework to capture the idea that in order to pass a particular project, *j*, a legislature (or legislator's district) may need to incur some cost associated with reciprocity or logrolling.

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[21] The Founders were not oblivious to this. In fact, Madison himself, as he wrote in The Federalist No. 10, understood the incentives of coalitions of legislators to exploit opportunities to heap costs onto others, while securing benefits for their own interests: "The apportionment of taxes on the various descriptions of property is an act which seems to require the most exact impartiality; yet there is, perhaps, no legislative act in which greater opportunity and temptation are given to a predominant party to trample on the rules of justice. Every shilling with which they overburden the inferior number, is a shilling saved to their own pockets."

[22] For an empirical analysis of this issue and the prevalence of logrolling in creating policy, see for example Stratmann (1996), Gawande and Hoekman (2006), and Kardasheva (2014).

Earlier we assumed that each project, j, only benefits one district (call the district benefiting from the project district n) while all districts carry some proportion of the cost for project j. Yet, it may be in the interest of district n to make a transfer (or some pecuniary reciprocal cost) to other districts to offset some of their cost proportions (especially if district n believes the project will not pass without this transfer).[23] Accordingly, for project j, other districts (i not equal to n) value only the proportional cost they must carry for the project and any transfer made from district n to district i (where district i is any non-project j district 1 through n-1).

In a model that incorporates this pecuniary cost of reciprocity (often referred to as logrolling), a legislator still chooses some level of current project investment, x, for project j to maximize this objective function. Let F(x) be the total pecuniary transfer that the current project district, n, must payout to the requisite coalition of other districts, making it worthwhile for the legislators to support the project. Let $k+1$ be the number of districts required to approve the project in order for legislature to pass the project. For example, under majority rule in a legislature with 100 representatives, $k+1$ equals 51, and the district with project j needs k or 50 other nonproject districts to approve the project. Each other, non-project district receiving a transfer (1 through k) has the transfer function $f_i(x)$ such that

$$F(x) = \sum_{i=1}^{k} f_i(x) . \quad \textbf{(4)}$$

Formally, the objective function of district n (with project j) is

$$N_n(x) = b(x) + c_1(x) - (t_j^n[c_1(x) + c_2(x)] + c_3(x)) - F(x) \quad \textbf{(5)}$$

The remaining, nonproject districts are split into two groups, those that receive transfers from district n and those that do not receive transfers from district n. This split in groups is relevant if the legislature requires less than unanimous support (i.e. k equals n-1). Project j only requires that the number of districts necessary to make the project pass have net benefits (where net benefits include transfers).

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[23] We let this cost be pecuniary for simplicity, acknowledging that reciprocity may very well be non-pecuniary, resulting in potentially greater deadweight loss. See Coate and Morris (1995) for additional discussion of inefficient redistribution or transfers.

The objective function of the nonproject districts *receiving transfers* is a function of the transfer received from district n, the real resource expenditure for project j spent inside the *nonproject* district ($c_2^i(x)$), and the portion of total real resource expenditures the nonproject district must pay for project j. Formally,

$$N_i(x) = f_i(x) + c_2^i(x) - t_j^i[c_1(x) + c_2(x)] \text{, where } i = 1 \ldots k \text{ .} \quad \textbf{(6)}$$

The objective function of the nonproject districts *not receiving transfers* is a function of the real resource expenditure for project j spent inside the *nonproject* district ($c_2^i(x)$) and the portion of total real resource expenditures the nonproject district must pay for project j. Formally,

$$N_i(x) = c_2^i(x) - t_j^i[c_1(x) + c_2(x)] \text{, where } i = k+1 \ldots n\text{-}1 \text{ .} \quad \textbf{(7)}$$

D.   *District Randomization Optimality*

In a traditional legislature with geographically defined districts and traditional election methods, the legislator knows to whom he or she is accountable. The legislator in the nth district (where project j would occur) understands that projects that are (on net) beneficial for that district would increase the likelihood of reelection, whether or not it is beneficial (on net) for the country as a whole. A randomization rule, which we explained in the previous sections, would change these incentives completely. Under a reelection regime with a randomization rule, the district in which a legislator goes up for reelection may be different from the district where the legislator has been elected in the past. As a result, we show in this subsection how the objective function for the optimization problem changes.

Suppose there are n number of districts in total. The legislator has an equally likely or $\frac{1}{n}$ chance to go up for reelection in any single district, including other, non-project districts 1 through $n\text{-}1$ and project district n. Accordingly, the legislator's objective function under the randomization rule follows from equations (5), (6), and (7) is

$$R(x) = \frac{1}{n}[b(x) + c_1(x) - t_j^n[c_1(x) + c_2(x)] - c_3(x) - F(x)] + \frac{1}{n}[\textstyle\sum_{i=1}^k f_i(x) + \sum_{i=1}^k c_2^i(x)$$

$$- \textstyle\sum_{i=1}^k t_j^i[c_1(x) + c_2(x)]] + \frac{1}{n}[\sum_{i=k+1}^{n-1} c_2^i(x) - \sum_{i=k+1}^{n-1} t_j^i[c_1(x) + c_2(x)]]. \quad \textbf{(8)}$$

It is easy to see that equation (8) simplifies to $\frac{1}{n}P(x)$ once we simply combine and cancel terms algebraically. First, we know that from equation (4) total transfers in to the other nonproject districts $(\sum_{i=1}^{k} f_i(x))$ must equal total transfers out from district n ($F(x)$) and, thus, these logrolling terms cancel. Second, the sum of real resource expenditures for project j located across all the nonproject districts (i.e. the sum of the $\sum_{i=1}^{k} c_2^i(x)$ and $\sum_{i=k+1}^{n-1} c_2^i(x)$ terms) equal the real resource expenditures for project j spent in nonproject districts in total ($c_2(x)$). As a result, these three terms simplify to $c_2(x)$. Third, the sum of all the individual district portions of taxes paid to cover real resource expenditures (i.e. the sum of the $t_j^n[c_1(x) + c_2(x)]$, $\sum_{i=1}^{k} t_j^i[c_1(x) + c_2(x)]$, and $\sum_{i=k+1}^{n-1} t_j^i[c_1(x) + c_2(x)]$ terms) must equal the total real resource expenditures (i.e. $c_1(x) + c_2(x)$) and simplifies to this sum. The above three modifications result in

$$R(x) = \frac{1}{n}[b(x) + c_1(x) - c_3(x))] + \frac{1}{n}c_2(x) - \frac{1}{n}[c_1(x) + c_2(x)] \quad \textbf{(9)}$$

It is also easy to see that the real resource expenditure terms above ($c_1(x)$ and $c_2(x)$) cancel. Intuitively, this step demonstrates that the randomization rule forces each legislator to internalize the real resource expenditures costs across districts, consistent with a single district objective function in equation (1). Once these expenditures terms cancel, we have:

$$R(x) = \frac{1}{n}[b(x) - c_3(x))] = \frac{1}{n}P(x) \quad \textbf{(10)}$$

From this equation, it is trivial to prove that the optimal x under multiple districts with the randomization rule (when $x = x^R$) is equal to the optimal x under a single district objective function (x^P).

THEOREM 1: $x^R = x^P$.

PROOF: The proof follows directly from simply maximizing equation (10) to find that: $R'(x) = \frac{1}{n}[b'(x) - c_3'(x))] = 0$, which means that $R'(x) = [b'(x) - c_3'(x))] = 0$. This equals the maximization of equation (1), hence $R'(x) = P'(x)$. Q.E.D.

It is clear from the proof above that the optimal scale and size of policy under district randomization effectively eliminates the particular inefficiency at the root of the current multidistrict democratic system, given that the optimal level of x under district randomization equals the same optimal level of a single, national district. Thus, from an individual legislator's standpoint, the threat of being selected to run in a district in which one has imposed external costs upon (without corresponding benefits), effectively internalizes and therefore eliminates this externality. More generally, a relatively simple rule change alters legislators incentives such that, out of their self-interest, they now need to construct policies that make sense to the nation overall in order to increase their likelihood of being reelected.

It is easy to see that, in the proof above, the choice of the optimal level of x under district randomization is independent of the number of districts, n. This is an important additional feature of district randomization because in a corollary, which Weingast et al (1981) call "The Law of $1/n$," they prove that as long as the "tax share is a declining function of the number of districts (n), then the degree of inefficiency in project scale is an increasing function of the number of districts" (Weingast et al, p. 654).[24] Hence, as nations add districts for practical reasons (e.g. incorporation of another state/province into the union), under the current system it may simply increase the level of inefficiency and dysfunction. But, with district randomization, the number of districts does not impact the choice of optimal policy, and "The Law of $1/n$" no longer holds. Another way of thinking about this is that democracies whose legislatures contain larger number of districts would reduce inefficiency from district randomization even more than ones with fewer districts.

5. Additional Implications of District Randomization

A. *Pareto Efficiency across Districts*

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[24] Consistent with the "Law of 1/n," Baqir (2002), for example, found empirical evidence that greater districting leads to considerably greater scale of government activity.

Legislators not only care about the optimal size and scope of policy, but they also care about how the net benefits are distributed across districts. If legislators can draw any district, then legislators have a greater incentive to ensure that all districts benefit from public policy changes, at least to some extent. For example, consider an international trade agreement that is *Kaldor-Hicks* efficient but not *Pareto* efficient (at the district level), where its benefits exceed the costs to the nation as a whole, but the net benefits are not felt by all districts. Some districts that have import-competing producers, for example, may have a loss, at least in the short term. Under the current system, certain legislators in these districts may have an incentive to block such legislation, and cobble together a coalition of allies via logrolling.[25] When these districts cannot muster the votes to block this legislation, and it passes, we still have a number of districts who are unhappy with legislation, even if it produces net benefits for the nation as a whole.[26]

With district randomization, legislators have a stronger incentive to redistribute gains to all districts, effectively creating Pareto efficient policies from Kaldor-Hicks efficient ones. That is, the distribution of benefits also matters. If they may potentially draw a "losing district," then forward thinking legislators may want to avoid having losing districts altogether. Note that the final term in equation (10) represents the "nonproject districts" which do not receive a benefit from the project or policy, nor do they receive a pecuniary (or non-pecuniary) transfer. So long as this term is negative (which is the case for all districts where $[\sum_{i=k+1}^{n-1} c_2^i(x) < \sum_{i=k+1}^{n-1} t_j^i [c_1(x) + c_2(x)]]$, then legislators would have an incentive to redistribute gains such that the benefits of a positive-sum national policy are enjoyed more widely and the number of districts that fall into this group are minimal (if any). Insofar as voters reward net benefits to their respective districts, legislators would have an incentive to not only promote greater efficiency, but greater equity across districts.[27]

B.   Consensus and Unanimity

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[25] In some cases, legislation that is beneficial, on net, may actually be voted down by such coalitions under the current system. This is yet another source of public dissatisfaction with Congress.

[26] In this case, the losing coalition will have the incentive to try to cobble together a larger coalition (e.g. via logrolling) in order to repeal such legislation. Hence, even legislation that is, on net, beneficial nationally is not safe from repeal under the current system. More will be discussed on this topic in Section 5.C.

[27] Note that this implication of district randomization is not a feature of the alternative proposals outlined in section 3.C.

A related reason why Congress is dysfunctional under the current system is that each legislator comes to the table with a different set of objectives, given that each district is inherently different and legislators represent constituencies that often want different policies. Even if legislators saw eye-to-eye on the benefits and costs of certain policies, their political calculations for reelection are fundamentally different, creating natural divisions within the legislature. In a way, because the current system creates legislators whose interests are fundamentally at odds with one another, this may partially explain why the functioning and national approval of this body is so low.

An additional, related implication of district randomization is that legislators have a stronger incentive to build a consensus. When districts are randomized for reelection, a legislator from District 1 has the same interests in mind as a legislator from District 2, and so on. All legislators have an incentive to vote for measures that are cost-justified nationally (i.e. marginal benefit is greater than or equal to the marginal cost), because they now have to account for the benefits and costs of all districts, albeit probabilistically. Specifically, the first order conditions from maximizing equation (10) imply that legislators will seek to maximize the net benefits of policies across all districts (i.e. nationally), and this objective is identical for all legislators. This itself is an important result in the broader political picture.

When the incentives for each legislator are identical, a single piece of legislation will impact all legislators in approximately the same way. That is, a single piece of legislation will accompany the same economic benefits and costs for each legislator. As a practical matter, legislators' assessment of costs and benefits may very well differ from one another, but insofar as there is agreement on the facts, their incentives are aligned in a way that they will view positive sum legislation with unanimous agreement. Hence, district randomization will lead to much stronger consensus for good policy, even unanimity, when there is widespread agreement on the facts.

If legislators' assessments of the costs and benefits of legislation differed greatly, then the degree of support certain legislation may vary proportionately, particularly for legislation where the benefits only nominally outweigh the costs. Indeed, this is just one source of disagreement in which legislators may have, irrespective of the system that elects them. Even ideologically moderate policy experts have substantive disagreements about the facts and the analysis of the

data more broadly. While practically, legislators may disagree in a world where districts are randomized for reelection, the fact that they have the same incentives signifies a marked improvement over the current system, where a disagreement about the facts *and* different incentives lead to disagreements about policy.

C.   Stability

In Section 4 it was clear that under the current system (i.e. without district randomization), legislators have an incentive to impose inefficient, external costs on other districts. Not only is this inefficient, as Weingast et al (1981) have shown, but this is also an unstable process. Legislators may form coalitions (via logrolling) whose legislation imposes a disproportionate amount of these external costs on minority districts (i.e. districts outside the coalition). Bernholz (1973) and Tullock (1981) argued that the losers would always have an incentive to make deals in order to attain membership into a winning coalition, and such winning coalitions, in theory, should not be stable, effectively creating "cycles." In other words, representatives constantly jockey for better deals, ones which benefit their respective districts, but may introduce both inefficiency and instability for national policy.

The previous section incorporated a pecuniary cost identity into the objective function to simplify logrolling that may take place in the legislative process. Under the current system, an individual legislator (or her respective district) may incur logrolling costs in order to help legislation pass that, on net, still benefits her district. In this case, logrolling favors are paid to enough districts to secure a winning majority. With district randomization, the logrolling term drops out of the equation entirely, which represents another important implication of our rule. Legislators would no longer have an incentive to jockey for better deals for a particular district and to create (fragile) majority coalitions, effectively eliminating the need for traditional logrolling and backroom reciprocity that makes the current system unstable. Thus, not only does district randomization produce more efficient legislation, it also produces stability in a way that the former system does not. This idea stems from the *veil of randomization*, in that if one does not know the district one will draw, there is relatively little incentive to play favorites in the legislative process.

D.   Moderating Ideology

To this point we have simplified matters by narrowing the legislator's objective function to maximizing the net economic benefits to their constituents. However, it is clear from even the casual political observer that voters care about more than purely economic benefits, including ideology and a range of issues that are non-monetary in nature. One simplistic way of changing this model is to merely redefine benefits and costs in terms of utility, rather than real economic resources. In a broader utilitarian sense, policymakers could weigh costs and benefits across more dimensions, making the maximization problem more difficult practically, but the general conclusions flow accordingly. However, we need not make that jump to understand the ideological implications of district randomization.

A more direct way of thinking about the ideological implications of district randomization is through the median voter theorem. The essence of the MVT is that a majority of voters (with single-peaked preferences) will prefer the ideology of the candidate who is closest to the median voter (in one-dimensional left-right space) when presented with a choice of two candidates. Under the current system in the U.S., the median voter is very different from district to district, which is a result of a complex set of socioeconomic, geographic, and cultural factors, as well as gerrymandering by state legislatures. Because certain districts' median voters are more extreme ideologically, more extreme legislators from these districts can be elected over and over. This varied ideological distribution of median voters has thusly led to a varied ideological distribution of legislators.

District randomization will likely have two effects that moderate the politics of a national legislature. First, the overall distribution of ideologies of legislators seeking reelection will be more moderate. Legislators who express extreme ideological positions have the lowest probability of reelection, because the ideology of the "expected district" is likely to be more moderate (and thus they are more likely to be beaten by a more moderate challenger ex ante). District randomization now forces legislators to think more about the "expected median voter" nationally, which transforms the system in a similar way as before (when we were modeling simply economic benefits). All legislators face the same distribution of potential districts, and thus the same "median voter," as opposed to the current system where they each cater to different median voters within their own respective districts.

The second moderating influence is simply that the nature of many ideological issues is zero sum, and under district randomization legislators will be less likely to take on purely zero sum issues at the national level. That is, with many non-monetary ideological issues, as one side wins, by definition, one side loses. This would needlessly create a number of disgruntled districts who, by the nature of the non-monetary issue, might not be so easily "compensated" for their loss. Hence, legislators would have less of an incentive to spend time with zero sum issues because they do not increase the net benefits to the districts they are likely to draw for reelection. The moderating influence on the legislature under district randomization may be either a feature or a bug, depending on the eye of the beholder.

6. The Role of Interest Groups under District Randomization

One advantage of district randomization over the current system, we believe, is that many interest groups will have less power under this kind of a political system. Since Mancur Olson (1965), economists have argued that interest groups (i.e. industry-based organized interests or pressure groups) form because legislation for subsidies and tariffs, for example, generate concentrated benefits and have diffuse costs. Consumers and taxpayers pay a substantial amount collectively, although each only pays a small amount individually. Hence, individually, these groups have less of an economic incentive to invest in organizing, especially if such a large group would create so many free riders from any solution. The firms that benefit from such policies are generally fewer, meaning that they can organize more effectively and are better able to handle the free rider problem. Thus, under our current system, farm lobbies can support (either through campaign contributions or other means) a farm state legislator who brings home specific subsidies or tariff benefits from bills that have negative net benefits for the nation as a whole. The same incentives exist for districts that have concentrations of other industries, like manufacturing, technology, and financial sectors. Because their respective districts will be better off for it, legislators tend to be rewarded by their constituents on Election Day. Moreover, their opponents are unlikely to call them out on accepting such support from these particular interest groups. In fact, if anything, one can imagine opponents in farm states calling attention to the fact that the very transfers that were advocated by these interest groups were *not enough*.

Again, under our rule, the incentives are different. The well-organized farm lobby, for example, will likely still exist. They might even support find enough support for some of their

measures to pass in the short run. Consumers and taxpayers will still not be organized under our rule either. However, our rule *does* provide a disincentive for accepting farm lobby support that does not exist under the current system. During the reelection campaign, if a non-farm district is drawn, then now an opponent can call attention that legislator for passing an inefficient farm bill. If the voters in a non-farm district were worse off because of this bill,[28] then they would be more receptive to the sort of arguments against the farm-interest legislators. That is, criticisms of such policies do not fall on deaf ears under our rule. There is at least some probability that these legislators are properly held accountable during a reelection campaign, where there is a miniscule probability of that happening under the current system. Thus, through backward induction, legislators catch on and will be more reluctant than under the current system to allow interest groups of this nature to show public support for them and will be less receptive to their recommendations because of the adverse consequences on their reelection campaigns.

Finally, the district randomization rule further erodes interest group power by making it a bit more difficult for an interest group to campaign against candidates of which they disapprove. For example, if a legislator votes for a policy of which an interest group disapproves, then traditionally an interest group can fund attack ads year round, attempting to sway the district's opinion of the legislator. Under district randomization, an interest group does not know which district to run attack ads until election time, creating a smaller window in which they can sway public opinion.

7.   Conclusion

District randomization is a simple, yet transformative, rule that solves a critical problem with our democracy. The problem formally raised by Weingast et al (1981) shows that legislators have an incentive to cater to their respective local interests, often at the expense to the broader national interest, resulting in inefficient policy nationally. Among other reasons, this helps explain why voters generally disapprove of the dysfunction and inefficiency at the national level, but repeatedly reelect their respective legislators at the local level. District randomization solves

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[28] Assuming that the bill has negative net benefits nationally, then, by definition, a transfer or reciprocating benefit cannot granted to all non-farm districts. Therefore, a bill that has negative net benefits will leave at least some districts worse off.

this problem by radically reshaping legislators' incentives so that they internalize the very political externalities that are at the source of the problem. Building on the modeling framework of Weingast et al (1981), we show that district randomization effectively aligns the interests of each legislator with the national interest.

The nature of these types of problems and the broader understanding of them are not new. Indeed, many of these problems were well known by the Founding Fathers. In Federalist No. 10, Madison (1787) understood that politicians were human, not necessarily benevolent legislators that practiced enlightened self-restraint to overcome the forces that pull them away from the national interest. In making his case for the Constitution of the United States, Madison (1787) acknowledged that, "it is in vain to say that enlightened statesmen will be able to adjust these clashing interests, and render them all subservient to the public good. Enlightened statesmen will not always be at the helm." We take it a step further by taking the latter statement as given, putting forth a constitutional-level change that does not require benevolent, enlightened statesmen to be at the helm. By aligning legislators' interests with the national interest, district randomization channels self-interest, via the desire to seek reelection, to promote efficient policy.

Even though our rule drastically changes the incentives of legislators for the better, we readily admit that no rule can be devised that transforms men into angels. Legislators will still face rent-seeking opportunities and a host of suspect avenues toward reelection, wealth, power, and prestige. For example, our rule does not eliminate the incentive for legislators to transfer wealth from nonvoters to voters, which is perhaps one of the most important issues facing democracies in the developed world. This can happen across generations, as politicians may neglect problems (like environmental concerns or entitlement reform) that could have huge impacts upon future generations, but less of an effect upon the present one (and the present election). A district randomization rule that solves this problem requires not only cross-sectional randomization, but intertemporal randomization that would violate the current laws of space and time. Indirectly though, by enhancing efficiency under the current system, district randomization can still shore up resources by limiting suboptimal distributive policies, which in turn may help ameliorate other areas of concern.

The purpose of district randomization is not to solve everything that is wrong with representative democracy, but to make an improvement over our current system and contribute to the broader discussion of improving democracy at its foundation. If implemented, district randomization would 1) improve efficiency of national policy, 2) lead to greater equity across districts, 3) generate broader consensus among policymakers, 4) create more stable legislative outcomes, 5) have a moderating influence on ideology, 6) and reduce the effectiveness of interest groups. District randomization accomplishes these ends through a (Rawlsian) just means. By placing legislators behind a veil of randomness, such that they only know probabilistically to whom they will be accountable in their next election, district randomization closely resembles John Rawls' veil of ignorance. The result is that a seemingly unusual, outside-the-box rule changes the complexion of national politics and has the potential to restore public approval for the national legislature.

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