Direct Voting and Proxy Voting

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Abstract: I develop a hybrid of direct democracy and representative democracy in which each citizen may vote directly on each issue, or delegate his vote on any issue to a representative (that is, a proxy) of his own choosing. I construct both an axiomatic argument for such a system and an argument based on its ability to ameliorate the information problems inherent in both direct and representative democracy. I also propose practical measures for implementation, including new variations on existing proxy system proposals. These new variations include a 'Dodgsonesque' procedure, a proportional agenda-setting procedure, a provision for virtual committees, and a provision for continual consideration of issues.

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1. Introduction

One might suppose that democratic decisions must either be made via direct democracy, which is strongly democratic but highly impractical, or via representative democracy, which is practical but democratic to a lesser degree.[1] This paper focuses on a middle-ground between these two choices, and aims to establish that it can be both practical and strongly democratic.

Direct democracy without any option for representation is problematic. Even if it were possible for every citizen to learn everything they could possibly know about *every* political issue, people who did this would be able to do little else, and massive amounts of time would be wasted in duplicated effort. Or, if every citizen voted but most people did not take the time to learn about the issues, the results would be highly random and/or highly sensitive to overly simplistic public relations campaigns. Or, if only a few citizens voted, particular demographic and ideological groups would likely be under-represented.[2]

So it is clear that some form of representation is valuable to the political process, but is it necessary to impose representation on citizens?[3] What if instead, we allow citizens to appoint representatives on a strictly voluntary basis? As I define it here, a system of *voluntary delegation* differs from traditional representative democracy in two distinct but related ways: the first is that citizens retain the option of voting directly, and the second is that citizens choose their own representatives (who can also be called proxies), rather than being forced to accept the winners of elections as their representatives. Therefore, in functional terms, a voluntary delegation system may be called a *direct/proxy voting* system.

The remainder of this paper is organized as follows. Section 2 discusses the academic literature on proxy voting. Section 3 constructs an argument for a voluntary delegation system based on two democratic axioms. Section 4 uses an issue space model to analyze the relative performance of voluntary delegation systems in two aspects: accurate reflection of voter preferences and similarity of outcomes to the median of votes cast under direct democracy with full information. Section 5 outlines strategies for practical implementation of the voluntary delegation idea, including some new refinements such as a 'Dodgsonesque procedure', 'proportional agenda setting', 'virtual committees', and 'continual consideration' of issues. Section 6 provides a broader discussion, which considers the effects of relaxing various assumptions used in the spatial model, and Section 7 concludes.

2. Literature

It is unsurprising that traditional representation systems are predominant while direct/proxy voting systems remain primarily in the realm of theory, because many features of the latter were impractical in large societies before the advent of modern computing technology. For the same reason, it is intuitive that the literature on direct/proxy voting systems made rapid progress in the late 1960s, as people began to realize the power that computers would eventually have to re-shape society.

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[1] For example, Buchanan and Tullock (1962), Downs (1957), and Black (1958) deem direct democracy impractical for decision-making on a large scale.

[2] The question of voter competence is a dominant recurring theme in debates over direct democracy. For example, see Cronin (1989, chapter 4) for a survey, Magleby (1984) for a pessimistic view, and Matsusaka (2005) for a defense of direct democracy within a limited role.

[3] If current systems of representative democracy were universally held in high esteem, this question might be of little more than academic interest. But in fact, dissatisfaction with these institutions is quite widespread even in established democracies. For example, America: Newport (2014) reports that only 14% of survey respondents approve of the US Congress's handling of its job (with an average of approximately 15% since the beginning of 2011), and Riffkin (2014) reports that only 7% of survey respondents have "a great deal" or "quite a lot" of confidence in the US Congress as an institution. Where approval of the current legislative system is this low, it is logical to give serious consideration to alternatives.

Gordon Tullock devotes the last chapter of his 1967 book *Toward a Mathematics of Politics* to proportional representation (PR). Aside from arguing the merits of PR in general, he proposes a special type of PR. In this proposal, each voter chooses a representative, and each representative has voting power equal to the number of votes he receives. A person is allowed to vote for himself, and even if no one else votes for him, he may serve as his own representatives and vote "by wire", while watching a broadcast of the proceedings. Representatives' pay and speaking time increase according to the number of votes that they hold, perhaps remaining at zero for those who fail to reach a certain minimum. Tullock observes, "Real world PR systems are normally much less radical than the one I have outlined above, but they can be taken as efforts to approximate the same results without the benefits of computers." In other words, Tullock's system may be thought of as PR in its purest form, or PR taken to its logical conclusion. Therefore many of the arguments both in favor of and against proportional representation[4] apply to Tullock's system as well, and by extension to the voluntary delegation scheme proposed here, as it has many similar characteristics. PR in general aims to make the legislature resemble a microcosm of the voters, but Tullock's system in particular does so with great precision.

In his 1969 article, "A Program for Direct and Proxy Voting in the Legislative Process", James C. Miller III is also inspired by the promise of technology. He writes:

> One marvels at the advancing technology of electronic computers, indicating devices, and recording equipment. Some, in fact, have predicted that within 20 or 30 years every home will have a console tied into a computer upon which the children do their homework, the housewife will make out her grocery list, and the husband will pay the family's bills. Such a computer console also could be used to record political decisions, giving each voter an opportunity to cast his ballot on every issue and have it recorded through the machine.

Gender role issues aside, Miller's proposal for direct and proxy voting is visionary. It is a true voluntary delegation system in that it allows for both a direct voting option and an unrestricted choice of representatives. Voters are able to vote independently on all issues, to "delegate proxy" to someone else on all issues, or to vote independently on some issues and to delegate proxy on others. (Miller notes that the proxy option is similar to stockholder voting systems in large corporations.) Since voters can change their proxies at will, those who serve as representatives may see their voting power fluctuate on a day-to-day basis.

Shubik (1970) is a response to Miller (1969). Shubik expects that advances in computer technology would lead to a system similar to Miller's "in the next ten to twenty years". (Forty-plus years later, it is interesting for us to ask why this has not in fact happened.) Shubik is not entirely negative about Miller's proposal, but he is concerned that the political process might speed up to the point where those who "both think and read about political problems", but are not part of the political elite, will no longer have enough time to influence those who vote but do not spend substantial time or effort thinking about how they will vote. To prevent this, he suggests that "any referendum be put to the public twice with a time lag of not less than six weeks between the two pollings."

Mueller et al (1972) use the Miller-Shubik discussion as the context for their own proposal for "representative democracy via random selection". They correctly point out the difficulties with a 'pure'

[4] For a concise overview of arguments for and against proportional representation, see Reynolds et al (2005).

direct democracy (i.e., the impossibility or undesirability of all voters becoming fully informed on all issues), but they neglect the potential of Miller's "proxy politician" feature to efficiently manage the division of political labor. Nonetheless, they do not dismiss Miller's proposal, but rather suggest that it should be described in more detail and included in future discussions of alternative political systems.

As for their proposal to select legislators from the population at random,[5] one drawback is that if some people are in any way inherently 'better' than others at being legislators (for example, more intelligent or socially concerned, better at generating or recognizing sound policy ideas, etc.), it does not give these people any greater probability of becoming representatives. Obviously, a system based on elections has its flaws (for example, the process of campaigning can give politicians an incentive to cater to narrow interests), but nonetheless we may hope that the ability of elections to use information about the candidates' relative merits (based on the aggregate of the voters' opinions) can more than compensate for these flaws.

Alger (2006) offers a proposal that follows Tullock rather than Miller, in that it does not provide for a direct voting option but rather describes an advanced system of proportional representation. In addition to making proposals for a proxy voting system, Alger provides valuable analysis. For example, he shows that in a simple model, voting by proxy maximizes both the closeness (in a one-dimensional issue space) of voters to their representatives, and the closeness of the legislative outcome to the median voter (subject to the constraint that the representatives' positions are fixed). He argues that increased competition among candidates resulting from his proposed system will lead to better provision of constituent services. He points out that, in the case in which no candidates need to withdraw, voting by proxy possesses the highly unusual and desirable properties of having zero disproportionality and zero incentives for strategic voting. That is, voters who simply want to be represented by their favorite candidate have no reason to vote strategically, although of course there may still be strategic voting in the legislative process itself.

In addition to what has been published in academic journals, substantial work on voluntary delegation systems has been produced in less formal venues, and much of it has been made available online. Lanphier (1995) proposes "public elections" in which ballots are not secret, and voters can choose between representing themselves and appointing "stewards". Ford (2002) proposes a system of "delegative democracy" that is akin to Tullock (1967) and Alger (2006), but with special attention paid to the structure of legislative committees. In Ford's system of "weighted open forums," delegates who do not choose to participate in a given committee may re-delegate their voting power to someone else whom they trust, allowing for specialization. Green-Armytage (2005) and Allen (2008) allow delegates to receive votes and re-delegate them to other delegates, creating what Allen calls a "delegate cascade".

Practical applications of direct/proxy voting systems are also being developed. The Swedish "Demoex project" elected a representative to a municipal council who voted based on online polls.[6] In Germany, Austria, Italy, Switzerland and Brazil, the Pirate Party advocates a voluntary vote-delegation system that is referred to as "liquid democracy" or "LiquidFeedback".[7]

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[5] As the authors note, this proposal has parallels in ancient Athenian democracy, where many offices were decided by lot. For example, Aristotle writes in book 4, part 9 of his *Politics* that "the appointment of magistrates by lot is thought to be democratic, and the election of them oligarchic."

[6] See Ottesen (2003).

[7] See http://liquidfeedback.org and Behrens et al (2014).

3. Axiomatic analysis

In this section I construct an argument for voluntary delegation systems that is axiomatic in nature. The first axiom I employ is that a democracy ought to give citizens a right to vote on collective decisions, and the second axiom is that voters in a democracy ought to have a right to delegate votes to others (and to revoke said delegations) as they see fit.

The first axiom requires relatively little discussion, as it is a familiar notion that 'pure democracy' connotes direct democracy,[8] and that direct voting would be more ideally democratic than a representative democratic system if it were sufficiently practical.

The second axiom, which is less familiar, can be recommended by a few lines of reasoning. First, it preserves the voting power of those who are otherwise unable to vote due to other time pressures. Second, it preserves the voting power of those who do not have time to do enough research to cast a vote that reliably reflects their own values. That is, if they know of and can delegate to individuals who have similar values and are better-informed on the issues, their values will be accurately reflected in the votes of those to whom they delegate.[9] Thus the second axiom is supported by the notion that a society is less democratic when only those with enough free time or sufficient education are able to cast meaningful votes. Third, while we may view delegation as a transfer of power from voters to representatives, we may also view it as a transfer of information (about how to vote) from representatives to citizens. Indeed, the implementations of the direct/proxy voting idea that I propose in section 5 below would see voter i copying proxy j's vote on issue m to his ballot and then casting the vote himself, as opposed to i giving his vote to j as a 'blank check'. When the second axiom is presented in this way, its rejection implies a restriction of the flow of information.

Taken together, these axioms imply that a voluntary delegation system is more democratic than either a traditional representative system or a direct voting system in which delegation is not allowed. If we accept them, we need a compelling argument on some other ground to justify choosing a traditional representative system rather than a voluntary delegation system. We have seen that traditional direct democracy is highly vulnerable to criticism on the ground that it can produce arbitrary and/or biased results when citizens are not fully informed, so it is logical to ask how a voluntary delegation system might perform under the same circumstances. For this reason I develop an analysis of voting with imperfect information in the next section.

4. Analysis of voting using a spatial model with imperfect information

Here I construct a multi-dimensional issue space model with imperfect information about both issues and representatives. The purpose of this model is to develop intuition regarding the ability of voluntary delegation systems to address the information problems inherent in both traditional direct democracy and traditional representative democracy.

[8] See e.g. the entries for "pure democracy" in the Merriam-Webster and American Heritage dictionaries: http://www.merriam-webster.com and http://ahdictionary.com

[9] Although it might be tempting to reject this reasoning on the grounds that voters in an ideal democracy would be fully informed on every issue, this objection cannot be applied to the full range of public decisions made by modern governments, as this would surely place too great a burden on citizens' time.

A concern about traditional direct democracy is that if most voters have very little information about the issues they are voting on, the resulting decisions may be poor. I incorporate this concern into the model by assuming that a citizens votes with error (denoted by ε) on each issue, and that the variance of this error term is higher when the voter is less knowledgeable about the issue. A concern about traditional representative democracy is that even if representatives are well-informed about issues (which cannot be assumed), voters may have difficulty determining which representatives most closely share their values. I incorporate this concern into the model by supposing that a voter perceives a potential representative's values with error (denoted by η), and that the variance of this error term is higher when the voter is less knowledgeable about the representative.

In this model I assume that voters seek to express their own values as accurately as possible, subject to the limitation that they have imperfect knowledge of issues and potential representatives. Here I assume further that each agent's level of knowledge is exogenous, though I discuss the consequences of relaxing this assumption in section 6. In this framework, voters will use additional options for expression if and only if they provide improved accuracy. Therefore, adding a proxy option to traditional direct democracy can only increase the accuracy with which voters express their values, which tends to bring the outcome closer to what it would be under full information. Similarly, adding an option for representatives to delegate to other representatives on individual issues permits further reductions in voting error. On the other hand, because strictly representative democracy provides less flexibility to voters than voluntary delegation, it neglects avenues for reductions in voting error.

4.1. Definitions

Let there be M independent issues to be decided, indexed $m = 1, \dots, M$. Let individuals be indexed by i, j, and k. Suppose that with respect to each issue, any position can be represented by a point on the real number line. Let p_{im} represent the 'true' position of person i on issue m, let ε_{im} be a random variable representing i's error in translating his true position into a vote on issue m, let $g_{im} = p_{im} + \varepsilon_{im}$ stand for i's best guess on how to vote on issue m, and let v_{im} stand for i's actual vote on issue m, which may be determined by i's direct vote or the vote of i's representative.

The intended distinction between p_{im} and g_{im} is easily misunderstood and therefore deserves careful explanation. p_{im} represents the person's underlying values and interests, while g_{im} and v_{im} represent choices on a ballot. If person i is fully informed on the issue, he can translate the former into the latter without error so that $g_{im} = p_{im}$, but if he is not fully informed, he does not know which vote would best represent his values. This is not because he is uncertain about his own values, but rather because he is uncertain about how to express them in this particular case, e.g. due to the complexity of the legislation and its impact.

For example, suppose that issue m is concerned with tax reform, and the situation is such that increases in equality may be achieved at the expense of decreases in total economic surplus, and vice versa. This model supposes that person i has an opinion on the appropriate balance of efficiency and equity (e.g. perhaps he is fairly conservative, and prefers that people keep a high percentage of their earnings, or is fairly liberal, and prefers a more robust social safety net), but he may not be familiar enough with the specifics of the tax code, the behavioral responses to taxation, the current income distribution, etc. to choose a policy that represents these opinions perfectly.

Thus, if person i is perfectly well-informed about issue m, $\varepsilon_{im} = 0$. If he is well-informed but not perfectly, ε_{im} is a random variable with a relatively low mean and variance. If he is poorly informed, ε_{im} is a random variable with a relatively high variance. Some issues (e.g. some social issues) may be more transparent to more voters than others (e.g. some economic issues, foreign policy issues, etc.); the former type of issue will have, on average, lower means and variances of the ε_{im}s than the latter.

Assume also that individuals view each others' positions with error. That is, let the random variable η_{ijm} represent the error that i has in estimating j's true position on issue m, and let $\hat{p}^i_{jm} = p_{jm} + \eta_{ijm}$ represent i's best guess of j's true position on issue m. The distribution of η_{ijm} will depend on how well person i knows person j. That is, if i has perfect insight into j's values, $\eta_{ijm} = 0$. If i has strong insight into j's values, η_{ijm} is a random variable with a relatively low mean and variance. If i is largely uncertain about j's values, η_{ijm} is a random variable with relatively high variance.

For simplicity, I assume here that the distributions of ε_{im} and η_{ijm} are exogenous. That is, voters have fixed levels of information about the issues themselves and about others' positions on the issues. I also assume that these distributions are known, i.e. that voters know how well-informed they are about issues, how well-informed they are about potential representatives' values, and how well-informed potential representatives are about issues.

Let $\delta_{im} = (v_{im} - p_{im})^2$ be i's 'expressive loss' on issue m, i.e. the squared distance between his vote and his true position. Assume that individuals (including representatives) act with the objective of minimizing their expressive loss; that is, they aim to cast votes that are as close to their true preferences as possible. Let v^*_m be the social decision on issue m, and assume that this is the median of votes cast.[10] Let $\tilde{v}_m$ be the 'full information decision', i.e. the median of the p_{im}s, which would be the median vote if all voters were fully informed. Let $\lambda_m = (v^*_m - \tilde{v}_m)^2$ represent the 'systematic loss,' i.e. the squared distance between the actual social decision and the social decision with direct democracy and full information.

Next I evaluate voting systems in terms of their ability to minimize the expected value of both the expressive losses (δ) and the systematic losses (λ). That is, first I take it as a goal for each voter's position to be captured accurately in the decision-making process, even if this position is not close to the eventual social decision. Second, I take it as a goal to achieve the social decision that is closest to the outcome of direct voting in the hypothetical case where all citizens are perfectly well-informed.[11]

Note that the second goal is not necessarily equivalent to maximizing the sum of utilities (or minimizing the sum of squared distances). For example, the two may differ when the members of a minority strongly prefer option A while the members of a majority weakly prefer option B. It is possible to use decision-making rules such as range voting that weight votes differently, according to expressed

[10] Black (1948) shows that the median position is an equilibrium in iterative majority rule if the issue space is one-dimensional and voters' preferences are single peaked. Here, I allow for multi-dimensional issue space and make no explicit single-peakedness assumptions. Therefore, my assertion that the median vote is the outcome is more of an assumption than a result. That is, I assume for simplicity that voters are not strategic, that the voting process consists of voters indicating a value in each dimension, and that the election authority determines the outcomes by finding the median votes. Relaxing these assumptions (along with the independence assumption, thus allowing a voter's preferences on one issue to depend on the outcome of another issue) would be an interesting challenge for anyone seeking to extend this model.

[11] I share these goals with Alger's (2006) analysis. My model differs in that it allows for multiple issue dimensions (which is useful when discussing the value of allowing voters to delegate to different representatives on different issues), and in that it includes the possibility that citizens vote with error (which is the most intuitive justification for representation of any sort).

strengths of preferences, but these tend to be more vulnerable to strategic manipulation than majoritarian systems.[12] So, we focus here on the more achievable goal of approximating the majority rule outcome for fully informed voters.

Sections 4.2-4.5 consider expressive losses in (1) direct voting systems, (2) proxy voting systems without re-delegation, (3) proxy voting systems with re-delegation, and (4) traditional representative democracy systems. I argue that expected expressive losses are lowest in the third of these. Section 4.6 discusses the relationship between expressive losses and systematic losses.

4.2. Direct voting only

First, consider a system in which individuals must vote directly and have no option for delegating their votes to representatives. In this case, $v_{im} = g_{im}$, and therefore $\delta_{im} = (v_{im} - p_{im})^2 = {\varepsilon_{im}}^2$. That is, each individual's expressive loss on each issue is equal to his own squared voting error. Thus, the expected values of these are also equal: $E[\delta_{im}] = E[{\varepsilon_{im}}^2]$.

4.3. Voter delegating to proxy

Next, consider a system in which each voter i may either vote directly on each issue m or delegate to a proxy. Suppose first that each potential proxy votes directly on the issues according to his own best guess. That is, if individual i delegates to proxy j on issue m, his vote is cast as $v_{im} = v_{jm} = g_{jm}$.

Proposition 1: *Relative to a system with direct voting only, each voter i has a lower or equal expected expressive loss if the option to delegate to a proxy is added.*

If voter i delegates to a proxy j, his expressive loss is

$$\delta_{im} = \left(g_{jm} - p_{im}\right)^2 = \left(p_{jm} + \varepsilon_{jm} - p_{im}\right)^2$$

Defining $D_{ijm} = p_{im} - p_{jm}$ as the difference between i and j's true positions, we have

$$\delta_{im} = \left(D_{ijm} - \varepsilon_{jm}\right)^2 = {D_{ijm}}^2 - 2D_{ijm}\varepsilon_{jm} + {\varepsilon_{jm}}^2$$

D_{ijm} is a random variable from i's perspective because he knows that his view of j's position ($\hat{p}^i_{jm}$) includes error, i.e. that $\hat{p}^i_{jm} = p_{jm} + \eta_{ij}$, and so $p_{jm} = \hat{p}^i_{jm} - \eta_{ij}$. Defining $E_i[\cdot]$ as the expected value of the variable in brackets from person i's perspective, we have

$$E_i[\delta_{im}] = E_i\left[{D_{ijm}}^2\right] - 2E_i\left[D_{ijm}\varepsilon_{jm}\right] + E_i\left[{\varepsilon_{jm}}^2\right]$$

Now we may consider how the possibility of voluntary delegation affects the expected closeness of an individual's vote to his true position. Recall the assumption that i's objective is to minimize his expressive loss, δ_{im}. Therefore, if there is no proxy j who offers a lower expected expressive loss than $E[{\varepsilon_{im}}^2]$, i will vote directly on issue m. Likewise, if i does delegate to a proxy, he will delegate to the one that minimizes $E_i[\delta_{im}]$.

In general, i chooses the representative (whether himself or someone else) who minimizes the combination of expected distance and expected voting error. Thus the option to delegate to a proxy can only reduce the expectation of i's expressive loss δ_{im}, relative to the 'pure' direct democracy system in 3.2. □

[12] See for example Green-Armytage (2014).

For example, if i knows with certainty that he and his representative j have the same position on issue m, i's expected expressive loss is $E_i[\delta_{im}] = E_i[{\varepsilon_{jm}}^2]$, i.e. the expected square of j's voting error. If this is strictly less than the expected square of i's voting error, i clearly expects a more accurate vote by delegating to j. For another example, if i is not sure that j shares his true position, but is sure that j votes without error on issue m, his expected expressive loss is $E_i[\delta_{im}] = E_i[{D_{ijm}}^2]$. If this expected squared difference is less than i's expected voting error, delegation is preferable to a direct vote.

4.4. Proxy delegating to proxy

A similar argument applies to the option of re-delegation, i.e. a system in which a voter i may delegate his vote on issue m to a proxy j, who may delegate in turn to another proxy k. If k votes according to his own best guess, then $v_{im} = v_{jm} = v_{km} = g_{km}$.

Proposition 2: *On average, if voter i's proxy j chooses to delegate to another proxy k rather than voting according to his own best guess, this will reduce i's expressive loss.*

We saw above in 4.3 that a voter i can effectively reduce his expected squared voting error by delegating to a proxy j rather than voting directly (if such a satisfactory proxy exists). Also, we saw that voter i's expected expressive loss is reduced if j's expected squared voting error is reduced. Connecting these, it follows that if proxy j delegates to proxy k rather than voting directly, this must effectively reduce j's expected squared voting error and therefore i's expressive loss. □

This argument applies to a 'chain' of delegation and re-delegation with any number of links. For example, if k delegated to another proxy in turn rather than voting directly, the same logic would hold. Recall that delegation can be thought of as a transfer of information from proxy j to voter i as well as a transfer of authority from voter i to proxy j. Viewing the system in this way, we see that the reasoning in 4.3 and 4.4 runs parallel to the idea that providing voters in a direct democracy with more information about others' opinions on the issues (which they can take or leave) improves their ability to cast votes that reflect their values and interests.

4.5. Representative democracy only

Proposition 3: *In a system where all voters must have the same representative for all issues, each voter i has an expressive loss greater than or equal to his expressive loss in a voluntary delegation system.*

If voter i must choose a single representative, j, he chooses the one that minimizes the sum over issues of expected expressive losses,

$$\sum_{m=1}^{M} E_i[\delta_{im}] = \sum_{m=1}^{M} E_i\left[\left(D_{ijm} - \varepsilon_{jm}\right)^2\right]$$

Except in the fortuitous case where a single representative j minimizes $E_i[\delta_{im}]$ for all issues m, this expected expressive loss is strictly greater than the minimum that can be achieved in a voluntary delegation system. □

The least restrictive system that requires citizens to choose a single representative is Tullock's (1967) proposal for proportional representation, in which each voter can choose any representative who is willing to serve in this capacity, including himself. However, this is still more restrictive than the direct/proxy

voting systems in 4.3 and 4.4, because in Tullock's proposal it is not possible to change representatives from issue to issue.

Mainstream forms of proportional representation are more restrictive than Tullock's proposal, to varying degrees. That is, they require individuals or parties to obtain a certain number of votes to participate formally in the legislative process as representatives. The simplest way to model this in our framework is to consider that the total number of potential representatives j that each individual i may choose among is diminished.[13] The number of choices is generally higher when the number of seats per district is greater, and thus the number of votes needed for a seat is smaller, but in any case it is less than in Tullock's scheme. As the number of potential representatives is reduced, the minimum sum of expected expressive losses $\sum_{m=1}^{M} E_i[\delta_{im}]$ that each voter experiences can only increase; this occurs whenever i's previously optimal representative is removed as an option.

In single-winner systems, each voter belongs to a district that elects one representative. There are a variety of voting rules that can be used to choose this representative, such as plurality, Borda, Hare, etc., and each of these has its own strengths and weaknesses.[14] What they have in common, however, is that all citizens in a district ultimately have the same representative, regardless of how distant their individual views are from this person. Therefore, the expressive losses are generally far greater than in the proportional representation and voluntary delegation systems considered above.

4.6. Systematic losses

Ceteris paribus, systems that reduce expressive loss reduce systematic loss as well. This is clearest when the number of voters is small. For example, if there is only one voter, the two types of loss are equivalent. The remaining question is to what degree expressive loss translates into systematic loss when the number of voters is large. Consider first a system of direct democracy without delegation as in 4.2. There, the expressive losses $\delta_{im} = (v_{im} - p_{im})^2$ are just equal to the squared voting errors ${\varepsilon_{im}}^2$. If the ε_{im}s are uncorrelated and have an expected values of zero, and if the voting population is large, each social decision v_m^* should approximate the corresponding full information decision $\tilde{v}_m$, and the systematic loss λ_m should tend toward zero. However, if the ε_{im}s are correlated or have non-zero expectations, the social decision could be substantially biased as a result of the individual expressive losses. For example, this could occur if there are systematic cognitive biases (e.g. the optimal policy is counterintuitive in some way) or political biases (e.g. a disproportionate amount of money is spent to advocate one alternative).[15]

A similar argument applies to other systems; the only difference is that we become concerned with voters' errors in perceiving representatives' positions (η) as well as their errors in voting (ε). For example, if many voters systematically misperceive some candidates as being further to the left in some issue dimension than they actually are, they may choose candidates who are farther to the right, and the

[13] A related problem is disproportionality, i.e. the discrepancy between each party or group's share of the vote and its share of the legislative voting power, caused by the requirement that each seat must possess equal voting weight.

[14] See e.g. chapters 12-13 of Tideman (2006) for a discussion of these.

[15] Caplan (2011) explores this idea in much more detail; he argues that voter errors will generally not cancel each other out, so that (using my terms) expressive loss will normally lead to systematic loss. Further, he correctly points out that democratic systems (like computers) are vulnerable to the "garbage in, garbage out" problem, but he doesn't make distinctions among systems in terms of the expected quality of their output relative to the quality of their input. My emphasis here is different: whereas his purpose is to provide evidence that democracy is fundamentally flawed (which I grant, to some extent), my purpose is to improve the performance of democracy to the degree that is possible.

final outcome may therefore be biased to the right. Or, if a group of representatives is successful in convincing voters en masse that they share a value which is in fact contrary to their true intentions, they may succeed in enacting policies that are opposed to the values of the majority.

Systematic loss may be driven by any combination of these two types of errors, which are also the two components of expressive loss in the model. To the extent that this combination of errors is correlated across voters or has a non-zero expected value, expressive loss results in systematic loss. In these cases, it does hold that systems allowing greater expressive loss will also allow greater systematic loss, ceteris paribus, even when the number of voters is large.

4.7. Summary

If a citizen is not well-informed enough to cast an accurate direct vote on an issue, on what basis can he choose a proxy to give his vote to? There are several non-mutually-exclusive possibilities, which are much the same as the reasons why a voter would choose one traditional representative over another. Perhaps the voter has noticed that the proxy has voted similarly to him on many other issues in the past. Perhaps he has read material she has written or seen her give speeches, interviews, or debates that left him with the impression that she has similar values, has similar goals for society, sees similar problems, advocates similar remedies, and is well-informed on the issue at hand. Perhaps he has friends whom he agrees with politically, and who recommend her as a suitable proxy based on their own research. Perhaps she is herself personally well known to the voter. Perhaps she is a widely recognized authority on the particular issue under consideration, or she represents a group that specializes in this issue. And so on.

It is through means like these that a voter *may* correctly identify proxies whose distances from his position (D_{ijm}) and whose voting errors (ε_{jm}) are close to zero. If there is a proxy[16] such that the expected combination of these is less than his own voting error (ε_{im}),[17] the voter expects his values and interests to be more accurately reflected by this proxy than by a direct vote. Of course, an individual voter *may* get this wrong, and delegate to someone whose final vote is not at all what he would have done with full information. But if the voter chooses to delegate to this person rather than voting directly, it indicates that, *according to him*, she is his best hope for accurate representation. Lacking prior reason to do otherwise, I suppose that no one is better positioned than the voter himself to make this determination.[18] Therefore I conclude that expected accuracy is reduced by either (a) requiring a direct vote rather than allowing delegation, or (b) narrowing the choice of representatives so that the voter must be represented by someone other than his first choice.

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[16] Or perhaps better still, multiple proxies; section 5.6 explains how 'virtual committees' may be more effective than single proxies in this case.

[17] In this framework, the precise condition is $E_i\left[{D_{ijm}}^2\right] - 2E_i\left[D_{ijm}\varepsilon_{jm}\right] + E_i\left[{\varepsilon_{jm}}^2\right] < E[{\varepsilon_{im}}^2]$.

[18] This supposition is analogous to the idea of anti-paternalism, which is common in mainstream economic thought and which goes back at least to Mill (1859). If we suppose alternatively that some other authority can more effectively determine a voter's best representative, how do we identify this authority? That is, it is possible for example that a wise an unselfish philosopher king may reach a better decision than a democratic majority, but we are still faced with the decision of how to choose this king, which brings us back to the same problem of aggregating individual opinions into a collective choice. Similarly, who can determine which voters are competent to decide this for themselves and which ones are not? Tests of intelligence or knowledge of current events are possible, but highly problematic, e.g. in that they depend once again on the authority that is empowered to write them. Perhaps there are further arguments in favor of political paternalism that should be considered, but I do not pursue them here.

5. Suggestions for practical implementation

5.1. Basic framework

Let there be a number of issues to be decided at the end of a given time period.[19] Each citizen with the right to vote has the ability to view these issues and vote on each of them (e.g. via an online account). Suppose that a number of people (called 'public voters' or 'model voters') have chosen to publicly cast suggested votes on each of these issues, that is, to post the suggestions online for anyone to refer to, perhaps along with written or recorded statements explaining the reasoning behind them.

If a citizen is not sure how to vote on an issue, rather than abstaining or taking an ill-informed guess, he can pick a public voter whom he trusts and copy her vote to his own ballot. If he wants to use the same public voter as the basis for all of his public votes, he is able to do so with a single command.

Public voters can view each others' accounts, discuss the issues, and copy each others' votes. Like ordinary voters, they can copy votes automatically, but it would be expected that they would look at the issues more closely. In the sense that person A can use person B as a model while person B uses person C as a model, this proposal is similar to re-delegation schemes such as those included in Allen (2008) and Green-Armytage (2005) and analyzed in section 4.4. Groups of individuals such as political parties (national, state, or local) and non-profit organizations should also be allowed to prepare model ballots and thus serve as proxies.

5.2. Legislators

This system would not eliminate the need for professional, full-time legislators. I suggest that there be an elected group of people serving fixed terms in a chamber with a limited number of seats. A single transferable vote (STV) system[20] with one electoral district[21] would be a logical way to allocate these seats.[22]

The direct voting process would have greater authority than the legislature, in that the former could undo decisions made by the latter but not vice versa. The legislature would be tasked with picking up where the direct voting process left off, i.e. filling in the gaps and details that it left unresolved, and doing most of the agenda-setting work (which is discussed in section 5.5 below).

Many legislators might still belong to political parties, but the number of parties would probably be large because of the large district magnitude,[23] and there would be relatively few obstacles to running and serving as an independent.

The jobs of 'legislator' and 'proxy' should be allowed to overlap; individuals doing both jobs would cast model votes in the direct democracy process as well as casting votes in the legislature. Indeed, overlap is both likely and desirable: First, individuals who serve as proxies for more people would be more likely to win the necessary support to gain a seat in the legislature. Second, individuals who serve as legislators should already be dealing with the issues in more detail than the average person, so they would have an informational advantage. Gradually gaining influence as a proxy could serve as a natural and fluid pathway to becoming a seated legislator.

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[19] To resolve Shubik's concern, we can make this period long enough to permit ample discussion and reflection. The number of issues is a matter of political choice, which should depend on the costs and benefits of direct voting.

[20] See Hoag and Hallett (1926) and Tideman (1995) for definition, history, and discussion. There are several distinct STV rules, which employ different quotas, different transfer rules, etc., but for our purposes here it is unnecessary to specify a favorite.

[21] Since the number of candidates would likely be very large, citizens should not be required to rank all of them. For the same reason, computerized ballots would be preferable to paper ballots. Individuals should be able to use the ballots of model voters to determine their ranking of the candidates, as with other issues.

[22] That is, it is consistent with the goal of giving voters maximum freedom to choose their representatives.

[23] A logical and empirically well-established result; see e.g. section 13.5 of Mueller (2003).

5.3. Remuneration

Representative democracies typically provide remuneration for legislators and their staff. This can be justified in terms of giving good candidates an incentive to run for office, and in terms of allowing legislators in office to focus on policy making at the expense of other income-generating activities. Similar logic can be extended to a direct/proxy voting system: to the extent that proxies are shouldering a share of the legislative work, it is reasonable to provide them with a share of the remuneration.

How should compensation to proxies be distributed? In traditional representative democracies, the voters decide who is elected and therefore who is paid a legislator's salary. Therefore a simple extension of this practice to a proxy system would allow each voter to determine who should receive $1/v$ of the total available compensation (where v is the number of voters), on the basis of a yearly vote.[24]

If voters are able to award their share of the remuneration fund to themselves or their friends and to use it for personal consumption, a free-rider problem arises with respect to proxy services that have characteristics of a public good, such as policy research. To address this problem, it could be necessary to impose some enforceable regulations on who may claim proxy remuneration, and how they may use it. The election authority could impose caps on the salary a proxy may pay himself from the money he receives,[25] and how much he may pay each member of his research staff. Further, it could require that spending be justified in terms of legislative work; for example, staff could be hired to do research but not to provide personal services such as cooking or massages. Proxies would document their claimed expenses, which would be available as public record and subject to audit. If a proxy were awarded remuneration beyond what he chose to spend legitimately, he could donate it to another proxy seeking funds or return it to the public treasury.

5.4. Voting procedures

Many social decisions cannot be reduced to a simple up or down vote. In this section I will discuss two procedures which may be used to choose among more than two options. These may be considered as alternatives to the myriad other voting rules that have been proposed, such as plurality, Borda, Hare, etc.[26]

For lack of a better term I will call the first of these the 'Dodgsoneque' procedure, because it is similar but not identical to Dodgson's (1876) "Proposed Rules for Conducting an Election."[27] This method works as follows: Citizens cast votes that rank candidates in order of preference. If there is no Condorcet winner,[28] options that are not in the minimal dominant set[29] are permanently removed from consideration and another vote is held; this process is repeated until a Condorcet winner is found.

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[24] By default, each voter's share of remuneration may be divided according to the number of times he used the model vote of each proxy, as a 'nudge' toward this practice. (But since voters could find ways to subvert attempts to enforce it more strictly, voters might as well be allowed to deviate from this default allocation as they see fit.)

[25] In the case of an individual serving both as a legislator and a proxy, the same cap would bind the sum of the two salaries.

[26] Behrens et al (2014) recommend the beatpath rule – defined in Schulze (2003) – for use with their proposed direct/proxy voting system. However (like most voting rules), beatpath may be vulnerable to strategic manipulation in a substantial fraction of cases; see e.g. Green-Armytage (2011), which finds that Condorcet-Hare hybrid rules are less likely to be manipulable. For this reason I would give preference to the Dodgsonesque rule described here when strategic voting is a concern, or to a Condorcet-Hare hybrid rule if the possibility of multiple rounds of voting is considered undesirable.

[27] Charles Dodgson is better known by his pen name, Lewis Carroll. The "proposed rules" that I refer to here should not be confused with what is now commonly known as "Dodgson's method"; the latter is drawn from later sections of Dodgson (1876), and uses a single round of voting rather than providing for additional rounds in the case of a majority rule cycle.

[28] This is a candidate who, according to ranked ballots, would defeat any other candidate in a one-on-one majority vote. See Condorcet (1785).

To avoid persistent cycles, there are further provisions for removing options between rounds. Human candidates are given an opportunity to voluntarily withdraw their candidacy, while policy options (e.g. bills) are subject to removal by their authors. If no such voluntary withdrawals occur, the option with the fewest first choice votes is eliminated.[30]

The motivation of this proposal is to minimize opportunities for manipulating the outcome through strategic voting.[31]

The second procedure that I focus on here, which may be called the median value procedure, applies only to issues such that an adequate decision can be expressed as a real numerical value on a one-dimensional spectrum.[32] The procedure asks each voter to choose a value, and then simply takes the median of the values given. (If the number of votes is even and the median is not single-valued, one of the two median values should be chosen at random.) This procedure is also recommended by its ability to minimize the role of strategic voting; if preferences are single peaked, it will be strictly non-manipulable in the sense that sincere voting is always a core equilibrium.[33]

5.5. Agenda setting: issue and option generation

I have just discussed procedures for resolving an issue by choosing among multiple pre-determined options. Here I speak to the question of how we might arrive at this choice, by developing 'proportional issue generation' procedures for determining the issues to be considered, and 'proportional option generation' procedures for determining the options to be considered as resolutions to a particular issue.

Proportional issue generation: The benefit of proportional representation is that political minorities are given a voice in the legislature, but if a majority coalition is able to entirely control the agenda, this voice is of limited practical consequence. Therefore I propose that agendas should be set in part according to a proportional logic. For example, each seated legislator should be able to bring a certain number of issues to a direct vote in a given time period.[34] This would give them the opportunity not only to see that the issues most important to them were addressed, but also to go over the heads of the legislative majority

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[29] Also known as the Smith set, due to Smith (1973). It is the smallest non-empty set of candidates such that every candidate inside the set is preferred by a majority to every candidate outside the set. When there is a Condorcet winner, it is the sole member of the Smith set.

[30] The reason for this particular choice of elimination methods is that it creates similarity with Condorcet-Hare hybrid rules.

[31] If there is a sincere Condorcet winner w with respect to the voters' sincere preferences, and everyone votes sincerely except for a faction of people who prefer another candidate q to w, then w will certainly still be a member of the minimal dominant set. The existence of a cycle gives members of the majority who prefer the sincere winner an opportunity to examine the votes cast for signs of strategic manipulation, and if they find any, to adjust their votes so as to cancel it out and elect the sincere winner. It is not obvious that such investigation and reversal will always be successful, but at least there is an opportunity to attempt it, whereas if only a single balloting is taken and the result is binding, there is a greater probability that the strategic incursion will go unchecked.

[32] For example, the amount of money spent on a particular project or agency, the marginal tax rate on a particular type of income, the number of days that should be served in prison for a particular crime, the legal drinking age, etc. Section 6.6 below discusses specific examples in more detail. Disaggregating the policy space into one-dimensional issues when possible should increase the stability of outcomes; see e.g. Enelow and Hinich (1983), and chapter 5 of Mueller (2003).

[33] A core equilibrium is defined as a situation in which no group of voters can gain a mutual advantage by changing their votes. The logic of this result is similar to that of Black's (1948) median voter theorem. In brief, if votes are sincere, voters with preferences either above or below the median will not be able to affect the outcome by exaggerating the distance between their vote and the median. (If the procedure chose the average of the two middle values instead of choosing one of them at random, this would not hold for cases without a unique median, e.g. with voter ideal points at 0, 4, 6, and 10.) The procedure escapes the negative result of the Gibbard (1973)-Satterthwaite (1975) theorem because it does not satisfy the universal domain criterion.

[34] It would also be possible to reserve some time for proportional issue generation by direct voting: First, model voters would be able to propose a wide range of issues to be addressed, in addition to the agenda decided on by the legislature. Second, the public would vote using STV among these issues to decide which ones would be considered.

to the people themselves when they suspected that a public vote might give them a more preferred outcome. This naturally adversarial process would help to keep the legislative majority accountable to the general public.

Proportional option generation: As discussed in 5.4 above and 6.6 below, different voting procedures are suitable for different types of issues. Some issues may be resolved by a simple majority vote between two salient options, while others may be reduced to a choice along a one-dimensional spectrum, and still others fit into neither of these categories. For issues of this third type, we need a means of deciding which options will be considered. Once again, I suggest that the STV rule should be used, so that options from a variety of political perspectives may be considered in the final vote.[35] This option selection vote may be taken by the public (for the more important issues) or by the legislators. Similarly, the options to be considered via STV for inclusion on the final ballot may be generated by an open process that includes the public (i.e. any model voter) or by a closed process that includes only seated legislators. In either case, once the options on the final ballot have been set using an STV tally, a voting rule such as the Dodgsonesque procedure described above may be used to determine the winning policy.

5.6. Virtual committees

When choosing a person to whom his votes would be delegated, a citizen might find that there was no single individual who stood well above all the other public voters in terms of how much he trusted her,[36] and how similar he expected her views to be to his own if both were fully informed. Therefore, I propose that each voter should have the option to form a 'virtual committee' from any number of public voters. The computer would then use their public votes to simulate a committee vote, and the outcome of this committee vote would determine his vote.[37]

Three added benefits of virtual committees are as follows. First, the computer could be programmed to notify a citizen when the vote in his committee was close, which could help to draw his attention to particularly interesting issues. Second, virtual committees could reduce the concentration of power in particular proxies. For example, if proxy j is only marginally more trusted by each member of a large group of people than proxy k, a system restricting each voter to one proxy per issue would be more likely than a system including virtual committees to give j a disproportionately large share of voting power relative to k. Third, virtual committees might facilitate more collegial relationships among proxies with relatively similar views, because voters would not have to choose only one of them.

In the context of the spatial model from section 4, the use of a virtual committee could decrease a voter's expected expressive loss $E_i[\delta_{im}]$ to a greater degree than a single proxy. That is, if i perceives that several representatives j have positions $\hat{p}^i_{jm}$ approximately equal to his own true position p_{im}, but each of their votes v_{jm} has a variance due to i's perception error η_{ijm} and/or j's voting error ε_{jm}, the voter's expressive loss can be reduced by taking the median of the v_{jm}s rather than a single v_{jm}.

[35] The maximum number of options should be set prior to this vote, but voters may be able to choose a smaller number through the use of a 'null option' on the ballot. The status quo should be considered as one of the options. Something on the order of five to ten options should be sufficient for most issues.
[36] In this essay I use male pronouns for voters and female pronouns for representatives.
[37] The citizen could choose among a variety of single-winner voting rules, including e.g. Borda, Hare, beatpath, etc. It would be possible, if desired, to assign different voting weights to different committee members.

For example, suppose that a voter's ideal point is at $x = \frac{1}{2}$, and he has n representatives on his virtual committee, each of whose true position he perceives as a uniform random variable on the interval $[0, 1]$. (Thus, they seem like equally good representatives from his perspective.) If n is odd, and we define $N \equiv \frac{n-1}{2}$, the CDF of his vote v is $F(v) = \sum_{z=0}^{N} \binom{n}{z} (1-v)^z v^{n-z}$, the corresponding PDF is $f(v) = F'(v) = \sum_{z=0}^{N} \binom{n}{z} [(1-v)^z (n-z) v^{n-1-z} - z(1-v)^{z-1} v^{n-z}]$, and the voter's expected loss is $E[\delta] = E[(v-p)^2] = \int_0^1 \left(v - \frac{1}{2}\right)^2 f(v)\, dv$. This expected loss decreases with the number of virtual committee members, n, and converges toward zero as n approaches infinity.

5.7. Continual consideration

Next, I describe a process of 'continual consideration' that may be facilitated by a voluntary delegation system. Suppose that the system generates a decision about a matter, and the cost of altering the decision is low. Rather than deleting everyone's vote on the issue, the computer stores them and allows people to change their votes over time if they like. When citizens die, their votes are removed from the tally (though, if they were public voters, their public votes remain for others' reference). When citizens reach voting age, new accounts open for them and they have the opportunity to vote on still-active issues from the past. Through all of this, the computer continues to re-tally the votes and recalculate the winning option.

If a change in the majority opinion were to lead immediately to a change in policy, instability would result. Therefore I propose that the legislature have discretion to delay any policy change until a period of public focus and discussion can take place. That is, they would name a particular date in the future and announce that the winning option as of that date would become the new policy.

The purpose of continual consideration is to provide information in real time about which policy issues are in need of being revisited, and in the process to empower citizens by allowing them to take concrete action toward changing a policy. Of course, some government actions cannot be easily undone. Also, there may be a point at which juggling many issues at once becomes too difficult, or cycling through various options on an issue characterized by intransitive majority preferences becomes too costly.[38] Therefore, some issues should not be subject to continual consideration.

5.8. Debates

The quality of discourse, and of democracy itself, depends not only on the allocation of formal voting power, but also on the quality of the media, the education system, etc. It is beyond the scope of this paper to explore ways to asses and improve these other factors, but clearly it is preferable if representatives of different political groups have an incentive to engage in substantive discussions with each other. To promote this, it would be valuable to have a system in which prominent issues under collective consideration are made the subject of a series of well-designed public debates,[39] in which influential legislators and proxies are strongly encouraged to participate.[40]

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[38] See Mueller (2003, chapter 5) for a review of the literature on lack of equilibrium in iterative majority rule.

[39] I propose the following debate format. Rather than having a limited time for each response, representatives have a limited time to speak in each discussion period. This way, the participants can have something approaching a normal conversation, asking and

5.9. Direct/proxy voting without online voting

In some cases, there may be good reasons to not cast votes via the internet. For example, there may be a risk of someone hacking into the system and casting fraudulent votes, or making private votes public. Also, some people may lack computer access. This section describes a method of implementing most of the procedures above using traditional polling stations rather than online voting.

The voting machines would be computers capable of drawing information from an online database of public votes.[41] As in traditional polling stations, the staff would use voter lists to prevent people from voting more than once, but the votes themselves would be anonymous.[42]

Model votes would be submitted in advance of the voting day and made available to voters at the polls, who would then have three options: (1) They could choose to vote directly on every issue. (2) They could choose to vote directly on some issues and copy from public voters or virtual committees of public voters for other issues. (3) They could choose one public voter or one virtual committee that would serve as the model for their entire ballot.

5.10. Other branches of government

The proposals in this paper pertain primarily to the legislative branch of government and are not intended to eliminate the need for either a judicial branch or an executive branch. They aim for outcomes similar to majority rule under full information, and thus do not prevent a tyranny of the majority, which means that a judicial authority protecting the constitutional rights of minorities would be as valuable as ever. Similarly, an executive authority would still be valuable for its ability to employ a fairly consistent bureaucratic staff who would conduct policy in a fairly consistent manner, and for its ability to make some decisions more quickly than the legislative process would allow.

6. Discussion

The model in section 4 makes simplifying assumptions for the sake of clarity and rigor. Here, I discuss possible ramifications of relaxing some of these assumptions. In section 6.1, I develop a broader list of objectives that voters and representatives might aim for. This list is still not exhaustive, but it provides a more realistic point of comparison to the formal model. In sections 6.2-6.5, I draw on this richer view of political actors' goals as I broaden the evaluation of voluntary delegation. In section 6.6, I provide a few examples of how such a system might be used to address current political issues.

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answering questions, making short statements of just a sentence or two, and following specific trains of thought to the end, rather than giving lengthy speeches that only partially respond to each other. Participants should be allowed to pause their clocks to consider their replies and to ask questions of neutral on-site fact checkers. The videos of these debates, when completed, should be made available for free online, with and without the pauses edited out. The version without the pauses would be attractive to viewers by virtue of combining well-thought-out discussion with a relatively fast pace.

[40] For example, they may be paid to participate, or stripped of some remuneration if they don't participate.

[41] Failing the introduction of such computerized voting booths, the creation of a social networking web site that allowed people to discuss upcoming votes, aggregate the opinions of proxy networks, and print convenient how-to-vote cards, could begin to provide some of the same benefits, albeit in a more limited capacity.

[42] Note that anonymous voting of this kind would preclude a system of continual consideration.

6.1. Incentives of voters and representatives

What are the objectives of voters? The most straightforward motivation is that they would like the outcome of the vote to suit their preferences, which may be defined by any mix of their own self-interest and what they think is right for society as a whole. However, as Downs (1957) observes, the probability of any single voter changing the outcome of an election is rarely high enough to justify the cost of voting (in terms of time, transportation, etc.), so there must be other motivations at work.

Participation in the political process has a social dimension, whereby individuals build their personal identity and relationships with others.[43] That is, voters may gain social currency by expressing support for particular groups, ideologies, or policies. Individuals enjoy expressing themselves and communicating with each other, and political issues may serve as an engaging discussion topic. Voters may gain pride or respect from voting intelligently, putting their values into practice, and taking an active role in determining the rules of their society.

Voters also have preferences, which vary across individuals, over how much knowledge they acquire to inform their votes and how they acquire it. Some may prefer to remain blissfully ignorant on political issues while others prefer to have at least a basic sense of what is going on (e.g. to avoid a feeling of disorientation or to avoid the scorn of others), and still others are naturally driven to learn as much as they can. Some may enjoy a certain amount of policy research, depending in part on how it may be conducted; for example, is it entertaining, or does it have a rewarding social component? But even for voters who are inherently interested in policy and enjoy the process of gathering information, there will be a point at which gaining additional knowledge is undesirable because it interferes with other, more valuable activities.

What are the objectives of representatives? First, they may share any of the motivations suggested for voters above. In addition to these, representatives may be driven by motivations relating to their wealth and professional career. That is, first, they may gain direct remuneration for their service. In addition, they may gain prestige, knowledge, experience, and social capital, all of which may help them to succeed in other endeavors. Also, we must consider the unfortunate possibility that representatives may be corrupted to one degree or another. That is, they may be persuaded to change their vote in return for material compensation such as a direct bribe, a campaign contribution, or the promise of future employment.

6.2. Endogenous research and political communities

In section 4's model, each voter seeks to express his political interests accurately subject to the constraint that he has a fixed level of knowledge about both issues and representatives, so that his distribution of errors in voting (ε) and errors in perceiving others' true positions (η) are exogenous. Consider the preferences and behavior of agents from the richer view introduced in section 6.1, which allows agents to adjust how much effort they spend acquiring knowledge. In this case, they will acquire more knowledge if doing so is more socially and personally rewarding, or if it is less costly.

[43] Fiorina (1976) and Brennan and Lomasky (1993) develop the notion of voting as personal expression, which serves as a complement to simpler rational voter hypotheses.

There are several avenues by which voluntary delegation may accomplish this. First, it would encourage grassroots discussion and organization, in that voters would know that they could potentially affect the outcome of votes directly, without the need to convince professional politicians to join their causes. Second, the public consideration of a few issues at a time, with added structure provided by the model voting platform,[44] would provide a focus for political conversations. These conversations could help friends to pass the time and get to know each other better. They could help connect people who find each others' ideas interesting. They could provide valuable opportunities for voters to improve reasoning and communication skills, and to reveal their own unique thought processes to each other. Third, with a much larger number of representatives to choose from, voters would be more likely to find one or more whom they agree with strongly and can take pride in choosing. This stands in contrast to traditional representative democracies in which many voters consider all viable candidates in many elections to be somewhat corrupt or otherwise objectionable, and thus can take little pride in any available choice. Fourth, citizens may be encouraged to serve as proxies in the hope of gradually gaining influence, which could potentially result in remuneration and perhaps even a seat in the legislature. Furthermore, individuals and organizations could cite statistics on how many people have used their model votes to gain respect in other arenas.[45]

The potential for the creation of cooperative and deliberative space is a particularly attractive feature of a voluntary delegation system. While traditional representation typically requires voters to aggregate into large political parties which have extensive hierarchies and multiple competing factions, voluntary delegation allows groups of any size to take direct political action and to choose their own representatives. Thus voluntary delegation could help to foster the growth of organic political communities, composed of people who share common values and who wish to work together to achieve common goals.[46]

If, for these reasons, voluntary delegation systems can increase the extent to which individuals choose to become informed, this strengthens the results of the model in section 4. That is, we find there that voluntary delegation leads to more accurate representation than the main alternatives when voter knowledge is held constant. If a voluntary delegation system also causes voters to acquire more knowledge, its advantage increases.

6.3. Strategic voting and nomination

In section 4 we simplify by supposing that voters seek to express their preferences as accurately as possible, while representatives are essentially fixed points in the issue space. Now we consider the

[44] That is, the system described in section 5, which provides an electronic venue in which anyone may cast a model vote, explain the reasons for that vote, and discuss it with peers. This may serve as the basis for conversations that extend into other media, such as face-to-face, phone, television, etc.

[45] For example, this may help some individuals to obtain jobs, or some non-profit organizations to obtain grants.

[46] I leave this discussion rather brief, but I consider it to be an excellent topic for future research, ideally in collaboration with those who have a strong background in the theory of deliberative democracy in the tradition of Habermas (1962), Bessette (1980), Elster (1998), etc. That is, I've made a preliminary argument that a voluntary delegation system (ideally coupled with a series of debates as described in section 5.8) may have the capacity to serve as a platform for citizens to create a more active, intellectually vibrant public sphere, but I hope for much more discussion on this topic. The theory of deliberative democracy has been used to criticize direct democracy in the form of referenda for lacking sufficient in-person deliberation – see e.g. Leib (2006) – and to develop "deliberative opinion polls" – see e.g. Fishkin (1991) – which have some features in common with Mueller et al's (1972) proposal for representative democracy via random selection. I suggest that voluntary delegation systems would be an interesting alternative to add to this conversation.

consequences of having voters who can use calculated dishonesty in the service of their political goals, and representatives who may make strategic decisions about what positions to take, or whether to run for office at all.[47]

First, consider strategic voting. As noted above with reference to Alger (2006), Tullock's (1967) proposal for proportional representation provides no clear incentives for voters to express insincere preferences. Voluntary delegation shares this property. However, most legislative election systems with a fixed number of seats do not. For example, voters wishing to be represented by a candidate or party that seems far from having enough support to earn a seat will have an incentive to vote instead for one that they favor less but consider more viable.[48] As the number of seats declines, the number of candidates affected by this dilemma increases, reaching a peak in the single-winner case, where, particularly in the plurality system, a candidate may earn votes simply by being perceived as 'the lesser of two evils'.[49] The use of tactical voting obscures voters' true preferences, introduces instability, and decreases the extent to which underdog candidates or parties can successfully challenge those that are more entrenched, which further reduces the range of voters' choices.

'Strategic nomination' refers to a candidate's choice to enter or exit a race strategically, i.e. when she does not expect to win in either case but makes the decision based on how it will affect the competition among the remaining candidates. For example, a candidate may exit a race to avoid being a 'spoiler', a candidate who causes a less-similar candidate to win by dividing the support of a more-similar candidate.[50] This results in a further reduction in the competitiveness of elections, and in voters' chances of having accurate representation. Again, voluntary delegation is unusual in not being subject to this type of strategic behavior.

6.4. Principal-agent problems

Many practical difficulties with the performance of governments can be thought of as instances of the principal-agent problem.[51] That is, voters are the principals, who entrust their representatives with authority, and representatives are the agents, who are supposed to be acting according to their supporters' interests and values. Problems arise when representatives have incentives for private gain that pull their interests out of alignment with those of the voters who elect them. Similarly, if voters elect representatives who appoint bureaucrats, who appoint other bureaucrats, and so on, similar principal-agent problems can arise in each new layer of appointment.[52]

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[47] Cox (1997) provides a useful survey of the literature on strategic political behavior from an interdisciplinary perspective. The Gibbard (1973)-Satterthwaite (1975) theorem demonstrates that any single-winner system that doesn't appoint a dictator or impose restrictions on the voters' orderings of candidates will provide incentives for strategic voting in some circumstances. Nitzan (1985) and Chamberlin (1985) provide interesting early efforts to understand the vulnerabilities of different single-winner voting rules to individual manipulation and to coalitional manipulation, respectively. Green-Armytage (2014) provides a more recent look at strategic voting and nomination in several single-winner rules.

[48] STV is designed to reduce the frequency of incentives for this type of strategy, but it is still not completely strategy-free.

[49] Given this, it is not surprising to observe frequent negative campaigns that focus on portraying the opponent as a great evil. This causes discourse among politicians to be polarized, which in turn may cause ordinary citizens to become politically polarized, which the Pew Research Center (2014) finds to be increasingly the case in the US.

[50] Dutta et al (2001) show that all reasonable ranked ballot single-winner election rules provide incentives for candidates to strategically exit races in some circumstances.

[51] Barro (1973) is one of the first to describe the problems of government in this way.

[52] See Hillman (2009, p. 105). Tirole (1974) also opens several lines of inquiry concerning the behavior of bureaucrats under asymmetric information.

For example, interest groups may be able to use financial or other favors to persuade government officials to undertake actions that are against the interests of most citizens.[53] Government-run enterprises may be inefficient because they lack strong incentives to maximize the net public benefits of their activities.[54] Individuals and firms may spend scarce resources bidding for political rents rather than employing them productively.[55]

Therefore, the most effective systems of government are those that keep the interests of the agents (representatives, bureaucrats, etc.) most closely aligned with the interests of the principals (voters). The analysis above provides intuition about the ability of voluntary delegation systems to perform in this way. First, section 4 argues that they facilitate more accurate representation than either direct democracy or representative democracy alone. That is, they perform well in terms of the degree to which each vote is cast in way that its original owner would approve of if he took the necessary time to research the issue in detail. This implies a tighter connection between principal and agent. Second, section 6.2 extends this argument further in the same direction by suggesting that a voluntary delegation system will encourage more democratic participation, which will improve the information that citizens have about both issues and representatives. Third, section 6.3 argues that voluntary delegation does not share the tendency of traditional representation systems (particularly single-winner systems such as plurality) to discourage political competition by way of strategic incentives that put new entrants at a disadvantage. By promoting greater competition, voluntary delegation systems provide stronger incentives for politicians to perform well, and make it more expensive for special interests to 'buy' all of the viable candidates. This further ameliorates the principal-agent problem.[56]

6.5. Possible problems considered

Most of the analysis in this paper suggests that voluntary delegation could have significant advantages over both traditional direct democracy and traditional representative democracy. However, when considering something as consequential as a radical change in the voting system, we should be especially vigilant in looking for potential drawbacks. So, I will consider a few of these here.[57]

First, the success of a voluntary delegation system depends at least in part on how well it is designed. For this reason I have described specific procedures in section 5 that are intended to promote efficient organization. Although these are highly detailed by the standard of the current academic literature, more detail still would be needed for any practical implementation. Some of these details should depend on the

[53] Olson (1965) gives a seminal analysis of the role of interest groups in collective decision-making.
[54] That is, governments don't face quite the same kind of pressure as firms in perfectly competitive markets to produce the most valuable outputs with the least costly inputs, in part because governments are by their nature not perfectly competitive organizations, except in extreme cases such as the governments-as-clubs imagined by Tiebout (1956).
[55] Since Krueger (1974), this has been referred to as 'rent-seeking'. Congleton et al (2008) provide a compilation and summary of this literature.
[56] Of course, a direct/proxy voting system is not perfectly immune from corruption. Just as it is sometimes mutually beneficial for an interested party to buy a traditional representative's vote with an explicit or implicit quid pro quo, it is not inconceivable that someone might offer a bribe to a model voter. Therefore (as in the case of traditional representation) it is in the public interest to outlaw such exchanges as broadly as possible, and to prosecute them aggressively.
[57] I do not claim that this selection is exhaustive. The purpose of this paper is not to settle all doubts about direct/proxy voting systems, but rather to convince the reader that they are interesting and promising enough to be worthy of further analysis, discussion, and experimentation.

specifics of the electorate.[58] Eventually, a computer interface needs to be designed. If any of these details are poorly designed or carried out, the process as a whole may suffer.

Second, changing the voting system would necessarily entail some investment and some transition costs. New computers would need to be built for the polling stations. Voters and politicians alike would need to learn how to use the new system. Even if voluntary delegation would eventually lead to intelligent political communities as described in section 6.2, these communities might take some time to develop, and there might be a period of relative confusion as the behavior of political actors adapted.

Third, the legitimacy of the system could be undermined in the absence of a means of verifying the accuracy of vote counts. Traditional representation systems share this problem with respect to the question of which representatives have been elected, but they do make it easier to verify the result of votes by representatives over policy options.[59]

Fourth, one may wonder how a voluntary delegation system would perform when voters have extremely low information about issues, so that very few of them can cast meaningful direct votes. In this case voluntary delegation may behave similarly to a proportional representation system, particularly if many low-information voters are inclined to name representatives rather than casting effectively blind direct votes. They may not be very well-informed about representatives either, but this problem would be shared by proportional representation, as well as most other traditional representation systems.

Fifth, since voluntary delegation effectively lowers the barriers to entry for representatives, it might allow some political 'riffraff' (that is, irresponsible demagogues and other types of undesirable political actors) to gain more official voting power than they could otherwise. However, the lowering of these barriers could also allow more voting power to go to genuinely civic-minded reformers and community leaders, who had good ideas about policy but who would be discouraged from running for office under traditional representation because of the personal and financial costs of political candidacy. Further, in a voluntary delegation system, voters would have the option of delegating to representatives whom they know and trust through direct experience, or through the recommendation of organic political communities. These additional sources of information could reduce the voters' dependence on information provided by both paid ads and prior fame. In the case of paid ads, this could also reduce the extent to which representatives would need to rely on campaign contributions to be successful, which would in turn reduce politicians' incentives to cater to moneyed interests at the expense of the public interest. With this said, the net effect cannot be made perfectly clear in the abstract, but rather depends on the concrete choices of actual citizens. I have argued that voluntary delegation is axiomatically more democratic, and that it reduces the incidence of information problems in the democratic process, but this does not guarantee that its outcomes will be universally good.

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[58] For example, how many issues will be handled, and how complex will they be? Will the voting be done in person or online? How literate and computer-literate are the voters? How many languages should be represented?

[59] Whether it is feasible to develop a verifiable and secure online implementation of direct/proxy voting is an interesting question, but one that is beyond the scope of this paper. The implementation using polling stations described in section 5.9 allows more familiar methods of verification, such as the printing of paper voting receipts.

6.6. Examples

In this section I give examples of how a voluntary delegation system might hypothetically handle a few issues that are currently prominent in public debates. The purpose of this is to give a more vivid impression of how the process itself might work in practice, rather than to convince the reader that it will necessarily lead to the 'best' results. However, it may at least be said that the process, if executed correctly, gives each issue a fair hearing on its own. This stands in contrast to traditional representation systems, in which elections messily throw issues in with each other and with the candidates' personalities, so that public support for each separate policy is hard to divine, and in which issues that aren't prominent in campaigns are left to be determined by representatives with limited accountability to voters.

First, consider the example of marijuana policy, which may be divided into various distinct dimensions. First, there is a question of whether it should be illegal, generally legal, or legal only for medicinal purposes. If marijuana is legal, the public may consider the tax rate that it should be subject to, the age at which it becomes legal to consume, etc. If it is illegal, the public may consider the prison sentences that should be served for possession, sale, or cultivation of various quantities. Considered on its own, any one of these dimensions should produce voter preferences that are approximately single-peaked, so that the median value procedure may be used as a clean resolution with minimal to zero strategic complications.[60] However, if the public's task is to consider a more thorough revision of the existing policy that considers several of these elements at once, it may be more effective to narrow the choice down to a finite number of complete policy packages using the proportional option generation procedure, and then to choose one of these using the Dodgsonesque procedure. Once the overall policy has been brought roughly in line with majority opinion in this way, the median value procedure may be used to make later changes in individual dimensions; this can be thought of as a process of 'fine tuning'.

Overall, this issue is technical to a relatively low degree; that is, people would not have a very strong need to rely on proxies, but some specialized knowledge might be helpful. The question of public health might be informed by scientific data on the effects of the drug. The question of the tax rate depends primarily on the voters' goals.[61] The question of prison time is also not very technical, though one would hope that the public discussion would take into account factors such as the cost of incarceration, the conditions in prisons, and the likelihood that individuals will be 'rehabilitated' by prison. Although voters will differ in their attitudes regarding how much (costly) incarceration is justified for each crime, there is a potentially great advantage to deciding such matters via an open public discussion and vote rather than via traditional representatives, because the latter may be influenced by the lobbying efforts and campaign contributions of for-profit prison companies.[62]

Second, consider the example of carbon emissions.[63] This provokes very complex policy questions, but it is possible to make substantial progress using a median value procedure with respect to either a Pigovian tax per unit of emissions, or a cap on the total quantity of emissions that will be allowed (e.g. with a full auction of permits). Single peaked preferences are realistic in both cases. A person who believed carbon emissions to be harmless could vote for a tax of zero in the first case or an emissions limit of infinity in the second; if this person were joined by a majority, emissions would be unrestricted.

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[60] Similarly, it would be straightforward to use a median value procedure to determine the legal drinking age.
[61] If marijuana use creates a negative externality, a Pigovian tax may be justified. Or, whether justified or not, the majority may aim for the tax rate that maximizes public revenue. Economists should be able to generate estimates for either of these.
[62] This concern is raised by Schlosser (1998) and Shapiro (2011), among others.
[63] Similar consideration may be given to other pollutants in general and other greenhouse gases in particular, e.g. methane, etc.

Many voters would be baffled if asked to come up with a figure for an optimal carbon tax rate or emissions cap out of thin air, but given some time and an active national focus on the issue, it should not be hard for serious proxies to track down a few highly educated guesses as to the optimal policy. Of course, many voters may still indicate policies that lack a clear climatological or economic rationale, and indeed such a policy may be chosen by the majority. A voluntary delegation system cannot guarantee the 'correct' decision in any circumstance, but it can aim for a democratic decision in which information flows as freely and conveniently as possible.[64]

Third, consider the issue of same-sex marriage. This is an entirely non-technical matter, where it is hard to see any need for the expertise of proxies, so a vote on this within a voluntary delegation system would be similar to an ordinary referendum, of which there have already been several with results both opposed to and supportive of same-sex marriage. The primary remark to make here is that (in keeping with the discussion in section 5.10) the judicial branch may justifiably overturn the result of a majority vote if it finds that the decision abrogates an essential right of a minority.[65]

Fourth, consider the question of whether the nation should initiate or enter a military conflict. Whereas majority voting on the previous issue may justifiably be constrained by the judicial branch, majority voting on this issue may justifiably be constrained by the executive branch. That is, the chief executive may able to make some decisions more quickly, more consistently, and on the basis of information that is best kept secret from the general public. The appropriate boundary between legislative and executive powers is too great a topic to cover here, but I will remark that if a nation were considering going to war, it would be valuable for the citizenry as a whole to at least have an opportunity to weigh in on the matter. Individuals not familiar with the circumstances of the conflict could delegate to those they consider to be foreign policy experts (including those in the executive branch, legislative branch, nonprofit sector, academic sector, and so on).

Fifth, consider the example of tax and budget policy. Reliance on the expertise of proxies may be relatively high for issues in this category. One possible approach is to begin with a yearly vote among different comprehensive packages proposed by different parties or politicians, using the proportional option generation and Dodgsonesque procedures. Then it may be desirable in later votes to fine tune the result by considering individual tax rates (including marginal rates for particular tax brackets) and particular spending items or categories (such as defense, education, law enforcement, health care for seniors, etc.). In addition, votes can be taken to increase or decrease by some factor all tax rates, and/or to increase or decrease by some factor the expenditure in all categories; one or both of these tools may be used to adjust the size of the government's projected surplus or deficit.

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[64] If carbon policy is determined by wise technocrats rather than by direct voting, the resulting decision may be more coherent. However, we still face the question of how these technocrats will be chosen. If the general public is unwise and set on a particular policy, will they permit the appointment of wise technocrats who may be expected to settle on quite a different policy? Meanwhile, it is especially difficult to imagine a democratic mechanism that could perfectly handle the externalities associated with carbon gas. One particular problem is that many of the people who are affected have yet to be born, so it is unclear how to include them in the bargaining process. Another problem is that the externality is global in scope, so that the optimal solution may require an intractably complex international bargaining process. It may be possible to design direct voting agendas that consider complicated Pareto compensation schemes, reciprocal reduction arrangements, etc., but I leave this for future inquiry.

[65] What rule for the election or appointment of judges would best assure that they will protect the rights of minorities? Are judges who are elected by majorities or appointed by others who are elected by majorities able to do this reliably when the majority wishes to tyrannize a minority? These questions are fascinating but beyond our current scope.

7. Conclusion

I have constructed an argument for voluntary delegation systems based on democratic axioms, and an argument based on accuracy of representation. The former asserts that each citizen in a democracy has the right to vote on each issue that the collectivity considers, as well as the right to delegate to his first choice among willing representatives. The latter indicates that a voluntary delegation system ameliorates the information problems associated with both traditional direct democracy and traditional representative democracy. Further, I have suggested that voluntary delegation has the potential to increase political participation, reduce strategic incentives within the election process, and ameliorate the political principal-agent problem.

I have also reviewed the literature on proxy voting systems (with and without the additional option of direct voting), and found that a great deal of room has been left for discussions of how these systems may be carried out in practice. Therefore I have provided practical suggestions for implementation, and I encourage other authors to continue this conversation by evaluating these proposals and suggesting further innovations and refinements.

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