



# Democratising Democracy: Votes-Weighted Representation

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*Abstract: Democracy is in retreat around the world. To reduce the UK's own democratic deficit, support is growing for some kind of proportional representation. We propose that existing versions of PR can be greatly simplified and improved on by giving each representative voting power in the assembly proportional to the number of votes they have been given by the electorate: "Votes-Weighted Representation". Under VWR a country/region is divided into multi-member constituencies. Each voter has a single vote. Ballot papers list the candidates (each party can field several), whom voters then rank. The candidate with the fewest votes (top preferences) is eliminated, and their votes are transferred to next preferences, repeating until the number of candidates remaining equals the number to elect. Optionally, given sufficiently secure and accessible voting software, every voter can also have a 'dynamic' second vote, which they can arbitrarily split and delegate to any representatives from any constituencies, for however long and on whichever issues they wish; delegated votes are added to representatives' vote weights. Any voter can override the delegation of their second vote on any issue, and remotely vote on it in the assembly themselves, directly. Compared with existing systems, these proposals will allow more accountable, more responsive and finer-grained coverage of the inherently multi-dimensional political space, including between elections. Fewer votes will be wasted, and better proportionality of voting power in the assembly should be achievable than under comparable Single Transferable Vote (STV) and highest averages or highest remainders methods for apportioning representatives. Also, fewer votes will be wasted compared with using electoral thresholds without vote transfers from eliminated candidates. Political fragmentation should be largely avoidable by using 6- or 7-member constituencies, without unduly compromising proportionality for bigger parties, or the diversity of elected representatives. Our proposals should help democratise democracy and reverse its global retreat.*

*Keywords: weighted voting, proportional representation, political fragmentation, electronic voting, dynamic delegation, single transferable vote, direct democracy, democratisation*

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## 1. Introduction: the dysfunction and global retreat of democracy

Only about 6-13% of humanity still lives in ‘full’ or ‘liberal’ democracies (Boese et al., 2022; Economist Intelligence Unit 2021), depending on the criteria. Authoritarian regimes are once again spreading across the planet (Rachman, 2022), in part because of multiple inadequacies of existing democracies. For example, politics in the UK has long been largely dominated by a succession of Conservative governments elected by a minority of voters (Cracknell et al., 2023). Recent election turnouts have been much lower than in the 1950’s (Clark, 2023) suggesting a worrying increase in voter alienation. In a long-overdue bid to improve UK democracy itself, the Labour Party recently voted overwhelmingly to introduce some kind of Proportional Representation or PR (Cowan, 2022). What kind, exactly, if it happens at all (Mortimer, 2023), is to be determined by an “open and inclusive process”. Now is a crucial time, therefore, to propose a significant improvement upon PR, which might help tip the argument.

### 1.1. To improve PR, let each representative ‘vote the votes’ that elected them

Our proposed model, detailed below, is intended to *achieve better proportionality* than many other ‘proportional’ systems, *simply by weighting the voting power of representatives in the legislative assembly by the number of votes each has received from the electorate* - refining related proposals (Abramowitz & Mattei, 2019; Alger, 2006; Cohensius et al., 2017; Green-Armytage, 2015; Miller, 1969; Pivato & Soh, 2020; Tullock, 1967, 1992). This straightforward intuitive change can solve, at a stroke, many of the problems and complexities associated with most popular variants of PR, such as party list PR (Wall, 2021), Mixed (Additional) Member ‘top-up’ PR (Linhart et al., 2019), and Single Transferable Vote or STV (Doron & Kronick, 1977; Gallagher, 2005; Santucci, 2021; Tolbert & Kuznetsova, 2021); see summary tables in the Appendix.

One of our starting points is that there is no particularly sacrosanct reason why all representatives need to have the *same* voting power in the assembly (Alger, 2006; Miller, 1969; Tullock, 1967): after all, widely different numbers of constituents voted ‘for’ (or ‘against’?) different representatives, who in any case can have very different amounts of real power in their parties and/or government. Furthermore, it is not hard to add up weighted votes, even without modern technology (e.g. by counting in thousands). Weighted voting and proxy voting have long been standard practice in many situations (for example, company general meetings, where *one-share-one-vote* is the norm).

### 1.2. Deeper democracy, better information and broader safeguards

We are not claiming our proposal is sufficient by itself, to ‘fix’ democracy fully. To do that, we would also need to embed democracy more systematically into our everyday lives. Many have advocated

extensive decentralisation, as well as a campaign to further enfranchise young people, perhaps starting with educating children about democracy by meaningfully engaging in it. Equally importantly, broader, deeper democratisation is needed across far more of the economy, wherever practicable, in companies and workplaces (Major & Preminger, 2019).

As shown by the global trends towards fake news - paralleling de-democratisation - no democracy can function properly without a diverse free press, allowing voters to receive genuine information from a variety of verifiable sources that continually challenge dominant elites, fraudulent ideologies, 'alternative facts' and polarising echo chambers. A broadly educated and politically sophisticated population will help buttress democracy.

Other safeguards, checks and balances are widely agreed to be important, such as an independent judiciary and a legal system that protects *everyone* in society, as justly and equally as possible, not just favouring the rich, the powerful, the majority and the vocal.

### 1.3. Multi-dimensional politics

However, at the foundation of any democratic society must be a democratic model that can give expression to this engaged, knowledgeable citizenry in all its complexity and contrariness. Therefore, we must also recognise honestly that politics is not merely a left-right, one-dimensional spectrum: it is better thought of as a *multi-dimensional space*. For example, the 'freedoms axis' and the 'equality axis' represent two key characteristics of any society that do not simply trade off with one another: it can be helpful to think of them as (largely) independent 'co-ordinates'. But there are many other dimensions. One subset of voters may be in favour of strongly redistributive taxation, but some of those may be in the camp who are against wealth taxes. A different, overlapping subset may want to increase defence spending and build a stronger defence industry; but some of these 'hawks' may recoil from selling weapons to dictators. Yet another overlapping group of voters might want an independent nuclear deterrent. Some voters may want energy independence, but an overlapping group might favour green energy sources rather than those emitting carbon dioxide. A different subset of voters might be in favour of energy diversity, and some of these might want to include nuclear reactors. Relatedly, individual voter preferences on particular issues may not map onto party platforms: however many political parties there are, there are always going to be far more issues. Democracies would be more effective if their voting systems could better reflect this inherent multi-dimensionality.

### 1.4. Representative democracy

We do not have the space to delve into extensive critiques of various existing models of democracy, but we must outline some key weaknesses of common ideas (also see summary tables in the Appendix). Firstly, most familiar to UK voters is, so-called, '*representative*' democracy. This, typically, is *unrepresentative* of the population, as a whole: the political class has inherent conflicts of interest with poorer, less educated or low-turnout groups. Unrealistic or renege-upon promises are common. Unmandated and undebated policy changes (and even heads of state or government) can be foisted on the population without actual elections. Inadequate sampling of expertise can lead

to groupthink among the ruling elite, thence to failures of collective intelligence (Centola, 2022; Laan et al., 2017; Malone & Bernstein, 2022; Surowiecki, 2004; Woolley et al., 2015). Inadequate sampling and following of public opinion can contribute to voter alienation and low election turnouts, especially among the young or poor. The public are rarely consulted on specific policies in an objective manner. Irrespective of how they voted, a given individual may only agree with their district (constituency) representative on a minority of issues.

### 1.5. Direct Democracy

*Direct* democracy, where all voters vote on all issues, is often touted as an alternative. However, this is generally agreed to be too intellectually demanding and time-consuming in large, complex societies: most voters are too busy and too inexpert on most issues (Green-Armytage, 2015). *Referendums* on key issues can play a useful role (Leininger, 2015), but can be manipulated (for example, by their wording or framing, by misinformation and by playing on fears). Holding too many referendums can lead to voter fatigue and low turnouts (Meir et al., 2021). Moreover, referendums do not appear to go nearly far enough to fix democratic deficits.

### 1.6. The lure of strong leaders

Leaderism and strongman-cults are rife (Rachman, 2022), and spreading, characterised by top-down, gang-like patronage systems with inevitable reluctance to stand up to bosses. Powerful positions are handed out to sycophants and allies, not to those with the most ability or relevant knowledge. However, society is far too complex for one, over-controlling brain to be unquestioningly 'in charge'. Despite all the misleading metaphors about ships needing captains (tell that to the Titanic!), there are many ways to aggregate opinions to make sensible decisions, including quickly if need be. Collective intelligence fails without dissent, debate and deliberation (Hong & Page, 2004; Lorenz et al., 2011; Madirolas & Polavieja, 2015; Malone & Bernstein, 2022; Surowiecki, 2004; Woolley et al., 2015).

### 1.7. Party 'capture'

If we look more closely at nominally democratic systems, we discover additional problems, including with one of the key democratic institutions: the political party. Such parties are prone to 'capture' by groups with unrepresentative or extreme opinions, such as party bureaucrats, elites, special interests, big donors, activists or even those most able/willing to attend long (often boring?), inconvenient and exhausting meetings (Diefenbach, 2019). Selection of candidates or 'elections' of over-powerful party leaders and even prime ministers by party hierarchies, or by rank-and-file party members, may not reflect the opinions of far greater numbers of non-member voters for that party. In both major UK parties, leaders elected by party members have conflicted with more broadly-elected representatives (MPs), which, as we have seen recently, can lead to unstable governments, as well as undermining the key idea of representativeness.

## 1.8. First-past-the-post

'First-Past-The-Post' (FPTP, winner-take-all plurality) voting is widely acknowledged to be highly unrepresentative, disproportional and one-dimensional, wasting a huge fraction of votes. It is, however, convenient for ruling elites and enjoys broad support among those whom it benefits. It tends to produce a two-party state (Duverger, 1964), with a 'squeezed middle', a relative lack of representatives from smaller parties, and policy gyrations when one party loses power to the other. In some countries, gerrymandering of boundaries is commonplace for single-member electoral districts; a high fraction are 'safe seats' (McInnes, 2020), where the real 'election' is when the dominant party (re-)selects its candidate – often via some kind of murky 'machination' of the party apparatus, which generally controls short-listing and can even impose candidates. Typically it is hard to shift an incumbent without a very good reason.

## 1.9. 'Proportional' Representation

PR is an important corrective, but has numerous, well-known problems (Buben & Kouba, 2017), including comprehensibility, with all commonly-used variants: Party List PR (Wall, 2021), Mixed (Additional) Member PR (Linhart et al., 2019), and STV or Single Transferable Vote (Tideman, 1995). There can be substantial vote wasting and serious disproportionalities (Gallagher, 1991) under many list PR systems, such as apportionment by highest averages, like the D'Hondt method (Medzihorsky, 2019), or largest remainder methods, or systems with formal electoral thresholds. Small changes in votes for parties just either side of an elimination threshold can lead to huge changes in coalitions and governments, as happened in Germany in 2013 when the FDP fell below the 5% threshold and dropped out of the Bundestag; this can induce preventative tactical voting. Mixed (Additional) Member PR is often far from proportional, even with 'top-up' members from regional lists. It can also be 'gamed' by 'party splitting', where a party which wins many constituency seats puts up a 'twin' party instead of itself in the top-up list part of the election, in order to gain representatives under its control, far in excess of fair proportionality. STV can suffer from complexity (depending on the transfer process for 'spare' votes), alphabet effects and voters ranking choices in the order printed. Other issues with STV include electoral 'stasis', or counter-intuitive/'perverse' (Doron & Kronick, 1977; Tideman, 1995) or highly disproportionate outcomes, all the more likely if there are too few representatives per electoral district, or too many parties or independents standing (Farrell & Katz, 2014; Gallagher, 1991; Santucci, 2021). Under STV, if a party fields too few candidates, they may end up winning a lot of 'spare' votes that end up being transferred to very different, lower preference candidates of other parties (and thus, wasted, from the 'donor' party's perspective). There may be a substantial loss of goodness-of-match between a voter and their elected representative, even for vote transfers *within* a given party, for example, if the voter's top preference is on one wing of the party, but some or all of their vote is transferred to their lower 'preference' on the opposite wing, or if the two candidates have very different issue-specific views, or experience or other characteristics. Transfers of votes from an elected independent can be particularly problematic (since there is no next preference from the same 'party').

Our proposals (detailed below), based on simplifying STV, are designed to mitigate these problems by:

a) *not* transferring ‘spare’ votes from elected candidates to lower preferences, instead simply allowing them to ‘carry’ those votes into the assembly, and vote them, and

b) allowing the order of candidates on ballot papers to be varied across a constituency, improving local links, while spreading the votes of a popular party more evenly between its candidates, reducing political fragmentation (explained below).

Like FPTP, PR also tends to entrench control of politics by parties, albeit more of them, nominally allowing voters more choice, thus, better overall matching of the electorate to their representatives. Selection and ordering of candidates are also typically dominated by party hierarchies or activists, who can often be out of step with the broader population of their potential supporters. The party list process, whether ‘closed’ or ‘open’ (voters rank candidates), can reduce or dilute the goodness-of-match between a given voter and their elected representative(s), as again, some or all their vote may be allocated within (or transferred down) a party list to elect candidates they are less keen on.

A criticism of PR is that it leads to coalition governments, and coalition-building can involve unpalatable deals behind closed doors – but that also happens *within* parties, including *after* elections. In any case, coalition building can improve governments (at least increasing the available talent pool), and may have a moderating influence, aligning them better to the overall population than FPTP does, stabilising policy-making (Colomer, 2012), boosting economic growth (Knutsen, 2011; Knutsen & Rasmussen, 2018) and reducing inequality (Zuazu, 2022). Another criticism of PR is that small parties can gain disproportionate power, by acting as ‘king-makers’; this can be mitigated by sensible election thresholds, but all too often the price is large numbers of wasted votes. Another alleged downside of PR is that it can lead to unstable governments – in some countries at least – but then, so can FPTP (for example, in the UK in recent years). In any case, a changing or reshuffling government does not necessarily mean an unstable country, especially if the alterations are beneficial or allow useful adaptations to new circumstances. The important point is that in many countries using PR (for example, Germany, Scandinavia), governments are in fact fairly stable, and these countries are often held up as being well-governed. In any case, is *government* ‘stability’, per se, the real gold-standard, to be set above the will of the people and the good running of the country? Or is *policy* stability - on average, improved by having more parties in government (Colomer, 2012) - more important?

### 1.10. Liquid democracy

A relatively new proposal to correct the flaws of standard models is *liquid* democracy (Aguirre Sala, 2022; Behrens et al., 2014; Blum & Zuber, 2016; Mendoza, 2015; Paulin, 2014, 2020). Under this system, each voter can vote either *directly* on a given issue, or *by proxy* (delegating to another voter). Proxying is *dynamic* (it can be withdrawn or switched at any time) and *flexible* (it can be to one proxy on some issues and to another proxy on other issues, as and when each voter wishes). Proxy votes can be further proxied: *onward delegation*. However, this could give rise to long delegation chains, which could end up being too indirect, confusing voters or even flipping their preferences (Kling et al., 2015; Markakis & Papatotopoulos, 2021; Paulin, 2020). ‘Super-gurus’ who receive huge numbers of delegated votes may also distort the democratic process (Gölz et al., 2021; Kling et al., 2015). Fractional weighted delegations (Gölz et al., 2021) could help spread risks and recruit

expertise, leading to more collective intelligence and wisdom (Blum & Zuber, 2016; Mannes et al., 2014). If voting is non-secret, then voter and proxy coercion and vote buying are clearly possible. However, if all voting is secret, then onward delegations are hard (perhaps impossible) to monitor and check. It may therefore, be better, for all the reasons above, to restrict onward delegation, or to have a clean separation between normal voters (using secret voting/delegation) and proxies (voting/delegating in public). In which case, why not just make *proxies* into more formal *representatives*? This leads to the second part of our proposal, detailed below.

### 1.11. Additional challenges, ‘solutions’ and shortcomings

Many existing democratic systems and proposed models face further, more general, challenges. These include voter coercion (individually or collectively); vote buying (if votes can be evidenced) and clientelism (Kyriacou, 2023); ballot box stuffing; lack of a free press, independent scrutiny or proper debates; incumbency advantage; gerrymandering; over-promising; blame-shifting and scapegoating; logrolling (vote trading by representatives) and pork barrelling (representatives demanding funding for their district in exchange for their votes). We can reduce the latter two by ‘whipping’ to vote along party lines, but this may stymie collective intelligence. Other problems include cash-for-influence and other forms of corruption, excessive lobbying and private/corporate campaign finance, subversion by organised crime and hostile states and revolving doors between politics, civil service, big business and think tanks (some of which have decidedly opaque funding) (Mureithi, 2022). This is only a partial list!

Two systems have been proposed to overcome at least some of these problems. Sortition (Meir et al., 2021) is random selection of the assembly by lottery, to produce a ‘mini public’ that is representative of the overall population, rather like a large (unselected) jury. However, this can miss out on valuable expertise (and motivation), leading to less collective intelligence and wisdom (Mannes et al., 2014). There are proposals to reinject expertise into sortition, for example via citizens’ assemblies (Courant, 2021), in which randomly chosen members of the public consult with and debate with experts - but who chooses the experts? One idea is that ‘independent’ civil servants (as well as the participants in the citizens’ assembly) can provide ‘starter’ suggestions for experts in the relevant field, who could then also recommend other experts. But we must then ask, who decides the questions being discussed? The citizens’ assembly itself? Or civil servants or ‘experts’? We should also question whether random citizens have the ‘bandwidth’ and knowledge to intelligently debate the questions on the agenda. Citizen’s assemblies in practice have also experienced numerous other problems (O’Leary, 2019), including non-random attrition (members leaving), and the limited time and capabilities of the participants (who may have caring responsibilities and other real life constraints, again highly non-random). In most cases, citizens’ assemblies have been advisory only, and have lacked formal decision-making powers (Smith, 2021), further undermining the motivation and staying power of their members.

For the reasons briefly presented above, those of us in nominally democratic countries need to find more imaginative and successful ways to democratise democracy, to set better examples to the rest of the world, so we can reverse our species’ current downward spiral into despotism.

## 2. Proposal: hybrid ‘votes-weighted representative’/direct democracy

### 2.1. *Election “Votes-Weighted Representation” (VWR). Multi-member constituencies: each representative’s initial voting power in the assembly is proportional to the number of votes that elected them.*

In the case of the UK, for example, the country could be divided into around 110 6-member constituencies (electoral districts), each with a population of roughly 600,000 on average (6 MPs × 110 = 660 MPs, vs. 650 now); the exact numbers are not central to understanding our idea (but see below).

Each voter gets one vote via a ballot paper on which they rank the candidates in their constituency. Each party can list multiple candidates per constituency in a recommended order, or they can encourage voters to pick party candidates in their own preferred order, based on mini-manifestos, etc. Each party is inherently a coalition; every voter for that party can pick, for their first choice, the candidate closest to their own views or preferences, in terms of experience, competence, character, etc., then rank the others.

If there are more candidates than representatives to elect, the candidate with the fewest top preference votes is eliminated, then each of their votes is transferred to the next-preferred candidate on that ballot paper, so no vote is wasted; this is repeated, until the number of candidates remaining equals the number of positions for representatives. These are elected.

Unlike with Single Transferable Vote, ‘spare’ votes of those elected are *not* transferred to next preferences. Each representative keeps *all* the votes that elected them, which contribute to their ‘voting weight’ (voting power) in the assembly. If Rep. A received 85,361 votes in the election, their initial (‘baseline’) voting weight is 85,361 (85 if counting by thousands). If Rep. E got 5,703 votes, then that is their starting vote weight in the assembly (6 if counting by thousands). Different representatives could have very different voting powers. The detailed preferences of the voters are, therefore, more closely adhered to than under STV, which ends up giving away votes of popular candidates to less popular candidates, quite possibly with different views (even if they are in the same party - which they may not be), as well as wasting much of the last ‘quota’ of votes.

Compared with existing systems, our simple and intuitive proposal will provide a more exact reflection of each voter’s multi-dimensional preferences. Voters will be able to choose both *between* parties and *within* parties. Each voter will be able to pick and rank the candidates and parties whose preferences are reasonably close to their own in multi-dimensional ‘political space’. For the great majority of voters, there is a good chance one of these will be elected. And a strong local link would be preserved, indeed enhanced (by giving voters more choice over which representatives they could approach).

A given party could list its candidates in different orders in different parts of an electoral district to reinforce and underline their local link and help ‘zone’ their casework. It could also help distribute votes more evenly between their candidates in that constituency, depending on what fraction of voters chose to follow the party’s recommended rankings. If their party did worse than expected,



elimination of the lowest-vote candidates and transfers of their votes to next preferences in the same party should ‘concentrate’ the votes back towards one or more ‘favourite’ candidates from that party, in that constituency, who might then still manage to get elected. Trying to spread votes more evenly between different candidates from a popular party, within a constituency, could also help reduce political fragmentation into an unwieldy number of very small parties or independents, by helping to ‘squeeze out’ candidates from low-support parties - so they are more likely to be eliminated and their votes transferred to more mainstream next preferences - hopefully still reasonably good matches.

Fewer than six representatives per electoral district could unnecessarily compromise the overall proportionality and diversity of voting power (Irranca-Davies et al., 2022). For example, in the UK the third biggest party, the Liberal Democrats, have only managed around 8% - 12% support over the last few years (Politico, 2023). Five or fewer MPs per constituency could see them eliminated in too many constituencies. Other than this, because every voter’s vote counts in the assembly (perhaps after a transfer or two, if their top choices were unpopular and eliminated), VWR should work well over a range of parameters, such as the number, sizes and exact boundaries of electoral districts, and differences in population.

With 6-member constituencies, the ‘worst-case’ (highest) ‘effective electoral threshold’ under VWR is  $1/7$ : the lowest fraction of votes needed to *guarantee* not being eliminated, which occurs when votes are evenly spread between 7 candidates, bar one vote (similar to the STV ‘Droop Quota’): just under 14.3%. In practice, under VWR, the effective electoral threshold can be lower - if votes are unevenly concentrated into particular candidates, as is likely. A simple, close to ‘highest threshold case’ scenario (i.e. with very evenly-spread votes) is that six candidates get 14.3% of the votes each, and another candidate gets 14.2%. The first six are elected, and the last is eliminated with their 14.2% of the votes transferring to next preferences, many of which may still (hopefully) be reasonably close matches. So 85.8% of voters get their first preference elected, and quite a few more get a semi-decent match. The first preference fraction can be even higher, due to uneven vote spread, with some candidates winning well over the ‘effective threshold’, concentrating votes and leaving fewer votes competed for by candidates close to elimination. For example, say seven candidates get 23, 22, 18, 15, 10, 7 and 5% of the votes. The first six are elected, with the votes of the 7th transferred to next preferences. In this perfectly plausible scenario, 95% of the voters get a first-preference representative elected - hopefully, also reasonably close to where they live, or easily reached by video call. And many of the remaining 5% transferred will also be to reasonable matches.

We could come up with more thought experiments with votes ‘diluted’ over more candidates with more diverse policies, so perhaps all of them initially fall below the effective threshold, but as lowest-vote candidates are progressively eliminated and their votes are transferred to next preferences, often in the same party, or with policy overlaps, the votes will again ‘re-concentrate’ into fewer candidates, in many cases not too dissimilar to the original first choices, so a reasonably high fraction of the electorate are still likely to end up reasonably satisfied (although this requires further research). By contrast, there are many notorious real-world examples of substantial vote wasting and serious disproportionality under rival PR systems such as apportionment by highest averages.

(e.g. D'Hondt; good example) or systems with formal electoral thresholds but no vote transfers from eliminated parties or candidates.

It is worth noting that the proportionality of several PR systems could be improved *after* the allocation of representatives, without any increase in political fragmentation, by weighting assembly voting by the *actual votes per representative*. This would compensate for differences in this ratio, which can sometimes be quite extreme, up to 2-fold (d'Hondt) or even 3-fold (Sainte-Laguë). Such vote weighting would not, however, correct for *wasted votes* for eliminated candidates or parties: to mitigate this requires actual *transfers* to next preferences, as under STV and its simplification, VWR.

We expect our system will generally lead to coalition governments, and we and many others believe this is no bad thing, for multiple reasons which have been much discussed and debated (Bellamy, 2012), including better economic growth (Knutsen & Rasmussen, 2018) and less inequality (Zuazu, 2022). In any case, a single-party government (for example, under FPTP) is itself generally a broad, shifting coalition (albeit 'pre-formed', before the election, and voted on as such). Democracy is inherently a series of compromises, and we believe it is best conducted according to the emerging principles of collective intelligence (Malone & Bernstein, 2022), in order to recruit a wide range of talents and to generate the best ideas.

The legislative assembly should have both remote and in-person debating and voting. This would broaden access and improve the attendance, diversity, expertise and representativeness of the representatives, by reducing travel needs and time away from home. This is also necessary given the increased difficulty of 'pairing' (cancelling out) representatives from government and 'opposition' if different representatives have very different vote weights. It is particularly crucial that representatives with high vote weights either vote or delegate those votes to trusted colleagues (see below).

Elections themselves could be low-tech, if needed for security or trust reasons, run via paper ballots, polling booths (and postal votes) and manual counts, with no obligatory reliance on computers, unlike some of the more complex variants of STV. Between elections, it should be fairly straightforward to record, count and verify weighted votes within the legislative assembly. Many deliberative assemblies, including the US House of Representatives, already use some kind of secure within-assembly electronic voting. Such systems could be upgraded, including for secure remote access.

Weighted voting in the assembly can allow different constituencies to have significantly different populations, if wanted: representatives from a lower population district would have fewer votes, on average: weighting-by-votes would ensure approximate overall proportionality of party voting power in the assembly, irrespective of the different populations of different constituencies. This neatly sidesteps the problem that low population density, multi-member constituencies can become 'too' geographically spread-out (although with modern communication technology, this should be less of an issue). The proposed system is also inherently resistant to gerrymandering, as the weighting-by-votes of multiple representatives per constituency makes overall party voting power in the assembly relatively insensitive to boundary changes. A party might lose some votes in one district but regain more or less the same number in the neighbouring district, if the boundary was shifted into the first district: most of the 'moved' voters would, in effect, simply shift representatives

*within* a party, while preserving its overall voting power in the assembly. There might be more significant effects if a party with a *single* representative in a district had that candidate eliminated because of boundary changes, although ‘their’ votes would then, hopefully, be transferred to a relatively similar candidate from another party.

A further advantage of our system is that, for casework and other issues, most inhabitants of a district would have the ability to contact a representative they actually voted for (perhaps via video link in rural areas), which might make them more approachable and sympathetic. The *local link* is preserved, including by ‘sub-zoning’ constituencies having multiple representatives from the same party, but it is also *improved* via greater choice and compatibility.

**2.2. *Dynamic Votes-Weighted Representation. Every voter in the electorate gets a second ‘dynamic’ vote, which they can delegate by splitting in any way they like, between any elected representatives, from any constituencies, or use directly in assembly votes.***

This is an optional, longer-term part of our proposal. Extra fractional or whole votes delegated to a representative are added to their baseline vote weight (while that delegation lasts). Each voter can customise their delegations on a *per-issue*, *per-theme* or on a more general basis, modifiable as and when they see fit (Abramowitz & Mattei, 2019; Green-Armytage, 2015; Miller, 1969; Paulin, 2020; Tullock, 1992).

Immediately after an election, each second vote could initially be split proportionally between every elected representative in that voter’s constituency, weighted by the fraction of votes each representative obtained (roughly doubling each representative’s voting weight, depending on turnout). This is a sensible and fair ‘safe’ default starting position, allowing for voters who do not wish to or have time to exercise their dynamic second vote, without (partially) disenfranchising them or distorting the proportionality of the assembly.

Low-weighted representatives may still add much value via effort × knowledge, their input to debates, and by increasing delegation options, overall brainpower, expertise, cognitive diversity and collective intelligence (Hong & Page, 2004; Malone & Bernstein, 2022; Mannix & Neale, 2005).

It might be prudent to allow any representative to split and delegate their weighted voting power temporarily to one or more other representatives they believe to be better qualified to make the right decisions on particular issues, or if they are unwell or otherwise unable to vote. But further ‘onward’ delegation, similar to liquid democracy (Paulin, 2020), should be discouraged, for reasons discussed above.

Representatives’ voting records (and any delegations to other representatives) should be easily checkable by the public. Whenever possible, representatives should also state voting (and any delegation) *intentions*, in advance, to allow each voter the option of altering their dynamic splittable second vote.

Each voter can choose to cast their dynamic second vote *directly* in any assembly vote. However, at least half the total voting power remains in the generally ‘more expert’ and ‘deliberative’ hands

of representatives. In practice, it will probably be far more than half, due to most voters' time constraints.

Voting and delegating should be handled by secure online voting software (Benabdallah et al., 2022; Neziri et al., 2022; Verwer et al., 2020), which is probably already close to being good enough, is evolving and improving, and is already being used in multiple countries (Ehin et al., 2022).

### **2.3. Voting in the assembly is weighted by each representative's *total* vote weight. Any direct votes are added (Tullock, 1992).**

To reduce vote buying or voter coercion, any direct votes and delegations from voters (dynamic votes) should be kept secret and handled by secure encryption software. A voter should not be able to prove how they voted or delegated, including via screenshot or smartphone photo. A practical way to mitigate the risk of voter coercion or vote buying is to allow re-voting, then only count each voter's *last* vote (or delegation mix). This way, any voter can *secretly* override a forced/sold vote (or delegation), 'double-crossing' a malicious agent without them realising (Ehin et al., 2022). This removes the motivation for attempting such subversion of the system in the first place.

### **2.4. By-elections**

If a representative ceases in that role, this presents a problem, as for all multi-member constituency systems. There are a number of potential solutions. The vote weights of any replacement representatives need to be fair. And there may need to be reasonable barriers against one 'sacrificial' representative resigning to trigger spurious by-elections in that constituency for other representatives, including from other parties.

We suggest, therefore, that all candidates should declare to whom or how their vote weights should be assigned in the event of their 'early departure'. They could specify that their political party should choose a replacement and assign them their votes (baseline and dynamic). Or, immediately after being elected, every representative could specify how their votes should be divided among other (named?) representatives (adding to their vote weights).

Perhaps if more than a reasonably high threshold (say 20%?) of the electorate for that constituency signed a petition, there should instead be a full by-election for *all* the representatives for that constituency. This could be extended to more generally allow *recall* petitions and ballots, which might further improve democracy, if 'done right' (Vandamme, 2020).

### **2.5. Executive branch of government**

Representatives with high total vote weights could be leading candidates for the executive branch of government. 'Following the science' for collective intelligence (Malone & Bernstein, 2022), each government department could have a broadly-based *collective leadership* of representatives elected by the assembly (plus any direct votes), based on policies, knowledge and competence - rather than being picked by a *single*, over-powerful prime minister or chief executive, based on patronage, favours and loyalty. Representatives with relevant expertise and talents could put themselves

forward for roles, and the assembly (+ any direct votes) could pick the best, most diverse leadership *team* for each department, aiming to maximise their collective intelligence/wisdom (Hong & Page, 2004; Laan et al., 2017; Malone & Bernstein, 2022; Mannix & Neale, 2005). Voting within each departmental leadership team could also take account of the vote weights of those representatives. The chair could be rotating. Members of the leadership team with the most expertise or vote weights could attend the ‘top-level’ cabinet. In this way, groupthink-resistant collective wisdom would be promoted at all levels of government and political parties (Diefenbach, 2019; Hong & Page, 2004; Laan et al., 2017; Lorenz et al., 2011; Madirolas & Polavieja, 2015; Malone & Bernstein, 2022; Mann & Helbing, 2017; Mannes et al., 2014; Surowiecki, 2004; Woolley et al., 2015); dissenting and divergent views would be encouraged and embraced, not suppressed (Laan et al., 2017; Madirolas & Polavieja, 2015; Mann & Helbing, 2017).

### 3. Conclusion

Democracy is in retreat across the world (Rachman, 2022), in great part because of its own multiple dysfunctions. This poses an existential threat to our entire species and planet. We claim there is a straightforward way to democratise and rescue democracy - and to enhance its collective intelligence (Malone & Bernstein, 2022; Woolley et al., 2015) and thus, its performance. We propose this can be done by greatly improving proportional representation, to make it fairer, less ‘gameable’, less beholden to party hierarchies, more flexible, and far more representative of the full, ever-changing, multi-dimensional political space, including *between* elections.

Rather than attempting various complex, opaque and ‘accident’-prone manoeuvres to achieve numbers of representatives that somewhat reflect the popularity of each political party, and then giving each representative an *equal* vote in the legislative assembly, we should instead simply introduce *weighted* voting in the assembly, where each representative’s voting power is the number of votes they have received from the electorate, and each electoral district (constituency) returns multiple representatives (Tullock, 1992), but crucially, with votes for eliminated candidates being *transferred* to next preferences, instead of being wasted.

Once secure remote voting technology is sufficiently trusted (Benabdallah et al., 2022; Ehin et al., 2022; Neziri et al., 2022; Verwer et al., 2020), each citizen can also be given a second, dynamic vote which they can either split between *any* representatives in the assembly, as and for how long they see fit, or use to vote *directly* on certain issues themselves (Abramowitz & Mattei, 2019; Green-Armytage, 2015; Miller, 1969; Tullock, 1992). This allows greater accountability and finer-grained, more multi-dimensional representation *between* elections.

Our proposals should first be tested and fine-tuned, for example, in local councils, or maybe in ‘a small country about the size of Wales’, currently further democratising its own devolved assembly (Irranca-Davies et al., 2022). These proposals are, however, designed so they can be made to work well at multiple scales, from local councils all the way up to large countries, such as the US, and even trans-national federations, such as the EU. Electoral districts would have to be sized appropriately to keep the assembly from growing too unwieldy (even with remote online debating and secure electronic voting functionality). A key advantage of our votes-weighted assembly voting proposal,

including at these larger scales, is that different multi-member electoral districts (such as US states) can have very different populations, while still achieving fair, flexible, responsive, multi-dimensional proportionality of overall representation.

There are numerous barriers to implementing even the first stage of Votes-Weighted Representation, including educating politicians about the research literature, and (in some cases) persuading them to vote against their own short-term self-interest. Nevertheless, VWR is eminently 'sellable' as a simplified 'natural' improvement of Single Transferable Vote, already popular in the UK, Ireland, Australia and elsewhere - but without its complicated, often confusing and sometimes off-putting 'spare' vote transfers from elected candidates to lower, worse-matched preferences (Gallagher, 2005; Tideman, 1995). VWR should achieve better proportionality of voting power in the assembly than STV, yet with far fewer suboptimal and wasted votes. VWR also preserves (or even improves) STV's other popular features, such as strong local constituency links, voter choice over which candidates from a given party are elected, and realistic chances of electing independents or diverse/small party candidates. Furthermore, with 5- to 7-member constituencies, like STV, VWR benefits from being able to have a *high enough effective electoral threshold to head off political fragmentation* and attendant difficulties forming coalition governments. VWR does all this without wasting significant numbers of votes, unlike far more complicated (and thus less intelligible) so-called 'proportional' systems using explicit electoral thresholds and/or highest averages (D'Hondt, Sainte-Laguë) or largest remainder apportionment - all of which *fail to transfer the votes of unsuccessful candidates or parties* to next preferences: a fundamental omission and distortion that, if it goes too far, can further undermine their claims to proportionality, and their democratic legitimacy.

For a reasonable (6-7 member) district size, our VWR proposal allows a more responsive, complete, accurate, proportional and fine-grained 'coverage' of multi-dimensional political space than other kinds of PR (Pivato & Soh, 2020), while avoiding political fragmentation. In essence, this is because it uses and preserves more information about voter preferences, *propagating this information into the assembly itself*, and thence, into debates, collective intelligence, policies, legislation and government.

## Appendix

Table 1 lists some problems of various systems, outlined in the Introduction, together with the extent to which VWR may help solve them. Some other solutions mentioned, but not exhaustively.

Table 1 Problems of other democratic models - solved by Votes-Weighted Representation?

System	Problems / bugs / features	✓ = Fixed by VWR?
All	Voter coercion or vote buying. Ballot box stuffing.  Identity fraud or voting multiple times.  <u>Voter suppression</u> (needing Photo ID, registration worsen). Low turnout.	Secret ballot; ban ballot photos. Voting booths, secure ballot boxes. Designated polling stations, lists from electoral register? Indelible 'voted' ink. Automatic/same-day registration, short queues + travel, postal votes, meaningful choices. Secure e-voting?
All	<u>Political corruption</u>	? VWR produces more scrutiny?
Small counting precincts, identifiable ballot boxes	<u>Clientelism</u> (services/spending for group in exchange for votes). Ability to identify voting patterns of neighbourhoods /workplaces.	Anonymise ballot boxes, returns.  Larger vote counting precincts.
All	<u>NIMBYism</u> ("Not In My Back Yard").  Loudest listened to, even if unrepresentative minority.	Bigger districts, less local veto. Planning regulations for 'greater good'. More party discipline; central control over candidates and orders on lists.
<u>Direct democracy</u>	Most voters have insufficient time, knowledge or 'bandwidth' in large, complex societies. Airtime hogging by loudmouths, wannabe big shots. Selection biases for regular/active participation. (Many other criticisms such as <u>tyranny of the majority</u> ; can also apply to <u>representative democracy</u> ).	✓ VWR diverse choice of candidates and elected reps. Assembly rules, discipline. ✓ Dynamic delegable 2nd votes, splittable; optional override by remote direct voting.
<u>Referendums</u>	Who controls the question/s and framing? Misleading, emotive or misleading arguments. Many voters have too little knowledge, time to research Too many referendums can lead to voter fatigue. Different referendums yielding contradictory results. Don't go far enough to fix democratic deficits.	✓ VWR dynamic delegation to choice of relatively expert reps; multi-dimensional match. ✓ VWR optional direct voting. ✓ <i>Integrated</i> legislative program ✓ Responsive <i>between</i> elections.
Most	<u>Incumbency advantage</u> .	? Parties select and voters rank multiple candidates. Limits on number of terms?
<u>Coalition governments</u>	Depending on no. of available partners vs. no. needed: Less stable? Less accountable? Weak?	<b>Coalitions generally work well.</b> Bigger talent pool; <b>policies usually more stable</b> , moderate, wise, even if coalitions reshuffle:

System	Problems / bugs / features	✓ = Fixed by VWR?
	<p><b>“Tail wagging the dog”?</b>  “King-making”?  “Holding to government to ransom”?  “Over-powerful” small parties?</p>	<p>on average, get <b>higher growth, less inequality</b> (Colomer, 2012; Knutsen &amp; Rasmussen, 2018; Zuazu, 2022).</p>
<p>FPTP,  long terms,  independents,  weak party discipline,  local selection/  control of candidates</p>	<p><u>Logrolling</u>  <u>Vote trading</u>  <u>Horse trading</u>  <u>Pork barrelling</u></p>	<p>? Party discipline: whipping, control of candidate selection and ordering on lists and ballot papers, support (money, teams).</p>
<p><u>First Past the Post</u> (FPTP; single-member plurality)</p>	<p><u>Vote splitting</u> (e.g. ‘spoiler’ effect can split a majority).  <u>Gerrymandering</u> (rigging borders to favour one party).  <b>Gross disproportionality</b>, votes per representative vary wildly between parties.  <b>Biased</b> against parties with over-concentrated (e.g. urban) votes.  <b>Governments supported by minority</b> of population (35-45%).   <b>Policy swings</b> when control flips between minorities.   <u>2-party system</u>, squeezed middle, <u>polarisation</u> (US).  Regionally concentrated votes yield more reps (e.g. nationalists).  Thinly-spread small-party votes yield no or few reps (e.g. Greens).  High fraction of <u>wasted votes</u>.  Only <b>minority of constituents support representative</b>, typically.  Most voters <b>cannot access compatible representative</b>.   Too many <u>safe seats</u>; <b>policies/campaigns biased</b> towards swing voters in marginal minority of districts.   Leads to <b>confrontational politics</b>.  Can get <u>wrong-winner elections</u> (Electoral Reform Society 2023).</p>	<p>✓ VWR resilient against.  ✓ VWR resilient against.  ✓ Votes weighting prevents.   ✓ Votes weighting compensates; more diversity.  ✓ Majority support needed (coalition?).  ✓ Coalitions likely: give policy stability.  ✓ Covers multi-dimensional spectrum.  ✓ Vote weighting compensates.  ✓ Few votes wasted: easier to elect small-party rep - if not, votes are transferred (to similar?)  ✓ Most voters elect first choice or similar.  ✓ Generally at least one of district reps compatible.  ✓ No safe seats - all voters in all parts of country count: campaign diversity.  ✓ Boosts co-operative politics.  ✓ Votes-weighting prevents.</p>
<p><u>Highest averages seat allocation methods</u> (e.g. D’Hondt)</p>	<p><b>Complex</b>, hard to explain/justify to voters (D’Hondt tricky, Sainte-Laguë worse): undermines legitimacy.  <u>D’Hondt</u> disproportional by most <u>measures</u> (Benoit, 2000), often grossly; <u>St-Laguë</u> can give <u>under half of seats to party with over half of votes</u> (Miller, 2013), e.g. 3 reps/district, 59% : 21% : 20% of votes → 1 : 1 : 1 reps; can give up to <b>3-fold range in votes/rep</b>.</p>	<p>✓ VWR <i>far simpler</i>, far more intuitive to explain.  ✓ Compensates by vote weighting, if at least one rep. elected for party; if not, mitigates by transfers to similar party.</p>



System	Problems / bugs / features	✓ = Fixed by VWR?
<p>Highest averages</p>	<p>D'Hondt gives up to <b>2-fold range in votes/rep</b> between parties.  <u>D'Hondt favours big parties</u> (Schuster et al., 2003).</p> <p><u>Waste arbitrarily high fraction of votes</u> of small parties that gain no seats; Sainte-Laguë often used with <u>threshold</u>, wasting even more votes.  <b>Unstable seat allocation:</b> small change in votes can lead to disproportionate change in reps (e.g. one party being in vs. out).            Violate <u>quota rule</u>, that no. of seats allocated to a party should be one of the two integers closest to (vote fraction × seats).  <b>Parties control</b> candidate selection, list ordering.</p> <p>Hard for independents to get elected (need <u>Droop quota</u> for D'Hondt)?</p> <p><u>Regionally concentrated</u> votes yield more reps: unfair.</p> <p>With big, many-member-constituencies, can <b>lose local link</b>.</p> <p><u>Political fragmentation</u> into multiple small parties; harder to form coalitions (less of an issue with fewer reps per district, but then less proportional).</p>	<p>✓ = Fixed by VWR?</p> <p>✓ Vote weighting compensates.            ✓ Compensates. Easier to elect small party; if not, transfer votes to similar.            ✓ Mitigates vote wasting by transfers to similar candidates.            ✓ Compensates by vote weighting, mitigates by transfers to similar.</p> <p>✓ Compensates by vote weighting.            ? Voters can override candidate order. Independents viable.            ✓ Need fewer votes, especially if big-party votes concentrate in few reps.            ? Partly: need less votes to get elected, then votes weighting mitigates. Transfers to similar.            ✓ Fix by not too many reps per district + '<b>zoning</b>' (vary ballot orders by zones).            ✓ Fix by not too many reps per district; to get more big-party reps, spread party's votes by varying ballot order / '<b>zoning</b>'.  <i>Could add electoral threshold?</i></p>
<p>Single Transferable Vote (STV)</p>	<p><u>Complex transfers of 'spare' votes: multiple methods, random or fractional votes</u> (requiring computers). Justifications <b>controversial</b>; in theory could lead to <b>different results; undermines legitimacy</b>, especially if unfamiliar.</p> <p><b>Hyper-localism</b>, e.g. as with STV in Ireland (Farrell et al., 2017).</p> <p>Some <u>disproportionality</u> (Difford, 2021b). Worse with too few reps/district, 'slate' or 'above the line' voting, or large number of independents/small parties: e.g. Ireland 2007, Australian Senate 2001: <u>Gallagher indices 10.1, 10.6</u> (Farrell &amp; Katz, 2014; Gallagher, 1991); <u>≤ 5 is reasonably proportional</u>.</p> <p>Wastes votes: last 'quota', typically.</p> <p>(STV tends <i>not</i> to produce party <b>fragmentation</b>.)</p>	<p>✓ No 'spare' vote transfers under VWR: weight by votes instead; <i>far simpler</i>, more intuitive to explain, much quicker to count.            ✓ Stronger assembly control over govt., bigger districts, party discipline.            ✓ Weights compensate; more reps / district better; concentrate big party votes to diversify parties elected, spread big party votes to raise threshold and reduce party fragmentation.            ✓ Far fewer wasted votes; votes from eliminated candidates are <i>all</i> transferred and thus count.            VWR may slightly increase fragmentation, unless vary</p>

System	Problems / bugs / features	✓ = Fixed by VWR?
STV	<p>In peculiar, highly specific scenarios, can in theory get <b>'perverse'</b> counter-intuitive results (Doron &amp; Kronick, 1977).</p> <p><u>Wrong winner elections</u>. In Malta, party with less votes has won more seats, and one election (Hasancebi, 2023)!</p> <p><u>'Donkey' voting</u>: ranking candidates in order they appear on ballot papers; <u>alphabet effects</u>. Can get very large, <b>confusing ballot papers</b> → random or incomplete voting. Voters not knowing large no. of candidates well enough to rank.</p> <p>Different district populations can lead to disproportionality. Low population density districts too spread out?</p> <p><u>Electoral stasis</u>: can be hard to change no. of reps elected by each party in a constituency; worse with fewer reps per district.</p>	<p>✓ = Fixed by VWR?</p> <p>candidate orders on ballot papers to spread big-party votes and squeeze out low-support rivals. Even more unlikely with more reps per district. Mitigated by candidate similarities and reciprocal preferences. ✓ VWR prevents wrong winner elections by compensatory vote weighting. Randomise or vary order on ballot papers in different zones of constituency to even out votes among a party's candidates. Group candidates by party with short descriptions; party selects candidates + orders on ballots: can vary by zones. ✓ VWR allows different district populations with same no. of reps, retaining proportionality. Use remote conferencing, video calls! ✓ VWR mitigates by vote weighting.</p>
Party List PR / Mixed Member PR / Additional ('top-up') Members (semi-proportional)	<p><b>Confusing</b> (e.g. <u>German system</u> with two votes per voter, serving different purposes, 'overhang' and 'levelling' representatives). <u>Political fragmentation</u> if many reps per district and no/low thresholds (e.g. <u>Weimar Germany</u>, <u>Israel</u>).</p> <p>Can be <u>disproportional</u>, especially if <u>too few top-up reps</u>, too few reps/district, or if <u>thresholds too high</u>, many small parties below it (e.g. <u>Turkey 2002</u>: AKP won 66% of the seats with only 34% of the vote). Can <u>waste many votes</u>, e.g. if threshold against fragmentation. Regional/national 'top-up' representatives can <b>lose local link</b>. In some systems, a party winning lots of constituency seats can unfairly <b>'game' too many top-up reps</b> via an <u>'ally' party</u> it controls. Thresholds can lead to <b>unstable shifts</b> in coalitions if one party drops below national threshold (e.g. <u>Germany 2013</u>).</p>	<p>✓ VWR <i>far simpler</i>.</p> <p>✓ Mitigated by high natural threshold, if not too many reps per district, if big-party votes evenly spread over candidates. ✓ Better proportionality via vote weighting and transfers of eliminated candidates to similar next choices. ✓ Transfers reduce wasted votes. ✓ VWR has good local links. Not an issue with VWR. ✓ No <i>national</i> threshold; mitigated by vote transfers from eliminated candidates and weighting by votes.</p>

System	Problems / bugs / features	✓ = Fixed by VWR?
	<p><b>'Too much' party control</b> over candidates and order on lists?</p> <p><b>'Closed' party lists de-personalised?</b> No voter control/choice.</p> <p><b>Long 'open' candidate lists confusing.</b> Voters know too few candidates or their views to 'safely' pick top choice/s in an informed manner.</p>	<p>✓? More local party / voter control. Independents viable.</p> <p>✓ VWR personalised; voters rank candidates.</p> <p>✓ VWR fairly local; can rank parties, then focus research on candidates of best-fit party only.</p>
All, especially confrontational FPTP	<p>Over-promising</p> <p>Blame-shifting (worsened by multi-level devolution).</p> <p>Scapegoating</p>	<p>? VWR may mitigate by improving co-operation, quality of debates/votes.</p> <p>? Vote transfers and coalitions make less confrontational.</p>
<u>Concentrated/oligarchic media ownership</u>	<p>Biased press → misleading information, brainwashing.</p> <p>Distorted debate: dodgy assumptions, logic and conclusions.</p>	<p>X Need to break up.</p> <p>? Diverse reps with wide range of views/knowledge.</p>
Corrupt/excessive campaign spending	<p>"The best democracy that money can buy".</p> <p>Quid pro quos, 'dark' funding, donations to all likely winners.</p> <p>Revolving door between think-tanks, civil service, parties, govt.</p>	<p>? Lowers barriers to getting elected, so need less funding.</p> <p>X Restrict + register campaign finance.</p> <p>? Voter choice may counter-balance.</p>
<u>Liquid democracy</u>	<p><u>Political fragmentation:</u> too many parties/factions to easily form coalition governments.</p> <p>Long delegation chains confusing, can flip choices.</p> <p>'Super-gurus' with too much influence; groupthink.</p> <p>Delegation cycles (several solutions). No <i>splittable/fractional</i> delegation/proxy votes. Need <i>secret</i> voting by voters, <i>public</i> voting by proxies.</p>	<p>✓ Mitigated by reasonably high effective election threshold; can raise threshold if spread big-party votes over more reps by varying order on ballot papers.</p> <p>✓ Two levels only: voters, reps.</p> <p>✓ Baseline votes spread among districts. Dynamic 2nd votes <b>splittable</b>.</p> <p>✓ Not a problem: <i>elected</i> reps distinct from voters.</p> <p>✓ Both features of VWR.</p>
<u>Sortition</u>	<p>Lack of interest, expertise, government experience.</p> <p>Easy to bribe/intimidate random non-office-holders.</p> <p>Hard to sequester large group long-term.</p> <p>Jury selection and tampering tricks.</p> <p>Non-uniform selection, attrition (e.g. caring duties).</p>	<p>✓ Expert, elected, paid reps</p> <p>✓ Safeguards on elected reps.</p> <p>✓ Reps accountable/removable.</p> <p>✓ Reps elected, openly.</p> <p>✓ Job shares, good pay, remote access, diversity encouraged.</p>
<u>Citizens' assemblies</u>	<p>Selection bias.</p> <p>Who chooses/frames the questions and picks experts?</p> <p>Members' poor 'bandwidth', knowledge, intelligence.</p> <p>Non-uniform attrition.</p> <p>Lack of credibility; not a panacea! (O'Leary, 2019).</p> <p>Bribery/intimidation.</p>	<p>✓ <i>Elect</i> diverse range of reps.</p> <p>✓ Legislature/government.</p> <p>✓ Experts among reps elected.</p> <p>✓ Job shares/remote access.</p> <p>✓ Select candidates and elect paid reps competitively.</p> <p>Safeguards on govt. officials.</p>

Table 2 compares FPTP (last column) with VWR and three popular contenders for PR in the UK: STV, 6-member D’Hondt constituencies proposed for the Welsh Senedd (Irranca-Davies et al., 2022), and Additional Member systems, as used in the Scottish Parliament and Welsh Senedd. Colour scheme is inexact e.g. regional top-ups column depends on proportion/exactness of topping-up.

Table 2. SUMMARY comparing VWR and four other voting systems used/proposed in UK

System	6-member VWR constituencies	6-member STV constituencies	6-member D’Hondt constituencies	1-member FPTP + regional top-ups ± threshold	Single-member FPTP (plurality) constituencies
Feature/bug					
Simplicity	Reasonable	Complex	Complex	Complex	Simple
Proportionality	Good; better if big party votes concentrate into few candidates. Could be nearly perfect, if transfers to 2nd preference parties included as ‘support’ (if not too many small parties)!	Generally good; can favour big parties / be disproportional (Difford, 2021b); one party can just win a rep while another party just fails to, with very similar votes ‘either side of’ last quota: votes just below quota are wasted.	Favours big parties. Can easily be very disproportional (Gallagher, 1991; Medzihorsky, 2019), up to 2 x votes/rep range (Gallagher, 1991), e.g. 2 parties have similar votes but 1 vs. 2 reps awarded; worsened by no transfers of wasted votes, e.g. if many small parties.	Low fraction of additional (top-up) reps worsens proportionality e.g. Welsh Senedd (Shuttleworth, 2021). Higher threshold worsens proportionality.	Very poor, e.g. typical General Election (GE) in UK or Canada (Difford, 2021a); typically minority of population elect government (supposedly) pursuing their interests (Difford, 2021b).
Vote splitting: if popular majority is split, another, less popular, party can win	No	Unlikely, due to multiple reps/district and transfers to next preferences	Sometimes, since bigger parties favoured (GM, unpublished simulations)	If too few top-up reps	If ‘progressive majority’ vote split, unpopular right-wing minority party often wins
Wasted votes	Few, especially if 2nd choice parties are reasonable matches	Wastes ‘Droop quota’ = $1/(reps+1) = 1/7 = 14.3\%$ of votes in 6-member district	Can waste arbitrary fraction of votes if lots for small parties failing to get reps elected	Many, if lots of small parties or high threshold; small change in votes can have big effects	Huge fraction, often majority; 70% in UK 2019 general election (Garland et al., 2020)
Government with majority of assembly voting power, but under 45% of electoral	Total votes matter, not no. of reps: so unlikely, esp. if count 2nd choice party as	Slight risk. Unlikely if 2nd choice party counts as	Has happened with regional D’Hondt; Spain 2011, Partido Popular got 53%	If too few top-ups: Scottish Parliament, Welsh Senedd: Labour 50% of	Usual in UK since 1970s; 35.3% of votes gave Labour

System Feature/bug	6-member VWR constituencies	6-member STV constituencies	6-member D'Hondt constituencies	1-member FPTP + regional top-ups ± threshold	Single-member FPTP (plurality) constituencies
'support'	'support'	'support'. E.g. <u>Ireland General Elections</u>	of deputies with 44.6% of votes	seats but under 40% of votes	big majority in <u>UK 2005 general election</u>
Coalition governments	Expected	Usually	Expected	Expect at UK level; often 1-party govts in Wales, Scotland	Rare, but lately get unstable 1-party governments!
Policy stability	Expected (Colomer, 2012)	Reasonable	Expected	Reasonable	Policy swings, e.g. if ruling party flips.
Moderate, pro-majority policies	Expected	Expected e.g. (Gallagher, 2005) Ireland	Expected	More likely than under FPTP; can get 1-party rule	Often extreme or pro-elite 1-party rule.
Economic growth and equality	Better expected than under FPTP (Knutson, 2011)	Better expected than under FPTP (Zuazu, 2022)	Better expected than under FPTP	On average, better with more parties in coalition	Both tend to be worse with single party governments
Political fragmentation	Mild: big parties can 'let in' others by concentrating own votes into fewer reps. Worse with regional concentration?	Mild, other than from regional concentration	Mild, other than from regional concentration	If low threshold or regional concentration	No; 'squeezed middle'; can still get unstable governments (UK!) or policies
Strong local link	Yes, sub-zoning improves	Weaker, sub-zoning helps?	Weaker, sub-zoning helps?	FPTP reps, but not top-up reps	Yes
Compatible local elected representative?	Yes (smaller party rep. less local?)	Yes? (smaller party rep. less local?)	Yes? (smaller party rep. less local?)	Less local if top-up regional representative	Not for many or most voters
Independents viable	Yes esp. if big party votes concentrated	Yes, but need 1/7 of votes	Disfavours small parties	FPTP rep? Not regional top-up reps	Occasionally
Party control of candidate selection	Weak: can elect 'same-party' 'independent' with under 1/7 of votes	Mainly: 'same-party' 'independent' needs 1/7 of votes	Yes	Yes	Yes
Parties control own candidate order	Somewhat if rules allow: but voters can over-ride	Somewhat if rules allow: but voters can over-ride	Yes	Yes for FPTP + 'closed' lists, less so if 'open' regional lists	Each party selects single candidate (can do primaries)
Diversity of parties/views in assembly	Big parties can allow in small parties if	Voters choose? High effective	? Favours big parties; more with diverse	Depends on threshold, top-up fraction,	Depends on regional

System Feature/bug	6-member VWR constituencies	6-member STV constituencies	6-member D'Hondt constituencies	1-member FPTP + regional top-ups ± threshold	Single-member FPTP (plurality) constituencies
	concentrate own votes into fewer reps	threshold. More with regional concentration	selection, regional concentration	selection, regional concentration	concentration, candidate selection
Gerrymander-prone; inefficient support concentration	Resistant, especially if OK matches to 2nd preference parties	Last rep elected can be unstable to small changes in votes	Last rep elected can be unstable to small changes in votes	Resistant if enough top-ups to compensate?	Vulnerable: common in US, 'accidental' in UK: <u>electoral register</u> not census used, biasing seats
Robust to wide range of constituency populations	Yes, inherently: votes 'carried' into assembly as vote weights	Requires fewer reps in smaller districts: → less proportional	Requires fewer reps in smaller districts: → less proportional	Somewhat, if enough top-up representatives to compensate	No! Hard to keep moving boundaries to match changing population
'Political stasis' / safe seats	No	Typically not, if over 4 members per district	No	Many safe FPTP seats; party mix of top-up seats changes	High fraction of safe seats
Responsive to voters <i>between</i> elections	Yes - dynamic 2nd votes and recall, if used	Somewhat + by-elections, if used	Somewhat; but no by-elections	Somewhat + FPTP by-elections	Somewhat + by-elections
Responsive to voters on specific issues	Yes, especially if dynamic 2nd votes used	Somewhat	Somewhat	Somewhat	Somewhat
Reflects multi-dimensional politics	Yes: if big party votes concentrated, then reps with lower support electable; dynamic 2nd votes, if used	? e.g. Green reps in Irish government	Big party bias; nationalist vote concentrations, but not political dimensions beyond 'left-right'?	If enough top-up seats? E.g. Greens in Scottish Parliament	Two 'left' vs. 'right' parties dominate; nationalist vote concentration, but not other political dimensions

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