

The Theory of Democratic Voice Expression

1 Abstract

This paper is a Euclidean presentation of democratic voice expression theory, with a few significant illustrative applications.

2 Context

The theory of democratic voice expression presented here arises from the historical roots of parliamentary evolution in Britain [1], and from Canadian jurisprudence, [2], [3], [4], [5], [6].

In as much as democracy rests on a mindset within the people, one that accepts the democratic contract of rule by a majority that does not oppress the minority, there is little doubt that millennia of North American Indigenous democratic experience influenced the flourishing of democracy in the US and Canada; see [7] and [8] for a sense of this iceberg's tip.

The history of democratic measurement, since the field's post World War II inception as reviewed in Lipset's (1959) paper [9], largely focuses on the creation and use of indices to analyze democracy. The literature is well reviewed by Giebler et. al. [10]; for more detail see [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33], [34].

Debate on a conceptual definition of democracy strangled the subject following Riker's 1965 comment [35], "... democracy is a form of government in which the rulers are fully responsible to the ruled" and Dahl's (1971) [36], "... a key characteristic of a democracy is the continued responsiveness of the government to the preferences of its citizens."

Work about how to categorize and analyze democracy continued without a definition of what was being discussed. Although a period of discussion helps crystalize concepts, ignoring definitional clarity eventually impedes logical thought.

Beginning with suitable definitions and a single axiom, this paper develops the theory of democratic voice expression using the Euclidean model of assertions proved by logic. These assertions lead to tools for implementing electoral reform, full discussion of which is essayed and referenced.

3 Definitions/Usage

For purposes of electoral reform, a **nation** consists of legally recognized **citizens** governed by law.

A **legislature** is a representative body empowered to enact law.

A **representative** is a citizen that represents/speaks or advocates for a group of citizens in a legislature or government respectively.

Governance is the function and structure of national institutions charged with conducting the business of a nation; in a democracy, governance arises from the legislature, which puts in place democratic institutions.

Power, or equivalently **voice**, is the ability to enact law.

Speech is not voice. Voice rules, speech argues; but no one is compelled to listen to speech. Money elects voice in a plutocracy, not a democracy; the requirement for the right to cast a ballot is citizenship, not wealth.

District is a geographic structure within which citizens' voices are aggregated for electoral function. Districts have different names worldwide: riding, seat, constituency, prefecture, comté, ward, borough, etc.

Advocacy is political effort in aid of a particular cause.

A **Ballot** is the formal expression of a citizen's voice:

- The **winning ballot** count is the number of ballots that help elect a candidate; any ballot in the winning ballot count is loosely called a winning ballot
- The **losing ballot** count is the number of ballots that do not help elect any candidate; any ballot in the losing ballot count is loosely called a losing ballot
- The **surplus ballot** count is the number of winning ballots for a candidate that are not needed for the candidate to win; any ballot in the surplus ballot count is loosely called a surplus ballot
- The **essential ballot** count is the number of winning ballots minus the number of surplus ballots; any ballot in the essential ballot count is loosely called an essential ballot
- Losing and surplus ballots are together are called **inefficient**; essential ballots are called **efficient**

A ballot is a **vote** if and only if it achieves voice.

Essential ballot support and clear responsibility are together necessary and sufficient for **accountability**.

An **electoral system** is a set of rules for aggregating ballots into representative legislative voice; the trivial aggregation of one to one is direct democracy, total aggregation is dictatorship. The **representation system** describes the use of power to enact law, including the electoral system.

Representatives occupy **seats** in a legislature, each seat representing some electoral district.

Seats are **allotted**, usually by constitution, tradition, or electoral system; they are **allocated** and **matched** to political parties and candidates by electoral system.

An **allocation division** is an electoral construct within which seats are allocated. A **matching division** is an electoral construct a) within an allocation division and b) within which candidates are matched to a seat.

The **natural quotient** or **threshold** is the fraction or percentage of ballots needed to guarantee allocation of a seat within an allocation division.

Political parties are vehicles for aggregations of citizens' voices around policy issues; a political party is loosely referred to as a party. A **seated party** is one that has at least one seat in the legislature; there are only as many seated parties as there are seats.

Districts are said to have **parity** if they have the same number of electors.

Disenfranchisement refers to those citizens who are denied the right to vote, e.g., underage, felons, expatriates, etc.

Non-participation refers to those enfranchised citizens who do not vote.

Malapportionment refers to lack of parity between divisions.

Regionalization refers to the mismatch of partisan representation and district structure.

A **centripetal** electoral system is one that fosters fewer political parties, a **centrifugal** one does the opposite; both are relative terms.

The **majority rule** is that agreement of 50 percent plus 1 of the representatives in a legislature is required to pass a law; majority rule is more efficient but less democratic than forming a consensus before enacting legislation.

The **plurality rule** is that the person with the most votes in a riding is elected, where most may be much less than 50 percent.

The **democratic contract** is that the majority rules, but not oppressively; minority voices must be heard and considered.

4 Axiom

Democracy is a system of governance in which all exercisable power or voice arises equally and independently from citizens; representative democracy is then a democracy in which the power or voice of citizens is transferred to equal and independent representatives through an electoral system.

Comments

In accordance with Canadian jurisprudence, this axiom is a broad, generous, and purposive interpretation of the right to vote enshrined in Section 3 of the Canadian Constitution, one that eschews legalese and respects the dignity of the individual citizen.

5 Derivations

5.1 Ballot Split by Type

Assertion 1. Losing and surplus ballots can be considered to have no voice.

The power of a representative is independent of surplus ballots because full power is achieved with essential ballots; surplus ballots add no power. Power assigned to surplus ballots can only come from complimentary essential ballots, which is mathematically equivalent to surplus ballots having no power; the latter is preferred for calculations.

5.2 Accountability

Assertion 2. Only one representative can be clearly accountable to an otherwise undifferentiated group of electors, and only if elected by essential ballots.

Essential ballots are by definition necessary for accountability; removing even one essential ballot must affect the outcome. The axiomatic definition of democracy requires equal and independent representatives; equality, independence, and responsibility are all blurred with multiple district representatives.

5.3 Thresholds/Quotients

Assertion 3. The natural threshold or quotient fraction is the reciprocal of the number of matching divisions contained in an allocation division.

Let n be the natural threshold, b the number of ballots cast in an allocation division, and m the number of matching divisions in the allocation division. The number of ballots needed for a natural threshold is b/m . By definition of natural threshold,

$$n = (b/m)/b = 1/m$$

Comments

If there are 10 seats for 10 matching divisions, then the threshold is $1/10 = 0.1$, or 10 percent, which means a party that gets a quotient of 10 percent of the aggregated allocation division ballots should be guaranteed allocation of one of the 10 seats. The natural threshold can also be affected by the way ballots are counted, e.g., the plurality rule reduces the actual threshold to less than one half of a natural threshold.

As a further example, if Canada's 338 matching division were in a single national allocation division, then the natural threshold would be $1/338 = 0.0029$, or about 0.3 percent. Any party polling 0.3 percent (approximately 50,000 ballots) of the aggregate national vote would be guaranteed allocation of a seat, which is practically true under SMP where the actual number is much less because of the plurality rule.

A party polling other than an integer multiple of the natural threshold results in an unallocated quotient residual. Since there is an integer number of seats, there will be at least one other unallocated residual fraction of a quotient, and at least one unallocated seat.

Traditionally, seats remaining after allocation of full quotients are filled based by residual quotients. It is known that the D'Hondt method of deciding residuals results in the greatest number of essential ballots and lowest number of losing ballots and is therefore most compatible with voice expression [37].

Assertion 4. *Proportionality and voice expression are highest when all parties are elected on full quotients.*

When there are residual quotients there will be losing ballots that fail to represent voice. The greater the number of seats settled by residual quotient the more voice unrepresented, and thus the less proportional the outcome.

Assertion 5. *Below 1, the natural threshold is inversely proportional to the number of parties.*

Below a threshold of 1 no party is elected on a full quotient. Let p be the number of parties in a system with threshold below 1. To be seated a party needs to poll one more ballot than $1/p$ of the ballots cast.

The actual quotient depends on the natural quotient and the number of seats in a matching division.

5.1 Governance Stability

Assertion 6. *Electoral systems with a threshold of 1 or less are at risk of structurally unstable governance.*

Above a threshold of 1, matching divisions control the threshold, and therefore the ease with which political parties can be formed. At a threshold of 1 it is extremely unlikely that one party will poll all the ballots, which practically reduces to the case of a threshold below 1. Below a threshold of 1, the number of political parties controls the threshold without upper bound, and therefore governance can become difficult to impossible.

Comments

Since all SMP-based systems necessarily have a threshold at or below 1, they are all at risk of

structurally unstable governance. This instability becomes more apparent as the population grows because unconstrained growth in the number of parties induces ungovernability.

5.2 Allocation/Matching Division Structure

Assertion 7. Allocation/matching division structure can scale cyclically with growth of the electorate.

Let v be a predetermined acceptable number of voters for a matching division, based on whatever criteria are considered important for a nation's representation system. Let m be an acceptable number of matching divisions per allocation division, again based on whatever criteria are considered important for a nation's representation system. The total number of voters is then $v * m$.

When the number of voters in an allocation division grows to $v * (m + 1)$, a matching division can be added to the allocation division, lowering the threshold from $1/m$ to $1/(m + 1)$. With $v * m$ extra voters have been added another allocation division can be formed, bringing the threshold back to $1/m$.

There are variations on this theme, but the allocation/matching division structure allows managed accommodation of population expansion without inducing instability of governance.

Comments

Such adaptability to scale means the same system can function for local, national, international, or global governance; even interplanetary, or intergalactic governance when the time comes. If based on a human scale of voice expression, there is no limit to the ultimate size of governance, always emphasizing shared goals.

Assertion 8. Population growth without multiple allocation divisions fosters unstable governance.

As the previous assertions prove, without an equivalent to allocation/matching division structure there is no structural bound on the number of political parties that can eventually form in a country, thus encouraging unstable governance dominated by factions. Thresholds can be implemented in other ways, but these are usually arbitrary and/or biased.

5.3 Legislative Empowerment Measure (LEM)

The single greatest impediment to the flow of power from citizen to legislator is the inherent aggregation of representative democracy. A citizen with voice of nominal value 1 has that voice reduced to power $1/n$ in supporting a representative as one of n voters.

For instance, Canada's 338 representatives for 35.7 million citizens yields a representative rate of 0.95 per hundred thousand, affording each citizen a potential voice or power of 0.0000095 instead of 1.

This point only matters in comparing nations, each differing as they do in population and national assembly seats; something that would be worthy of serious consideration for amalgamation purposes, since parity between allocation divisions would then be important for voice equality.

The power of citizens in each national electoral system can be normalized to 1 for the limited purposes of determining if a given electoral system is more or less democratic than others.

Assertion 9. *The measure of voice transmission from citizen to representative is a universal and objective measure of democratic voice expression from citizen to legislature.*

The universal and objective impediments to citizens' voice expression in a legislature are disenfranchisement, non-participation, malapportionment, regionalization, and inefficiency. Each restricts the flow of voice or power from citizen to representative.

Axiomatically, the power or voice of the people is total, i.e., 100 percent, or 1 as a fraction.

Disenfranchisement is a simple count expressed as a fraction of the citizenry and subtracted from 100 percent, leaving a residual.

Non-participation is also a simple count expressed as a fraction of the citizenry and subtracted from the previous residual to yield a new residual.

Malapportionment is given by the GINI fraction of a cumulative distribution curve of allocation division electors; this fraction is subtracted from the previous residual to yield a new residual.

The GINI coefficient of local partisan cumulative distribution, minus the fraction given by the GINI coefficient for national partisan cumulative distribution, yields a fraction of local partisan maldistribution due only to district structure mismatch; this fraction is removed yielding a new residual.

What remains is either inefficient or efficient voice expression, both relative fractions of which can be calculated from simple ballot-split-by-type counts. Subtracting a fraction of the residual equal to inefficient ballots fraction leaves a remaining fraction of efficient voice expression, which is by construction an objective and universal legislative empowerment measure (LEM).

Comments

LEM is expressed either as a percentage or as a fraction between 0 and 1 and can be thought of as the democratic voice of a citizen, representative, or legislature through an electoral system. This allows comparison of systems independent of country population.

Veto power, where it exists, can also impede voice, but that is an impediment to the voice of the legislature. In comparing electoral systems, the citizen's voice in the legislature is more useful

than the voice of the legislature. However, in comparing representation systems the voice of the legislature is more useful.¹

The aggregation impediment inherent in representation should also be included in comparison of representation systems.

5.4 Accountable Local Representation Measure (ALRM)

Assertion 10. *Expressed voice per average local representative is an objective and universal accountability of local representation measure.*

By assertion 2, responsibility varies inversely to the number of district representatives, and by definition, accountability depends on essential ballots. Since voice flow is objective and universal, legislative empowerment measure (LEM) per average number of district representatives is therefore an objective universal and accountable local representation measure.

5.5 Voice Expression v. Governability

Assertion 11. *Representation is an impediment to voice expression.*

The axiomatic definition of representative democracy introduces aggregation as an impediment to voice expression because it is not possible for citizens to have independent voice in other than direct democracy.

Assertion 12. *Representation can empower voice expression.*

Without aggregation around common political principles, citizens' voices are essentially incapable of being expressed as law through informed majority rule; to wit, a cacophony of voices is powerless. The fewer the parties the more focused and informed the debate surrounding policy, the more general the policy agreed upon, the more acceptable will be the law, and thus the more powerful voice becomes.

Comments

The two previous assertions concern the tension between democratic voice expression and governability. At some point, greater voice expression can induce ungovernability, but where that point is for a nation is a function of many variables. It is important to the survival of democracy that there be an unbiased and structural way to appropriately adjust representation in the face of challenges.

The foregoing assertions establish that an allocation/matching division structure provides the necessary tools. This concept is an outgrowth of historical imperative in as much as local governance structure in a national context predates democracy by over a millennium in the

¹ If it takes v votes to override a veto, then the impediment to voice expression of the legislature imposed by the veto is $1 - v$.

evolution of British responsible government. Canadian jurisprudence confirms appropriateness.

Democracy arises and flourishes not from definitions, checks and balances, or institutions, but rather from manifesting and nourishing a mindset. The principal vehicles for this manifestation are accountable local representation and the simple democratic contract that the majority will rule, but not oppressively. Locally based voice of all is to be heard and duly considered, thus nourishing each citizen's sense of national belonging and purpose.

6 Applications

The following are example applications of democratic voice expression theory.

6.1 Ballot Split by Type

Figure 1 uses ballot split by type to compare electoral system types.

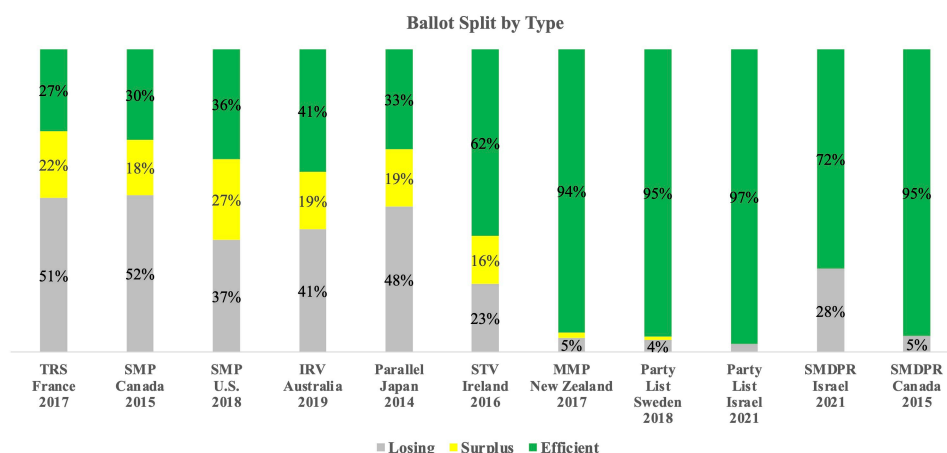


Figure 1: Vote Split by Type Compared with SMDPR

Clearly, list proportional and MMPR systems provide the greatest voice.

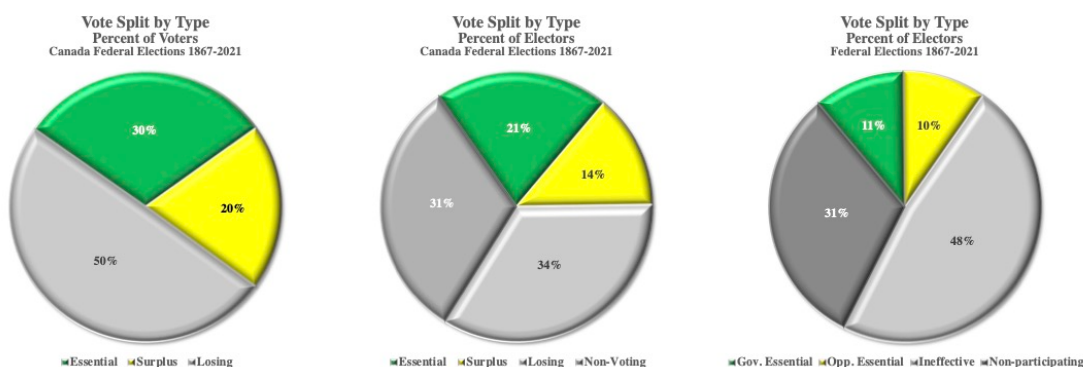


Figure 2: Ballot split by type for Canada 1867-2021

Figure 2 shows aggregate ballot split by type for 44 Canadian general elections.

Significant observations are that a) 70 percent of voters, or 79 percent of electors, have no voice in the deliberations of government, and b) the 1 percent of electors deciding who has power possesses disproportionate voice.

Figure 3 is a longitudinal presentation of the same data.²

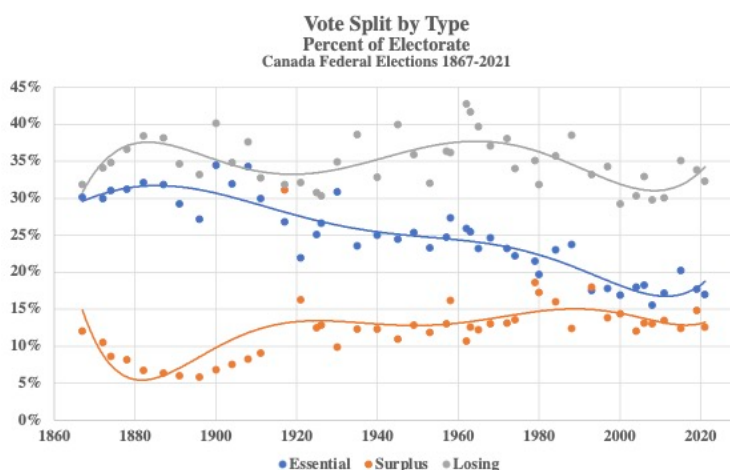


Figure 3: Ballot split by type as percent of electorate

Some interesting points here are a) the behaviour of ballot split by type during Canada's early years, when there were only two big federal parties, b) the gradual evolution following emancipation for women after 1921 and up until the 1980s, and c) the evident changes occurring from the 1980s on.

Figure 4 presents total ballot counts longitudinally by Government/Opposition.

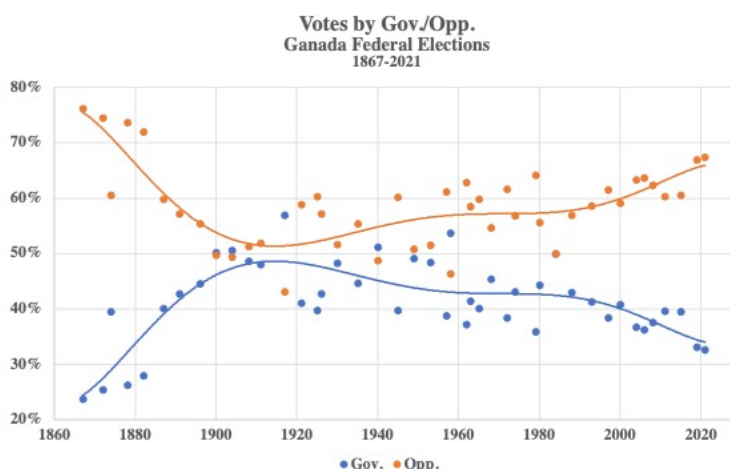


Figure 4: Ballots by Government/Opposition

² Trendlines are sixth degree polynomials, which reduces boundary effects.

Again, the two-major-party period prior to World War I is interesting. This is followed by about 60 years of gradual evolution, with more rapid change since the 1980s.

The following three figures look at individual ballot split by type categories, to get a better sense of the post 1980s changes.

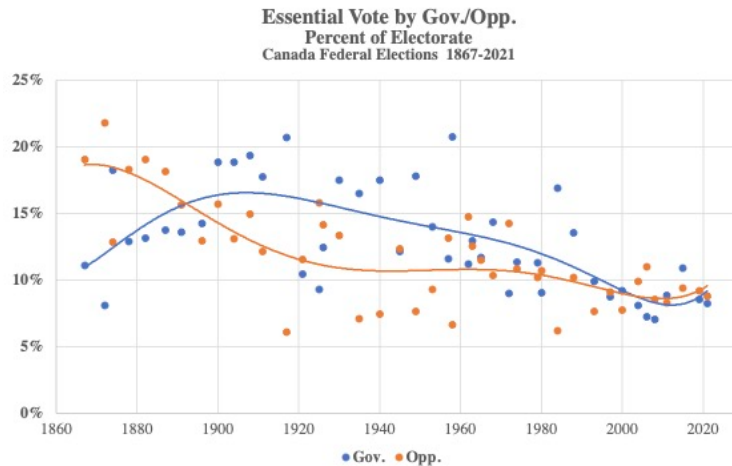


Figure 5: Essential ballots by Government/Opposition

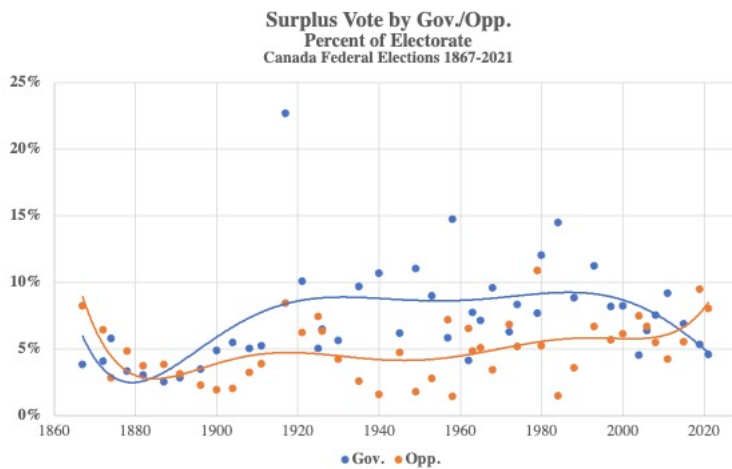


Figure 6: Surplus ballots by Government/Opposition

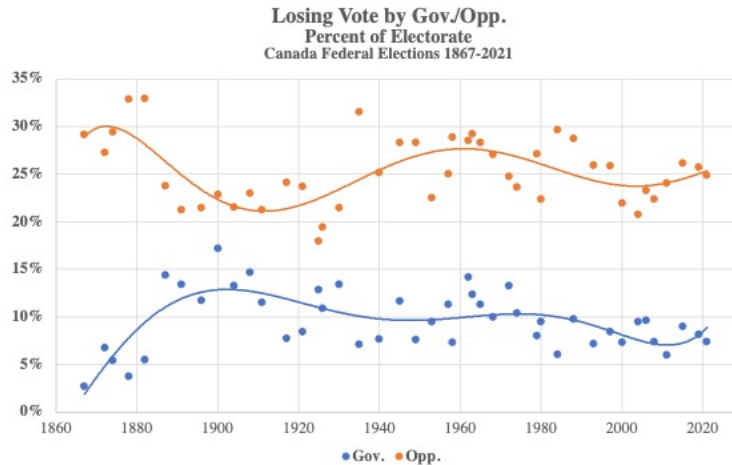


Figure 7: Losing ballots by Government/Opposition

It is important to note that the movement of Government/Opposition ballot split trendlines after 1980 is contemporaneous with the advent of accurate polling and detailed, cheap databases; both used to divisively game the plurality rule by focusing on the 1 or 2 percent of the electorate possessing disproportionate power.

The previous five figures help characterize the political history of Canada. They confirm that the last decade of the twentieth century and the first two decades of the twenty-first saw a fundamental change in the politics of the nation; one evidently engineered by gaming of the plurality rule.

The effects of gaming the plurality rule using divisive tactics to suppress opposition ballots would be expected to have had consequences on turnout, as well as on national and local political regionalization. This supposition is confirmed in Figure 8, which depicts turnout together with the coefficient for political regionalization impediment and its component GINI coefficients. Change since the 1980s is again evident.

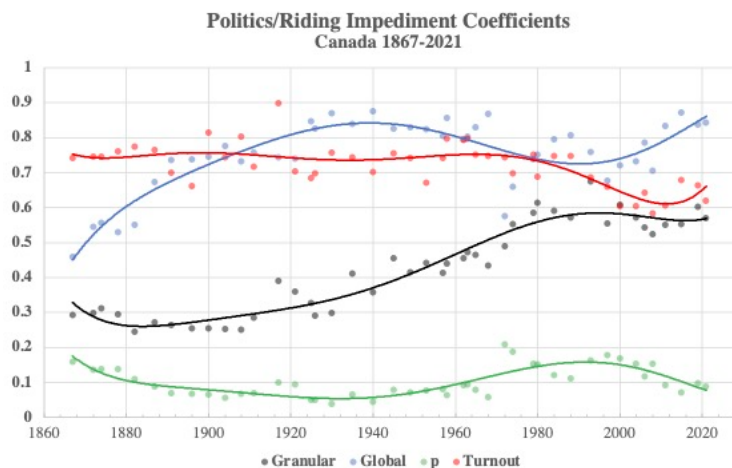


Figure 8: Turnout and GINI coefficients of riding/politics disparity

Concomitantly with aggressive plurality-rule gaming, turnout plummeted in the 1980s. Regionalization coefficients show that both global and granular partisan disparity increased during this same period, despite a reduction in the overall coefficient of partisan disparity; the reason for the latter being that global partisan disparity is growing faster than local.

Here are probable symptom of a country nearing a point of systemic political failure, one in which central government is becoming divorced from local reality. Gaming of the plurality rule in a democratically flawed SMP system is arguably the underlying mechanism.

6.2 Single Member District Proportional Representation (SMDPR)

SMDPR is structured as follows:

- In accordance with assertion 1, seats are allocated to parties proportional to aggregate ballot count in an allocation division.
- In accordance with assertion 2, candidates are matched to seats by ranking all candidates on local performance; the highest ranked get their party's allocated seats, subject to the requirement of one and only representative per division.

Comments

Choice of the number of allocation divisions and the number of matching divisions in an allocation division depends on a country's constitution, history, existing party structure and regionalisation, absolute numbers of electors, and many other factors. Change can result in either a centripetal or centrifugal system; partisanship should play no special role.

Figure 9 shows LEM for nine electoral system types in major world use, as well as two proposed implementations of SMDPR—Canada and Israel. The data for Canada is derived from SMP data, in which there is no expectation of proportionality; Israel has no local electoral structure. In practice SMDPR would be expected to have an LEM of 60 or more in both Canada and Israel.

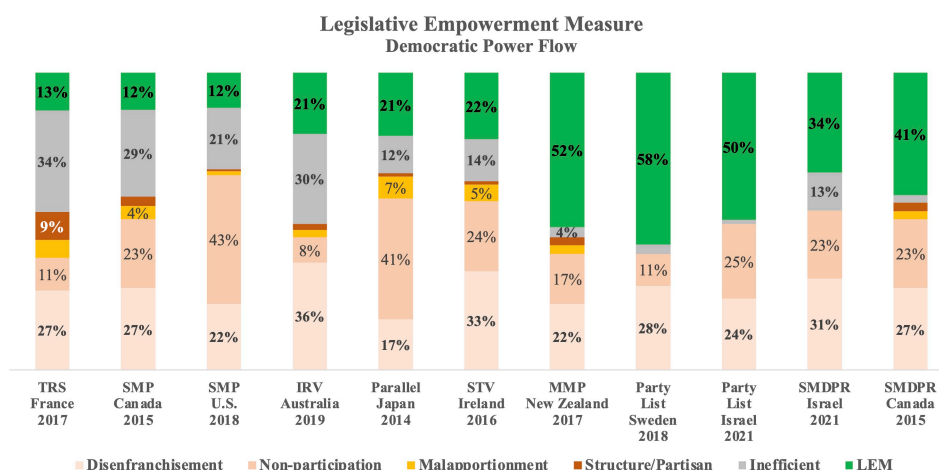


Figure 9: Legislative Empowerment Measure Compared

To sense the value of allocation/matching division structure, consider that Israel and Sweden both have party-list electoral systems in a single national allocation division; Israel has no matching divisions, Sweden has 29.

Under the current systems, 50 percent of citizens in Israel have voice (LEM=0.5) while in Sweden fifty-eight percent have voice (LEM=0.58); the difference arises largely because of greater non-participation in Israel. Israel had ALRM less than 1 percent, Sweden's was 5 percent (*vide infra*), both of which indicate poor accountable local representation, although Sweden's is factors better than Israel's.

In most recent elections, Israel, with a natural threshold of 0.29 percent, had 39 parties, 13 of which were seated from an electorate of 6.6 million. Sweden, with a natural threshold of 0.83 percent, had 10 parties, 8 of which were seated from an electorate of 7.3 million. This supports the importance of even poorly accountable local representation.

In the Canadian context under SMDPR's single member district format, 33 allocation divisions averaging about 10 matching divisions each for a parliament of 338 seats would have a natural threshold of 9.76 percent and would seat at most 3 or 4 national parties from an electorate of 18 million.

A new democracy formed from traditional rival groups regionally concentrated might require an allocation/matching division structure with a threshold of 0.2 or higher for a few elections, in order to focus the population on commonalities rather than on differences.

6.3 Legislative Empowerment Measure

In addition to comparing electoral systems, LEM can be useful in analysing longitudinal changes over time within a single nation, as show in Figure 10.

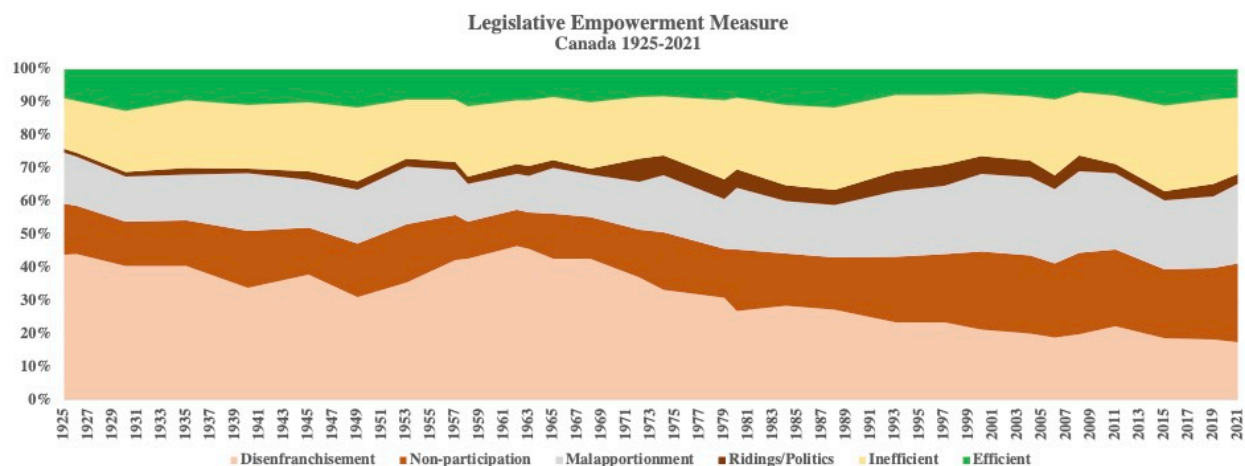


Figure 10: Longitudinal LEM in Canada

Despite upheavals — wars, anarchism, fascism, communism, rampant capitalism, a sexual revolution, feminism, unprecedented advance in science, travel, and communication, upheavals

in demographics — only a consistent 11 percent of citizens have had a voice in the deliberations of Canadian government. Imagine what might have been possible if 90 percent of citizens had engaged in the national effort.

More of the population is enfranchised today, yet non-participation has increased.

Malapportionment has been steadily growing since the 1960s, which is a sign the constitutional formula for riding boundary management may be stressed by population growth. Regionalization also grew following the 60's but was maximum from the 70s to the noughties and seems to have declined recently.

6.4 Accountable Local Representation Measure

Figure 11 presents ALRM across the same 11 electoral system used previously.

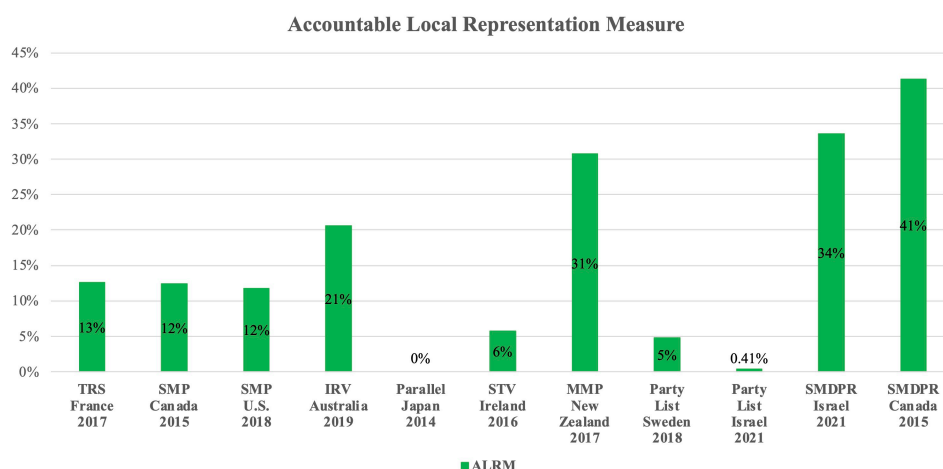


Figure 11: Accountable Local Representation Measure

Note again that SMDPR ALRM is artificially depressed because of data issues. Sweden and Israel have extremely low accountable local representation, a feature not shared by SMDPR; the difference being accountable local representation.

This is a soupçon of what might be beneficially analysed.

6.5 Descriptive Value of Allocation/Matching Division Structure

Following is a thumbnail sketch for each of the subject systems of Figure 9, demonstrating use of allocation/matching division concepts.

France, Two Round System (TRS): France has a two-round system of voting to fill a legislature of 577 seats, each seating a representative chosen by majority on the first or second round; a second round between the top two candidates in the first round is triggered in ridings

having a plurality less than a majority on the first round. The two rounds together form one allocation division; each seat is a matching division.

Canada, Single Member Plurality (SMP): Canada has a single member plurality (SMP) system with 338 seats/constituencies, each with one representative, in a federation of 13 unequal Provinces and Territories. Each constituency is an allocation division as well as a matching division.

United States House, Single Member Plurality (SMP): The United States House uses SMP to fill 435 seats/constituencies, each with one representative, in a federation of 50 unequal states. Although its House is elected by SMP rules as in Canada, there is a presidential veto in the US; this affects voice of, but not in, the legislature. Each constituency is an allocation division as well as a matching division.

Australia, Instant Run-off Vote (IRV): Australia has an instant run-off vote (IRV), also called alternative vote (AV), system with 151 seats/constituencies, each with a single representative, in a federation of 8 unequal States. Each constituency is an allocation division as well as a matching division.

Japan, Parallel: Japan has a parallel system with 295 SMP seats/constituencies, plus an additional 11 blocks with 180 seats decided by D'Hondt list proportional. Each constituency is an allocation division as well as a matching division: the list/block system forms a second allocation division, with the blocks as 11 matching divisions.

Ireland, Single Transferrable Vote (STV): Ireland has a single transferable vote (STV) system with 40 constituencies and 157 seats. Each constituency is an allocation division as well as a matching division.

New Zealand, Mixed Member Proportional Representation (MMPR): New Zealand has a mixed member proportional (MMP) system with 71 seats/constituencies and a list division deciding 49 seats using Sainte-Laguë applied to all 120 seats. The constituencies are matching divisions only, with a single national allocation division; overhangs are allowed to stand, possibly allotting, allocating, and matching seats by electoral system.

Sweden, National Party-List: List: Sweden has a national party-list system, using a modified Sainte-Laguë method, to fill 349 legislative seats in 29 constituencies. The constituencies are matching divisions only, with a single national allocation division, overhang being handle by losing pluralities.

Israel, National Party-List: Israel has a party-list system, using a variant of D'Hondt called the Hagenbach-Bischoff system, to fill 120 legislative seats with no local structure. There is one national allocation divisions, which also serves as the single national matching division.

Canada, SMDPR: SMDPR is a local party-list system based on multiple allocation and matching divisions. In Canada, it would fill 338 seats in 33 allocation divisions of 10 to 15

matching division each — exceptions being one matching division in each of three Territories and four matching divisions in Prince Edward Island.

Israel, SMDPR: In Israel, SMDPR is proposed fill 120 seats in 12 allocation divisions of 10 matching division each.

7 Addenda

Use of ballot split by type, LEM, and ALRM is more fully covered in [38]; a more complete picture of SMDPR is presented in [39]; all of the foregoing and an exploration of voice expression theory in conjunction with Demeny voting and constituent assemblies can be found in [40].

Control of allocation/matching division structure should be handled by a permanent electoral reform commission empowered to set, monitor, and alter the electoral system in accord with constitutional constraints, jurisprudence, public input, and data. The concept of a permanent electoral reform commission is covered in all of the above but most completely in [40].

Supporting data for all of the previous works can be found at [41].

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