

Party-list Proportional Representation and the Single Transferable Vote are Not Functionally Equivalent¹

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Abstract

Do party-list proportional representation (PR) and the single transferable vote (STV) produce different results? These reforms are hotly debated in American politics, but most answers to the question come from non-U.S. cases. This paper replicates and extends the best existing analysis of U.S. data. Gosnell (1939) simulated list PR elections from observed STV first choices in Cincinnati (1925-37) and New York City (1937), finding that majority control of government did not change across the systems. Later work took this to mean that both kinds of PR were equivalent with respect to preference aggregation. Reappraisal and extension of the study do not support that view. All else equal, voters' lower rankings changed majority control in five of 21 elections, one of which was in the original sample. These results offer fresh perspective on ballot exhaustion and ticket-splitting, research into which otherwise often frustrates reform advocates. The paper explains simply how list PR and STV differ. It concludes with notes on research directions and extending the data to more cases.

Keywords: preference aggregation, party-system fragmentation, proportional ranked-choice voting

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Introduction

The single transferable vote (STV) differs from all other forms of proportional representation (PR) in using voters' rankings to allocate seats rather than a party list (Shugart 2013; Farrell and Katz 2014).ⁱ Scholars sometimes argue on the basis of comparative evidence that this distinction is practically unimportant (Lijphart 1999; Amy 2000; but see Bowler and Grofman 2000). At stake in the debate is whether any form of PR can “work” in the United States (Rush and Engstrom 2001; Diamond et al. 2024). Fragmentation theorists long have argued that either type of PR would make it harder for political parties to form identifiable majority and opposition blocs in government (Hermens 1984; Pildes 2024). This belief goes back to a handful of STV-elected city councils that struggled to elect presiding officers and then legislate (Hermens 1941; 1943; cf. Banfield and Wilson 1963, 96-98; Riker 1982, 757). Simulation evidence at the time suggested list PR would have produced nearly all the same winners and, more importantly, no changes in control of government. In other words, it implied that the ranked ballot was not a factor (Gosnell 1939).

This research note does two things. First, it shows with a simple example how seat allocation differs in list PR and STV. Then it replicates (insofar as possible) and extends Gosnell's (1939) simulation study of STV elections in Cincinnati (1925-37) and New York City (1937) through each city's full use of it (1955 and 1945, respectively). He likely studied these cases because they were nationally salient, much as Alaska's “top-four” system has been in recent years (Reilly et al. 2023). Given the data, the best possible test for effects of rankings would allocate seats from first-choice votes alone (as he did), then hold all other features of the electoral system constant (which he did not). Further, it is not clear how he obtained candidates' party endorsements, aggregated votes for very small parties, aggregated votes for candidates with

multiple parties' endorsements, or handled independents. All these details matter in a list PR allocation.

Conditional on an assumption that first choices do not vary with ballot type (cf. Bartholdi and Orlin 1990), voters' lower rankings changed majority control of government in five of 21 elections. One of these is a New York City election in the original sample, and another in Cincinnati is just outside it. These results show that the equivalence finding rested on insufficient attention to how STV works, both among consumers of the study (including this author; see Santucci [2022, 184]) and the researcher who assembled the data. Because the current normative debate in the U.S. mostly takes equivalence as given, it follows that said debate might benefit from greater attention to STV-specific causes of party-system fragmentation. The paper ends with thoughts on research directions and including data from more cities. What follows is not an argument for or against multiparty politics (cf. Drutman 2020).

Simple illustration of how STV and list PR work

STV has three defining features: a quota of votes needed for a candidate to win a seat, a ballot asking voters to rank candidates in order of preference, and a seat-allocation process that transfers votes among candidates according to voters' rankings. Seat allocation usually begins by computing a Droop quota: $\lceil (\text{valid first-choice votes}) / (\text{district magnitude} + 1) \rceil + 1$. It is possible (but rare) to use a fixed quota, as in New York City below. Any candidate with a quota of first choices is elected. If no candidate has a quota, the trailing candidate is eliminated, and all votes in their column transfer to the next-ranked candidates on the respective ballots. If a candidate has more than a quota, their excess (surplus) transfers to next-ranked candidates in either of two ways. One is to choose ballots randomly and transfer their votes at full value. Another is to

transfer a fraction of every vote in the winner's column. Subsequent counting rounds repeat the process until all seats in the district are filled.

Candidate	Party	Round 1	Round 2 : Henri eliminated	Round 3 : Gerald eliminated	Round 4: Emma eliminated	Round 5: Brad elected	Round 6: Carter eliminated
Andrea	Democratic	750	950	950	1025	1025	1325
David	Democratic	700	865	865	865	865	1265
Brad	Republican	720	720	1020	1320	1251	1251
Francine	Republican	680	680	740	1040	1100	1100
Carter	Democratic	710	710	710	725	725	0
Emma	Republican	690	690	690	0	0	0
Gerald	Conservative	380	380	0	0	0	0
Henri	Working Families	370	0	0	0	0	0
Exhausted		0	5	25	25	34	59
Invalid		15	15	15	15	15	15
Total		5015	5015	5015	5015	5015	5015

Table 1: Example STV count to fill three seats with a Droop quota and random-transfer rule. The quota is 1,251 votes. Bold cell entries show values different from those of the previous round.

Table 1 gives an example STV count for a three-seat district with eight candidates and 5,015 voters.ⁱⁱ The candidates have four parties' endorsements: Democratic (D), Republican (R), Conservative (C), and Working Families (W). Each column presents the candidates' votes in each counting round.

The first step is to calculate a Droop quota from the first round's total valid votes:
 $\text{FLOOR}(5,000/3+1)+1=1,251$. There are 5,000 such votes, not 5,015, because 15 voters have invalidated their ballots (see Pettigrew and Radley [2026] for ways to do so).

The next step is to see if any candidate has 1,251 first choices. Since none does, Henri (W) is eliminated, and his votes transfer to voters' second choices. The column marked "round two" gives each remaining candidate's new total. Of Henri's 370 votes, 200 go to Andrea (D), 165 go to David (D), and 5 go to "exhausted" because they contained no second choices.

No candidate has a quota in round two, so round three sees Gerald (C) eliminated. Of his 380 votes, 300 go to Brad (R), and 80 go to Francine (R). Again, no candidate has a quota, so we eliminate Emma (R) in round four. Of her 690 votes, 100 go to Andrea (D), 300 go to Brad (R), 300 go to Francine (R), and 15 go to Carter (D).

Brad now has 1,320 votes in round four, and his surplus is 69. We need to decide whether to transfer 69 of his ballots at random or all of them at $69/1,320$ th of their value. This example uses a random rule to keep the numbers simple. Of 69 randomly chosen ballots, 60 go to Francine (R), and 9 exhaust. No candidate has a quota in round five, so round six begins with Carter (D) eliminated. Of her 725 votes, 300 go to Andrea (D), and 300 go to David (D). They win the remaining two seats because there is no need for further rounds. Andrea (D), Brad (R), and David (D) are elected.ⁱⁱⁱ

We can use the same example to illustrate a list PR allocation. The first step is to sum first-choice votes by party. The next step is to decide how many seats each party gets. The last step is to give those seats to candidates in declining order of their vote totals. Choice arises at the middle step. A **quota-based** rule first divides the party totals by the quota. Any seats not allocated in this way then go to parties in declining order of their remainders. A **divisor-based**

rule awards seats to parties sequentially, taking account of how many seats they already have at each stage (starting with zero). Both elect Andrea (D), Brad (R), and Carter (D).

The party-level results do not change across the approaches, but they might have. Quota rules reward *larger remainders* whereas divisor rules aim to allocate all seats on an *even votes-per-seat basis* (D'Hondt 1882, 11-17; Martin and Carey 2023, 2-3). Turning to STV's unique features, several candidates' transfers crossed party lines. While this might be normal (Laver 2000), part of Emma's (R) transfer crossed the *main left-right divide* as suggested by the parties' names. Finally, exhausted ballots were few, barely exceeding one percent (cf. Endersby and Towle 2014).

Origins of the functional-equivalence argument

Conflation of the single transferable vote with proportional representation dates to reform debates in mid-19th-century Britain. At the time, STV had seen independent invention by several intellectuals and some use for upper-chamber elections in Denmark (see Reilly [2001] and Endersby and Towle [2025] for authoritative histories). For our purposes, the key event is J.S. Mill's effort to rebrand STV as "personal representation" so that the "PR" acronym could be taken to refer to it (Conti 2019; Urdánóz 2019; compare Laursen and Bowler 2025). On the continent, D'Hondt (1872) had been begun to advocate party-list PR to prevent disciplined groups of voters from "sweeping" multi-seat elections in contexts involving paper ballots. (See Colomer [2001] for the history of list PR's development.) He also speculated that the emerging British attachment to STV may have resulted from the use of voice voting. Either way, it became popular with reformers opposed to the government's agenda-setting function in parliament

(Lakeman and Lambert 1955; Riker 1982), then entered the United States via the Australian reformer Catherine Helen Spence (Cooley 1893).

Two developments in the U.S. cemented STV's status as "PR" in that country. One was a decision to promote it alongside council-manager government (Hoag 1914). Officially, the American PR League's position was in favor of any reform based on "a single vote in a multiple-membered district" (i.e., STV or the single non-transferable vote; see XXX). Its public-facing work, however, referred to such systems as proportional representation.

The second development was a series of publications by the German-turned-American political scientist Ferdinand A. Hermens. These works' common thread was to take reformers' arguments and taxonomies at face value, then explore their implications for "integration" and governance. By "integration" he meant what a modern social scientist would call preference aggregation (read: the act of collective choice in a diverse society). After a seminal 1936 paper on the breakdown of Weimar democracy, the work increasingly concerned elites' perceptions of how STV (qua PR) was shaping legislative behavior in U.S. cities. Hermens' arguments and evidence then got a second life as Americans began to debate how to provide racial-minority representation under the 1965 Voting Rights Act as amended in 1982 (see, e.g., Grofman 1985). Gosnell's 1939 paper may have aimed in part to use data to soften the debate between Hermens and reformers (compare Gosnell 1941). However, the latter took it as evidence that list PR and STV were equivalent in outcome with respect to majority formation.

The belief that list PR and STV are functionally equivalent probably also depends on impressions of the latter's performance in Australia, Ireland, Malta, and potentially other contexts (e.g., Welsh, Scottish, and New Zealand local elections). The literature on these cases is rich and growing (see, e.g., XXX). For present purposes, the general conclusion is that getting

STV to produce party-list-like outcomes requires supplemental rules and practices. Rules might include giving voters the option to ratify a party's predetermined ranking of candidates, as with Australian "above-the-line" voting. Practices are known technically as "vote management" and involve calculations about how many candidates to nominate, what kinds, where in a district they should campaign, etc. Much of this activity is intended to maximize a party's return from first-choice votes. When it works, STV indeed can produce seat distributions that look like they came from list PR with the same basic parameters (assembly size, district magnitude; see Shugart and Taagepera 2017).

Do voters' rankings change who wins?

Gosnell (1939) offers the hypothesis that "the counting of a candidate vote as a list vote as well approximates the transfer of votes under the Hare plan [STV]" (p. 646). He then makes two decisions that bias the test against finding differences. One is to allocate seats on a divisor basis. When compared to STV with party-line voting (which he correctly views as a baseline), divisor allocation hides effects of rankings (which otherwise would accumulate in remainders). Second, he appears to aggregate votes for very small parties *and* independents into a single "Other" category (but this is not consistent across cases, p. 648), then assumes implicitly that transfers will stay among them. Further, it is not clear how he handled candidates with multiple party endorsements. Finally, the paper does not report data sources (p. 648).

I obtained the official transfer tables for Cincinnati (1925-55) and New York City (1937-45). New York party endorsements come from *The New York Times* because none are in the tables, and losing candidates are not listed in the official source that does show party endorsements.^{iv} The quota is Droop in Cincinnati and 75,000 in New York. I allocate seats to

parties entirely on a quota/remainder basis. All parties and independents are treated as their own lists. Fusion candidates' votes are treated as votes for their primary endorsing parties (Prosterman 2013, 6).

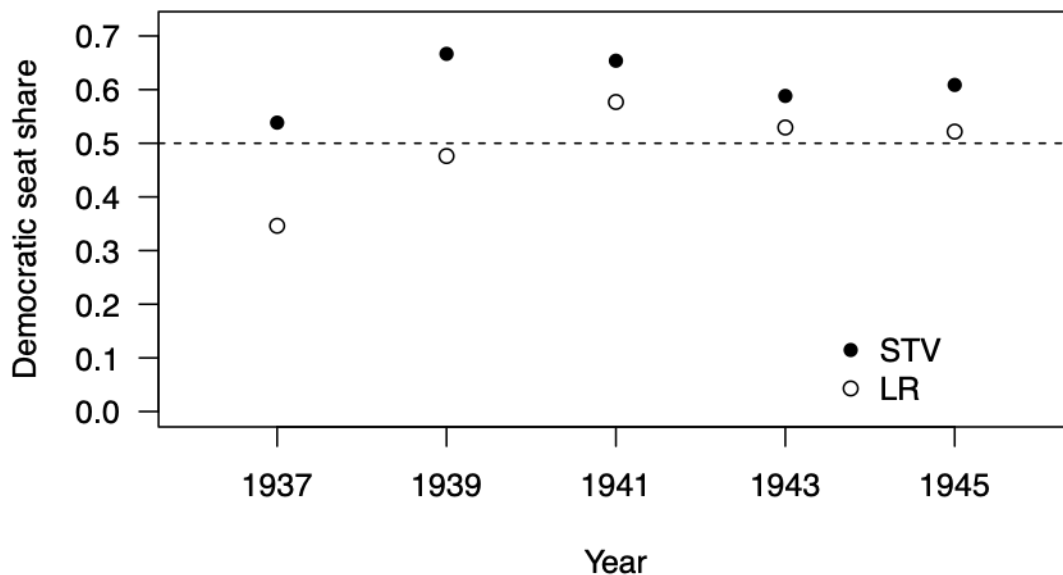


Figure 1: Democratic seat share in New York City under STV (observed) and list PR with quota allocation (largest-remainder, LR). Figure generated by Claude Sonnet 4.6 (June 2026) from author's analysis.

Figure 1 shows the Democratic Party seat share in New York under both scenarios. I show share, not count, because council size was variable (due to the fixed quota). Table 2 gives seat counts by party and contains enough information to be frustrating. The figure also presents theoretically relevant information because Shaw (1954, 223-4) reports that non-Democratic members maintained a caucus called “the coalition” until 1943. Filled points represent the observed STV results, and empty circles represent largest-remainder (quota) results. A dashed line at 0.5 indicates majority control. Gosnell’s (1939) result for 1937 is the same as the observed STV result with respect to the seat distribution as well as individual winners (p. 647). All else equal, lower rankings (or their absence) deprived “the coalition” of a seat majority in 1937 and 1939. The 1937 result produced an evenly divided council. It took several months to organize

due to the protracted absence of one Democratic member and ultimately became evidence of PR's tendency to produce “anarchy” (Hermens 1941).

Seat totals broken out by party are in Table 2 (seat-winning parties only). Entries are bold if a party’s total differs from observed STV to the list PR simulation. Whereas the aggregated results in Figure 1 suggest transfers/exhaustion working to the Democrats’ advantage, this table suggests which parties they *disadvantaged*: Fusion (Mayor Fiorello La Guardia’s organization), Communist, Citizens’ Non-Partisan, Republican, and Socialist.^v Gosnell’s assumption that transfers from minor parties should stay among those parties therefore is (and was at the time) worth scrutiny.

	D		R		A		F		C		CNP		I		L		S	
Year	STV	LR	STV	LR	STV	LR	STV	LR	STV	LR	STV	LR	STV	LR	STV	LR	STV	LR
1937	14	9	3	3	5	5	3	4	0	1	0	2	1	1	-	-	0	1
1939	14	10	2	3	2	3	2	2	0	1	-	-	1	2	-	-	-	-
1941	17	15	2	4	3	2	2	3	1	1	-	-	1	1	-	-	-	-
1943	10	9	3	3	1	2	-	-	2	2	-	-	1	1	-	-	-	-
1945	14	12	3	4	2	2	-	-	2	2	-	-	0	1	2	2	-	-

Table 2: Observed STV and simulated quota (AKA largest-remainder, LR) results by party for New York City. Fusion candidates contribute votes to their primary (first-listed) parties. Party abbreviations: D = Democratic, R = Republican, A = American Labor, F = Fusion, C = Communist, CNP = Citizens' Non-Partisan, I = Independent, L = Liberal, S = Socialist. Independents are treated as separate lists in the simulation but aggregated under 'I' for display. Bold entries show when STV and LR produce different seat totals for that party. Results are robust to an alternative simulation in which cross-endorsed candidates' votes are allocated to their full endorsement combination rather than to their primary party; differences available in supplementary output. Table generated by Claude Sonnet 4.6 (June 2026) from author's prior analysis.

The Cincinnati results show a similar pattern, with list PR producing different majority outcomes in three of sixteen elections. Table 3 shows party seat shares in the nine-seat council. Gosnell reports the same seat distributions under list PR and STV in all years except 1937. For that year only, he runs two simulations. One assumes “no cohesion among the independents” (seemingly including minor-party candidates) and produces a 5-4 Republican majority. The

second treats two minor parties as a joint list, does not say how it handles independents, and produces the same “4-4-1” council as STV. However, he says this joint list is implausible based on examination of the transfers (pp. 648-9). Consistent application of a quota-and-remainder rule to all parties and independents as listed in the data reproduces the “4-4-1” council. In 1939, it produces a 5-4 Republican majority instead of STV’s “4-4-1” split. The “4-4-1” councils of the 1930s became a major point against “PR” writ large (Hermens 1943), and this simulation suggests the third was an artifact of rankings. Further, list PR reverses majority control in 1947 and 1955 (the last STV election).

	C		R		P		I	
Year	STV	LR	STV	LR	STV	LR	STV	LR
1925	6	6	3	3	-	-	-	-
1927	6	6	2	3	-	-	1	0
1929	6	6	3	3	-	-	-	-
1931	5	5	4	4	-	-	-	-
1933	5	5	4	4	-	-	-	-
1935	4	4	4	4	1	1	-	-
1937	4	4	4	4	1	1	-	-
1939	4	3	4	5	-	-	1	1
1941	4	3	5	6	-	-	-	-
1943	4	4	5	5	-	-	-	-
1945	4	4	5	5	-	-	-	-
1947	5	4	4	5	-	-	-	-
1949	5	5	4	4	-	-	-	-
1951	4	4	5	5	-	-	-	-
1953	5	5	4	4	-	-	-	-
1955	5	4	4	5	-	-	-	-

Table 3: Observed STV and simulated quota (largest remainder, LR) results by party for Cincinnati. Party abbreviations: C = Charter Committee, R = Republican, P = Progressive Democratic, I = Independent. Independents are treated as separate lists in the simulation but aggregated under 'I' for display. Bold entries indicate years in which STV and LR produce different seat totals for that party. Table generated by Claude Sonnet 4.6 (June 2026) from author’s analysis.

In short and across the cases, lower rankings change majority control in five of 21 elections: 1937 and 1939 in New York City; then 1939, 1947, and 1955 in Cincinnati. This

contrasts with Gosnell's conclusion (p. 650): "in seven-eighths of the cases, the first choices are likely to indicate all that can be obtained from an elaborate transfer of ballots."^{vi}

Implications for the study of electoral reform and fragmentation

Gosnell's paper aimed to speak to STV supporters facing complaints about voter confusion and long counts. In that context, he aimed to show that list PR *could be designed* to produce the same results that STV had, not test a hypothesis about the effect of rankings. Earlier study of transfers may have led him to believe that most voters rank candidates on a party-line basis (Gosnell 1930). However, reappraisal and extension of the work suggest such assumptions are unwise. The overall lesson of this exercise is that list PR and STV are not functionally equivalent with respect to party slates. By extension, they are not equivalent with respect to preference aggregation by political parties.

These results offer fresh perspective on the causes of ballot exhaustion and ticket-splitting. Not all academic STV supporters agree that political parties should be aggregating preferences (Dummett 1984; Tideman 1995; Barber 1995). The question then becomes what entities should do it instead. The Democratic performance in New York City points to a potential incumbent advantage in lower rankings (cf. Atsusaka et al. n.d.). Candidate race also is worth study (Crowder-Meyer et al. 2024), especially in Cincinnati (Burnham 1997). Finally, experiments suggest that voters might penalize woman candidates (Dhima et al. 2021), but this may depend on how party competition turns gender into a campaign issue (Terrell et al. 2021). Researchers interested in these topics will find the replication packet useful.

An obvious next step is to extend the analysis to other U.S. cases. If the research concerns political parties, data collection should begin with cities using STV after 1932, when it

became the National Municipal League policy to promote party formation alongside STV, and that were large enough to support other than what Trounstein (2008, 25) calls “friends-and-neighbors” politics. Based on the 1940 Census ranking of city populations, fruitful sites might include Cambridge (MA), Yonkers (NY), Worcester (MA), Toledo (OH), and Cleveland (OH). Election results like Table 1 may be in local libraries, municipal archives, and/or personal collections. Local newspapers might help if the tables do not include candidates’ party endorsements. However, no such records are available for at least one of these cities. Modern cases like Cambridge (MA) and Portland (OR) are helpful for studying interest groups but not parties (Boatright et al. 2025). Working with such data may lead to surprising findings about the nature and effects of proportional representation.

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ⁱ Mixed-member PR also relies on party lists (Keena et al. 2026).

ⁱⁱ First-choice vote totals were generated to distribute 5,000 votes roughly evenly among four of six candidates; remaining values were assigned with readability in mind.

ⁱⁱⁱ Further variations might recalculate the quota at each round to account for exhausted ballots (those that cannot transfer), eliminate all candidates in batch whose first-choice totals are below some arbitrary threshold, let transfers pass through winning candidates, and/or let them pass through eliminated candidates. Tie-breaking rules also are important, as in any system.

^{iv} Digital copies of all originals are among the replication materials.

^v The number of parties in this coalition (also including the Republicans) suggests it was fragile. However, it did unite to try to organize the chamber.

^{vi} The candidate-level results for Gosnell's period overlap in 85.4 percent of cases, slightly lower than his 87.5 percent. See the replication materials for this computation.