Participatory Budgeting and Committee Elections with Trichotomous ballots

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The problem

Strong Hypothesis in PB: All projects are good

Figure: Protest against airport project in France

Need for trichotomous ballots (positive, neutral or negative)

How to define proportionality ?

Positive: proportionality: 10% pop $\implies$ 10% budget
Negative: how do we pay for eliminating ?
Positive and Negative JR incompatible.
Priceability not adapted.

	p_1	p_2
1	1	0
2	-1	0

Applying existing axioms

Masařík et al. [2023]: worst case scenario.

	p_1	p_2	p_3
1	0	1	-1
2	1	0	0
3	0	1	-1
4	1	0	0

Both $\{1, 3\}$ and $\{2, 4\}$ should deserve a candidate, but $\{p_1, \overline{p_2}, \overline{p_3}\}$ is proportional according to Masařík et al.'s [2023] axioms.

Beyond worst case scenario

Compensation for opponents.
Depends on utility of opponents

	p_1	p_2	p_3	$\dots$
1	1	1	1	
2	1	1	1	
3	1	1	1	
4	-1	-1	-1	

$\{1, 2, 3\}$ deserves only 50% of the budget here instead of 75%.
They would deserves 100% of budget with Masařík et al. [2023]
Based on EJR+ from Brill and Peters [2023]

References

M. Brill and J. Peters. Robust and verifiable proportionality axioms for multiwinner voting. *arXiv preprint arXiv:2302.01989*, 2023.

T. Masařík, G. Pierczyński, and P. Skowron. A generalised theory of proportionality in collective decision making. *arXiv preprint arXiv:2307.06077*, page 18, 2023.