Designing a Fair Voting Mechanism: Quadratic Voting Approach

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The Problem

The EU's Migration Pact reveals a deep conflict among member states on how to share responsibility for asylum seekers.

- Frontline States (e.g., Italy, Greece): Prefer Capacity-Based Allocation (B)
- Interior States (e.g., Germany, France): Prefer Hybrid Solidarity (C)
- EU Institutions: Also prefer C, but for different reasons (fairness, legitimacy)

Core Research Question:

How can we design a voting mechanism that fairly aggregates these intense but divergent preferences, avoiding the pitfalls of traditional majority rule?

Theoretical Insights

The design is grounded in Nobel Prize-winning ideas that explain the limitations of current systems.

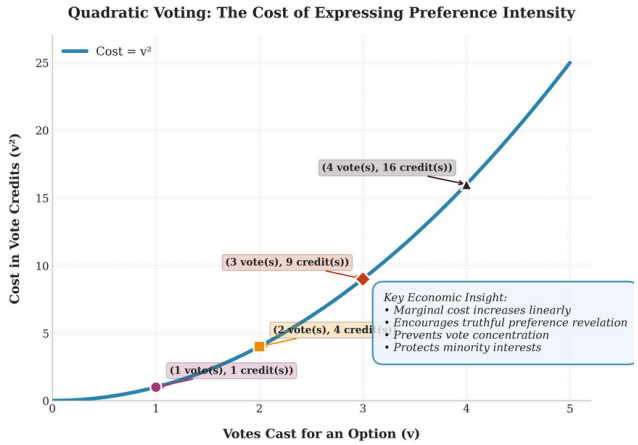
- **Arrow's Impossibility Theorem**
  - Problem: No voting system based on rankings alone can be perfectly fair when there are 3+ options.
  - Solution: We move beyond simple rankings to capture preference intensity.
- **Buchanan's Constitutional Economics**
  - Problem: Self-interested actors will exploit poorly designed rules.
  - Solution: We build institutional constraints directly into the mechanism to ensure compliance and fairness.

The Solution: Quadratic Voting

I propose a novel voting system that allows voters to express how strongly they feel about each option.

How It Works:

1. Each state gets an equal budget of vote credits.
2. To cast v votes for an option costs v^2 credits.
3. The option with the most total votes wins.



Why QV? Key Advantages

- **Reveals True Preference Intensity:** States can show what they really care about.
- Protects Minority Interests: A passionate minority can outweigh a lukewarm majority on critical issues.
- Reduces Strategic Manipulation: The high cost of extra votes encourages truthful voting.

Testing & Validation Plan

I will validate the mechanism through an interactive classroom simulation.

- **Roles:** Students act as Frontline, Interior, and Institution states.
- **Process:** Multiple voting rounds using both QV and traditional methods.
- **Metrics:**
  - Fairness: Distribution of satisfaction across groups
  - Stability: Frequency of preference reversals between rounds
  - Minority Influence: Probability that minority-preferred options win
- **Example Outcome:** A hypothetical comparison suggests that Quadratic Voting may lead to higher fairness scores (e.g., 70% vs. 55% under majority rule) and stronger minority inclusion.

Impact (SDGs)

Contribution to Sustainable Development Goals:

- Contributes to SDG 10: Reduced Inequality
  - Promotes a more equitable distribution of asylum responsibilities within the EU.
- Contributes to SDG 16: Peace, Justice & Strong Institutions
  - Enhances the legitimacy and resilience of supranational governance.

Limitations & Trade-offs:

While QV ensures equal vote budgets, differences in countries' capacities or resources may still affect participation.
Balancing equality and proportionality remains a key institutional design challenge.

Expected Outcomes

- QV yields fairer and more stable results than majority voting.
- Minority preferences gain greater representation.
- Participants report higher perceived fairness and legitimacy of collective decisions.

Broad Applicability

This framework can be adapted for other complex collective choice problems such as climate finance, blockchain governance, and public goods funding.

Key References

- Arrow, K. J. (1972). Social Choice and Individual Values.
- Buchanan, J. M. (1986). The Constitution of Economic Policy.
- Lalley, S. P., & Weyl, E. G. (2018). Quadratic Voting.
- European Commission (2024). A Pact on Migration and Asylum.

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