Experimental Economics II: Ethical Voting

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Voter Turnout

- The probability that a single vote is pivotal is negligible in large election, so small voting costs should dissuade turnout.
- Yet, significant turnout is often observed in reality; does this mean voters are not strategic when they decide to vote?
- There are evidences suggesting that voters take the costs and benefits of participation into account.
  - Voters seem to condition their choice on the viability of candidates.
  - Turnout is correlated with education and income levels (information levels influence turnout).
  - Turnout is inversely related to voting costs.
  - Closeness of elections influences turnout.
- However, there is no canonical rational choice models with costs to vote that properly explain a large turnout.

Harsanyi's Rule Utilitarianism

- Voters are sometimes considered to be motivated by a sense of civic duty; this is how decision-theory models explain turnout.
  - Riker & Ordeshook (APSR, 1968) analyzed a model of participation in which agents receive a "duty" payoff when they vote for their preferred candidate.
- Harsanyi (1977, 1980, 1992) considers a general game-theoretic model in which people receive a payoff from acting ethically.
- He assumes that a fraction of the population are "rule utilitarians."
  - A rule utilitarian is an agent who receives a payoff for acting according to a strategy that maximizes social welfare (the sum of utilities), if everyone acts according to it.
- Harsanyi takes an example of costly voting with two candidates one of whom is assumed to maximize social welfare if elected.
- Assuming a fixed fraction of the population voting for the inferior candidate, he tries to explain the participation behavior of rule utilitarians.

Ethical Voter Model

- Feddersen & Sandroni (AER, 2006) is another game-theoretic extension of the idea that voters are motivated to vote out of a sense of ethical obligation.
- Like Harsanyi, they assume that some agents care about how they should behave and that agents have preferences over the candidates and the cost of the election.
- Unlike Harsanyi, voters' preferences are not necessarily related to social welfare and are not identical across all voters.
- In their model, each agent has an action he *should* take and receives utility from taking this action.
- Given a preference type, a *rule* defines a cut-off point s.t. agents with voting costs above the threshold should vote for their favored candidate and agents with voting costs above the threshold should abstain.
- The main question in their model is which rules will ethical agents determine they must follow.

Basic Model

- An election with two candidates, 1 and 2.
- A continuum of voters who must either vote for 1, or 2, or abstain; $A \equiv \{1, 2, \emptyset\}$.
- Each agent has a cost of voting $\bar{c} > 0$ multiplied by an independent uniformly distributed random variable over the interval $(0, 1)$.
  - Each agent's cost of voting is independent of any other random variable in this model.
  - Each agent knows her own realized voting cost, but not that of the others'.
- Agents have preferences about which candidate wins and the social cost of the election.
  - These preferences reflect not only agents' self-interest but also their religious, ethical, or philosophical perspectives.
  - The preferences might be associated with a notion of social welfare (utilitarianism), a concern for distributive justice, or support for human rights.

Basic Model

- Two types of agents; type 1 agents prefer C1 and type 2 agents prefer C2.
- Preferences must reflect choices, but no single agent decides who will be elected.
  - Hence, preferences over social outcomes reflect the choices the agent would make *if* he were a social planner and could make such decisions.
- We assume that all agents prefer the social cost of voting to be minimized.
  - So, if the agent were the social planner, then, holding constant the prob. that C1 wins the election, he prefers low turnout to minimize the social costs of voting.
- Formally, type 1 and 2 agents have a utility function given by

$$wp - \phi \qquad \text{and} \qquad w(1-p) - \phi,$$

respectively, where p is the prob. that C1 wins the election, ϕ is the expected social cost of voting, and $w \in \mathbb{R}_+$ is a parameter of the model, called the *importance of the election*.

Basic Model

- The fraction of type 1 agents in the electorate is $k \in (0, 1/2]$.
- So, type 1 agents are a minority and type 2 agents are a majority.
- The parameter k indicates the *level of disagreement* within the electorate.
  - When k is small, almost everyone agrees that C2 is preferred to C1, but when k is close to $1/2$ the society is nearly evenly divided on the question of which candidate is preferable.
- The model as defined so far is a standard voter participation game.
- In voting games with a continuum of agents and costly voting, there are generically no equilibria in which a positive fraction of the population participates.

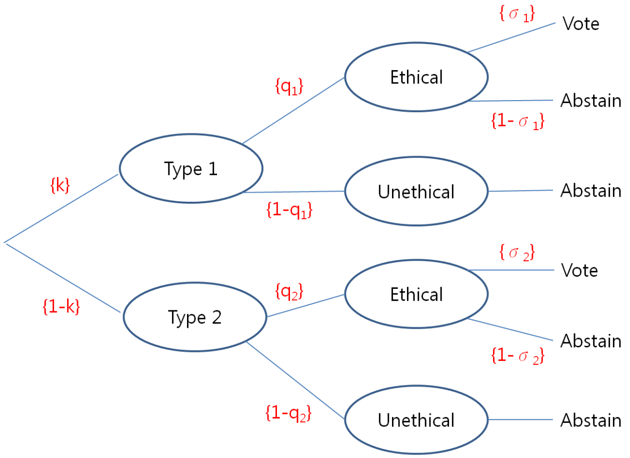
Rule for Ethical Agents

- We now alter this standard game and assume that each agent has a rule that he understands he should follow.
- If this agent acts according to this rule, then we say that the agent is "doing his part."
- We assume that some agents derive utility from doing their part.
- Let a *rule* profile be cutoff points $\sigma_i \in [0, 1]$, $i \in \{1, 2\}$, which specify that type i agents with costs below $\sigma_i \bar{c}$ should vote for i and type i agents with costs above $\sigma_i \bar{c}$ should abstain.
- Some agents (called *ethical* agents) receive a payoff $D > \bar{c}$ for doing their part, and therefore, always do so.
- Other agents (called *abstainers*) receive zero payoff for doing their part, and always prefer to abstain.
- The fraction of ethical agents in each type group, $\tilde{q}_1$ and $\tilde{q}_2$, are independent and uniformly distributed over $[0, 1]$.

Cutoff Rule

- In Riker and Ordeshook (1968), the set of agents who understand they should vote is exogenously determined.
- However, we assume that the agents determine their best rule endogenously.
- Taking the behavior of abstainers and ethical agents of type $j \neq i \in \{1, 2\}$ as given, each ethical agent type i independently considers what would occur if they (i.e., *ethicals* of type i) all follow rule σ_i.
- The rule σ_i^* that produces the best social outcome (for type i) is the one that each type i agent reasons is the rule he should follow.
- Agents face a trade-off when determining which rule to follow.
- A higher cutoff σ_i implies a higher chance that his favored candidate is elected, but also a higher social cost.

Expected Fraction of Turnout



Cutoff Rule

- Assume that ethical agents follow the rule profile (σ_1, σ_2).
- The expected social cost of voting is

$$\begin{aligned} \phi(\sigma_1, \sigma_2) &\equiv \bar{c}\Big(kE(\tilde{q}_1)\int_0^{\sigma_1} xdx + (1-k)E(\tilde{q}_2)\int_0^{\sigma_2} xdx\Big) \\ &= \Big(\frac{\bar{c}}{4}\Big)[k(\sigma_1)^2 + (1-k)(\sigma_2)^2]. \end{aligned}$$

- C1 is elected if he receives the majority of votes. This occurs if

$$k\tilde{q}_1\sigma_1 \geq (1-k)\tilde{q}_2\sigma_2 \quad \Leftrightarrow \quad \frac{\tilde{q}_2}{\tilde{q}_1} \leq \frac{k\sigma_1}{(1-k)\sigma_2}.$$

- So, C1 is elected with prob.

$$p(\sigma_1, \sigma_2) \equiv F\Big(\frac{k\sigma_1}{(1-k)\sigma_2}\Big),$$

where F is the cumulative distribution function of $\frac{\tilde{q}_2}{\tilde{q}_1}$.

Rule-dependent Preferences

- Given agents' preferences, it follows that if ethical agents act according to the rule profile (σ_1, σ_2), then the induced payoffs for agents type $i \in \{1, 2\}$ are

$$\begin{aligned} R_1(\sigma_1, \sigma_2) &\equiv wp(\sigma_1, \sigma_2) - \phi(\sigma_1, \sigma_2); \\ R_2(\sigma_1, \sigma_2) &\equiv w(1 - p(\sigma_1, \sigma_2)) - \phi(\sigma_1, \sigma_2). \end{aligned}$$

- So, when evaluating the merits of different behavioral rules, the costs that agents take into account are those of the entire society.
- Agents take into account the welfare of the entire society when reasoning what they should do (although agents might disagree on which policies are best).
- Alternatively, Coate and Conlin (AER 2004) assume that agents consider only the voting costs of their group.

Consistent Rule

Definition 1 *(Consistency requirement):*
The pair $(\sigma_1^*, \sigma_2^*) \in (0,1] \times (0,1]$ *is a consistent rule profile if*

$$R_1(\sigma_1^*, \sigma_2^*) \geq R_1(\sigma_1, \sigma_2^*) \qquad \textit{for all } \sigma_1 \in [0,1];$$
$$R_2(\sigma_1^*, \sigma_2^*) \geq R_2(\sigma_1^*, \sigma_2) \qquad \textit{for all } \sigma_2 \in [0,1].$$

- If a rule profile is not consistent, then at least one agent must conclude that the ethical agents of his type should follow an alternative rule and, thereby, achieve a better outcome.
- Conversely, in a consistent rule profile, no agent concludes that the ethical agents of his type can achieve a better outcome by following an alternative rule.

Why Vote?

- An agent may take a costly action even though he understands that this single action has no effect on the final outcome, and hence, does not benefit anyone.
- They take these costly actions because they feel morally obligated to do their part.
- The right behavioral rules are determined by the cutoff points $\bar{c}\sigma_1^*$ and $\bar{c}\sigma_2^*$.
- Ethical agents of type $i \in \{1, 2\}$ understand they should vote for i when their voting cost is below $\bar{c}\sigma_i^*$ and abstain when their voting cost is above $\bar{c}\sigma_i^*$.
- The consistent rules (σ_1^*, σ_2^*) are determined so that each voter correctly anticipates behavior.
- Hence, the cutoff points $\bar{c}\sigma_1^*$ and $\bar{c}\sigma_2^*$ determine how agents understand they should behave, and also how agents will behave.

Closed-form Solution

- The consistent rule profile (σ_1^*, σ_2^*) can be derived, in closed-form solution, as a function of the parameters $(k, w, \bar{c}, D)$.
- Let the cumulative distribution and density function of $\frac{\tilde{q}_1}{\tilde{q}_2}$ (F and f, resp.) be given by

$$F(z) = \frac{z}{2} \quad \text{and} \quad f(z) = \frac{1}{2} \qquad \text{if } z \leq 1;$$
$$F(z) = 1 - \frac{1}{2z} \quad \text{and} \quad f(z) = \frac{1}{2z^2} \qquad \text{if } z \geq 1.$$

- Letting $\bar{k} \equiv \frac{k}{1-k}$, the first-order conditions of the maximization problem implied by the consistency requirement for type 1 agents are

$$wf\left(\bar{k}\frac{\sigma_1}{\sigma_2}\right)\bar{k}\frac{1}{\sigma_2} - k\frac{\bar{c}}{2}\sigma_1 \begin{cases} = 0 & \text{if } \sigma_1 \in (0,1) \\ \geq 0 & \text{if } \sigma_1 = 1. \end{cases}$$

Closed-form Solution

- Noting that $f(z) = f(1/z)1/z^2$, the first-order conditions of the maximization problem implied by the consistency requirement for type 2 agents are

$$wf\left(\bar{k}\frac{\sigma_1}{\sigma_2}\right)\frac{\bar{k}\sigma_1}{(\sigma_2)^2} - (1-k)\frac{\bar{c}}{2}\sigma_2 \begin{cases} = 0 & \text{if } \sigma_2 \in (0,1) \\ \geq 0 & \text{if } \sigma_2 = 1. \end{cases}$$

- The consistent profiles are given in closed-form as follows:

$$\begin{array}{lll} \sigma_1^* = \sqrt{\frac{w}{c}}\frac{1}{\sqrt[4]{k(1-k)}},\ \ \sigma_2^* = \sqrt{\frac{w}{c}}\sqrt[4]{\frac{k}{(1-k)^3}} & \text{if} & \frac{\bar{c}}{w} > \frac{1}{\sqrt{k(1-k)}}; \\ \sigma_1^* = 1,\ \sigma_2^* = \sqrt[3]{\frac{wk}{\bar{c}(1-k)^2}} & \text{if} & \frac{k}{(1-k)^2} < \frac{\bar{c}}{w} \leq \frac{1}{\sqrt{k(1-k)}}; \\ \sigma_1^* = \sigma_2^* = 1 & \text{if} & \frac{\bar{c}}{w} \leq \frac{k}{(1-k)^2}. \end{array}$$

Electoral Outcomes

- The final outcome of a large democratic election depends on the fraction of agents who support each candidate, k and $1-k$, and on the fractions $\tilde{q}_1\sigma_1^*$ and $\tilde{q}_2\sigma_2^*$, which is comprised of ethicals of each preference type who understand they should vote.
- Thus, a fraction $k\tilde{q}_1\sigma_1^*$ of the electorate vote for C1, a fraction $(1-k)\tilde{q}_2\sigma_2^*$ of the electorate will vote for C2, and all others will abstain.
- Hence, the expected total turnout is

$$\begin{aligned} T &\equiv E(k\sigma_1^*\tilde{q}_1 + (1-k)\sigma_2^*\tilde{q}_2) \\ &= 0.5(k\sigma_1^* + (1-k)\sigma_2^*). \end{aligned}$$

- The expected margin of victory is

$$MV \equiv E\left|\frac{(1-k)\tilde{q}_2\sigma_2^* - k\tilde{q}_1\sigma_1^*}{(1-k)\tilde{q}_2\sigma_2^* + k\tilde{q}_1\sigma_1^*}\right|$$

Electoral Outcomes

- Taking expectations for $\tilde{q}_1$ and $\tilde{q}_2$ (or $\frac{\tilde{q}_1}{\tilde{q}_2}$), the margin of victory is written as

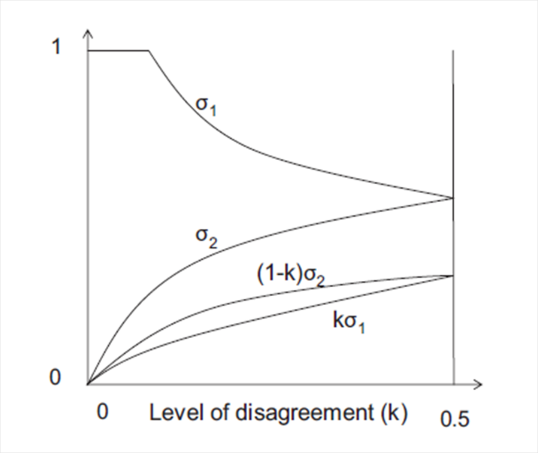
$$MV = \frac{k\sigma_1^*}{(1-k)\sigma_2^*}\Big(2ln2 - 1 - ln\Big(1 + \frac{(1-k)\sigma_2^*}{k\sigma_1^*}\Big)\Big) + \frac{(1-k)\sigma_2^*}{k\sigma_1^*}ln\Big(1 + \frac{k\sigma_1^*}{(1-k)\sigma_2^*}\Big).$$

- The prob. of victory for C2 (supported by the majority) is

$$PV \equiv F\Big(\frac{\sigma_2^*(1-k)}{\sigma_1^* k}\Big).$$

- The expected margin of victory and the prob. of victory for C2 are both increasing functions of $\frac{(1-k)\sigma_2^*}{k\sigma_1^*} \geq 1$, hence the comparative statics results for them are identical.
- Using the closed-form solutions for σ_1^* and σ_2^*, T, MV, and PV can be obtained as a function of the parameters $(k, w, \bar{c}, D)$.

Expected Fraction of Turnout



* $D > \bar{c}/2$ and $\bar{c}/w > 2$.

Expected Fraction of Turnout

Property 1: *The expected fraction of agents in the majority group who vote, $0.5\sigma_2^*$, is smaller than the expected fraction of agents in the minority group who vote, $0.5\sigma_1^*$. However, the total expected turnout of the majority, $0.5(1-k)\sigma_2^*$, is greater than the total expected turnout of the minority, $0.5k\sigma_1^*$.*

- From the first order conditions, changes in participation rates (σ_1 and σ_2) lead to a ratio of marginal benefits and of marginal costs given by

$$\frac{w\frac{\partial p(\sigma_1,\sigma_2)}{\partial \sigma_1}}{w\frac{\partial p(\sigma_1,\sigma_2)}{\partial \sigma_2}} = \frac{\sigma_2}{\sigma_1} \quad \text{and} \quad \frac{\frac{\partial \phi(\sigma_1,\sigma_2)}{\partial \sigma_1}}{\frac{\partial \phi(\sigma_1,\sigma_2)}{\partial \sigma_2}} = \frac{k\sigma_1}{(1-k)\sigma_2}.$$

- By assuming $\sigma_2^* \geq \sigma_1^*$, we get a contradiction to the the optimality condition that marginal costs and benefits must be equal for both sides in a consistent rule.
- By assuming $k\sigma_1^* \geq (1-k)\sigma_2^*$, we get a similar contradiction.

Comparison with Palfrey & Rosenthal (1983, 1985)

- In the Palfrey & Rosenthal (1983, 1985) model, agents consider the effect of changing only one vote, which is beneficial only when the election is tied or the voters' preferred candidate is behind by one vote.
- In this model, agents consider the effect of changing many votes, which is also relevant only when their preferred candidate is tied or slightly behind in votes.
- In spite of this similarity, the Palfrey and Rosenthal model predicts in some cases that the minority may be just as likely to win a large election as the majority (even if the majority is overwhelmingly large).

Comparison with Riker & Ordeshook (1968)

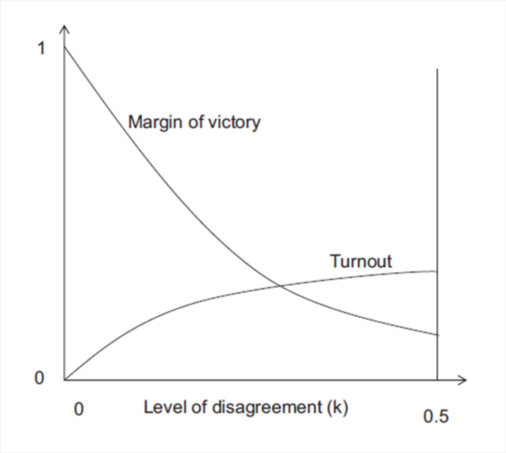
- In a decision-theoretic model along the lines of Riker & Ordeshook (1968), it is exogenously determined that agents understand they should vote.
- In such a model, turnout is determined by the fraction of the electorate with cost to vote less than D.
- So, the participation rate of the majority and the minority is $min\{D/\bar{c}, 1\}$.
- Hence, unlike this model, the participation rate of the minority is identical to that of the majority.
- This shows that the differences in turnout b/w the majority and the minority are related to the fact that agents endogenously determine how they should behave.

Positive Turnout

Property 2: *Expected turnout is strictly positive, and converges to zero as the level of disagreement goes to zero.*

- Turnout is not simply a consequence of our assumption that some agents receive positive payoff for doing their part.
- It also depends on the level of disagreement in the electorate.
- The intuition for property 2 is that, as type 2 agents becomes an overwhelming majority, they can vote at a low level and win the election with high probability.

Expected Margin of Victory and Turnout via the Level of Disagreement



Expected Margin of Victory and Turnout: the Level of Disagreement

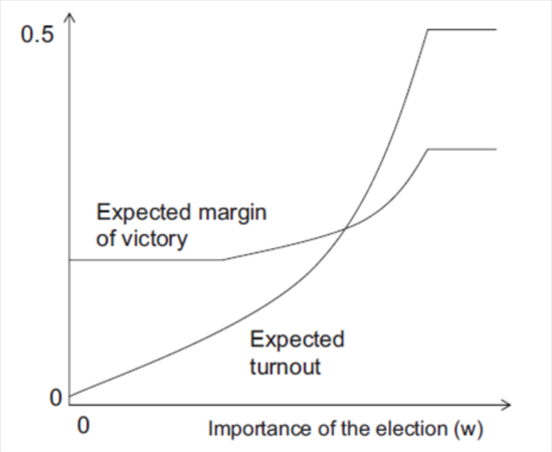
Property 3: *Expected turnout is increasing in the level of disagreement, while the expected margin of victory is decreasing in the level of disagreement.*

- The model produces an inverse correlation between margin of victory and turnout.

$$\frac{\sigma_2^*}{\sigma_1^*} = \frac{k\sigma_1^*}{(1-k)\sigma_2^*} \Leftrightarrow \left(\frac{\sigma_2^*}{\sigma_1^*}\right)^2 = \frac{k}{1-k}.$$

- As the level of disagreement goes to zero ($k \to 0$), the turnout of the majority goes to zero ($\sigma_2 \to 0$).
- With groups of equal size ($k = 1/2$), the participation rates of both groups are the same ($\sigma_2^* = \sigma_1^*$).

Turnout and Margin of Victory via the Importance of the Election

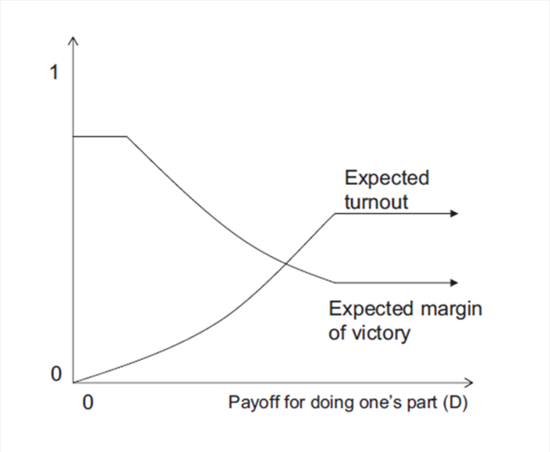


Expected Margin of Victory and Turnout: the Importance of the Election

Property 4: *Expected turnout and margin of victory are increasing in the importance of election (w) and decreasing in the average voting cost ($\bar{c}/2$).*

- For example, turnout is higher for presidential elections than state elections (and so is the margin of victory).
- Changes in the importance of the election can produce a positive correlation between margin of victory and turnout.
- When the importance of the election is very high, both groups participate at maximum levels, so MV is determined by group size.
- When the importance of the election decreases, turnout also decreases because the marginal benefit of participation decreases and the marginal costs remain the same.

Turnout and Margin of Victory via the Payoff for Doing One's Part



Expected Margin of Victory and Turnout: the Payoff for Doing One's Part

Property 5: *Expected turnout is weakly increasing in the payoff for doing one's part (D) while the expected margin of victory is weakly decreasing in D.*

- We again have an inverse correlation between the expected margin of victory and turnout as D changes.
- When $D < \bar{c}$, we have $\sigma_1^* = \sigma_2^* = D$ (it cannot be optimal to reduce turnout because the reduction in total voting costs would be small).
- As D increases beyond $\bar{c}$, it becomes the case that $\sigma_1^* > \sigma_2^*$ (Property 1), decreasing the chances that C2 wins.

Remarks

- Behavior motivated by moral considerations is fairly novel in formal models, both in political science and in game theory.
- Perhaps agents should receive a payoff for doing their part only when they take a costly action and this would prevent abstainers from receiving this payoff.
- It is without loss of generality to restrict behavioral rules to be based on cut-off points (Feddersen & Sandroni IJGT 2006, QJPS 2006).
- Properties 1 and 2 are quite general and robust to alternative assumptions - the division of population k might be a random variable; the distribution of voting costs and/or fraction of ethicals $\tilde{q}_i$ might be non-uniform, etc.
- Also refer to the experiments by Tyran (JPubE 2004), Feddersen, Gailmard & Sandroni (2009), and a survey by Tyran & Wagner (Oxford Handbook of Public Choice II 2019).