Weighting Votes, Rule Complexity and Information Aggregation

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  - Storable vote, qualitative voting, quadratic voting, etc.

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- Richer ballot space is seen as a solution
  - Storable vote, qualitative voting, quadratic voting, etc.
- **This paper:** Richer ballot space in the laboratory
  - Focus on information aggregation

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  2. Rules allocates the same weight to all members that vote

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  - Basic idea: give better weight to more informed voters

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- What if we allowed members to *endogenously* allocate a weight to their vote?
  - Weighing your vote $\Rightarrow$ choosing 'how pivotal' you want to be
  - $\uparrow$ weight $= \uparrow$ likelihood of changing the election outcome

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  - Robust to general information structures, number of players, information technology of other players, ...
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  - Robust to general information structures, number of players, information technology of other players, ...
- In the case of **private values**, Núñez and Laslier 2014 show that allocating votes doesn't change the equilibrium outcomes
- Implication: Allowing voters to endogenously choose the weights to their votes might be a Pareto improvement

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  - The theory ignores cognitive costs
  - Many pivotal events, that depend on the weight
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  - The theory ignores cognitive costs
  - Many pivotal events, that depend on the weight
  - Computationally much more demanding than simple mechanisms
- This paper: laboratory experiment
  1. First experiment with divisible votes
  2. Comparison of continuous voting with simple majority
  3. Test several comparative statics of the model
  4. Elicit preferences over mechanisms

Literature Review

- Information aggregation in Elections
  - **Theory:** Austen-Smith and Banks 1996; T. Feddersen and Pesendorfer 1997; Myerson 1998; Krishna and Morgan 2011; Bouton and Castanheira 2012; Bhattacharya 2013; Barelli, Bhattacharya, and Siga 2019
  - **Experiments:** Ladha, Miller, and Oppenheimer 1996; Guarnaschelli, McKelvey, and T. R. Palfrey 2000; Bhattacharya, Duffy, and Kim 2014; Bouton, Llorente-Saguer, and Malherbe 2017

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- Strategic Abstention
  - **Theory**: T. J. Feddersen and Pesendorfer 1996; McMurray 2013; Oliveros 2013; Herrera, Llorente-Saguer, and McMurray 2019b
  - **Experiments**: Battaglini, Morton, and T. R. Palfrey 2010; Morton and Tyran 2011; Mengel and Rivas 2017; Herrera, Llorente-Saguer, and McMurray 2019a

Literature Review

- Preference Intensities
  - **Theory**: Casella 2005; Hortala-Vallve 2012; Casella, Llorente-Saguer, and T. R. Palfrey 2012; Núñez and Laslier 2014; Goeree and Zhang 2017; Lalley and Weyl 2018; Drexl and Kleiner 2018; H. P. Grüner and Tröger 2019; Casella and T. Palfrey 2019; Eguia and Xefteris 2021
  - **Experiments**: Casella, Gelman, and T. R. Palfrey 2006; Hortala-Vallve and Llorente-Saguer 2010; Cárdenas, Mantilla, and Zárate 2014; Engelmann and H. Grüner 2017; Goeree and Zhang 2017; Casella and Sanchez 2022

The model

Model

- $n > 2$ voters must decide between two alternatives, A or B
- Unobserved state of the world denoted by $\omega \in \{\alpha, \beta\}$
  - Commonly known prior $\Pr(\alpha)$

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- Unobserved state of the world denoted by $\omega \in \{\alpha, \beta\}$
  - Commonly known prior $\Pr(\alpha)$
- State contingent preferences:

$$\begin{aligned} u(A|\alpha) &= u(B|\beta) = 1 \\ u(B|\alpha) &= u(A|\beta) = 0 \end{aligned}$$

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Information Structure

- Finite set of precisions $P \subset (\frac{1}{2}, \overline{p}]$ with $\overline{p} < 1$
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- Voters' precisions drawn from distribution F on P
- Finite set of signals $S = \left\{ s_{\omega}^{p} \;\middle|\; \omega \in \{\alpha, \beta\},\ p \in P \right\}$
- Voter i receives a signal s_i:

$$Pr(s_i = s_{\omega}^{p} \mid \omega, p) = p; \qquad Pr(s_i = s_{-\omega}^{p} \mid \omega, p) = 1 - p$$

Model

Voting Rules

We consider two voting rules, i.e. two ballot spaces V:

- Majority Rule (M):
  - Vote for A ($v_i = 1$), for B ($v_i = -1$) or abstention ($v_i = 0$)
  - $V = \{-1, 0, 1\}$

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- Continuous Voting (CV):
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- Continuous Voting (CV):
  - Each voter chooses a number $v_i \in [-1, 1]$
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- For each rule:
  - A is implemented if $\sum_i v_i > 0$
  - B is implemented if $\sum_i v_i < 0$
  - Ties broken randomly

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- Profile $\sigma : S \rightarrow V$
- Efficient if

$$Pr(A \mid s_1, \ldots s_n) > \tfrac{1}{2} \quad \Rightarrow \quad \sum_{i=1}^{n} \sigma(s_i) > 0$$

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- Symmetric if $\sigma(s_\omega^p) = -\sigma(s_{-\omega}^p)$
  - relevant when prior is $\frac{1}{2}$

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- Equilibrium notion : BNE

Proposition 1

Under CV, when the prior is even, there is a symmetric, efficient equilibrium σ, such that:

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Implications:

- All voters partially abstain, unless they have maximal precision: $\forall p \neq \overline{p} : -1 < \sigma(s_\omega^p) < 1$

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Efficiency of CV

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Implications:

- All voters partially abstain, unless they have maximal precision: $\forall p \neq \overline{p} : -1 < \sigma(s_\omega^p) < 1$
- No voter fully abstains: $\forall p, \quad |\sigma(s_\omega^p)| > 0$

Model

Efficiency of CV: comments

Robustness : equilibrium strategies are independent of:

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- It becomes unique (up to a multiplicative constant) when $n \to \infty$ or when F has full support on $P = (\frac{1}{2}, \overline{p}]$

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General Prior : CV remains efficient, strategies of the form

$$\sigma(s_\alpha^p) = c + \kappa \log\left(\frac{p}{1-p}\right)$$

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Dominance of CV over M

Proposition 2

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- Dominance is strict with the experimental parameters

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- Dominance is strict with the experimental parameters
- Differential complexity not built in the model

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Communication before Voting

Proposition 3

Under communication, there are no welfare differences across voting rules under the best equilibrium.

⇒ Under communication, M becomes efficient

- Intuition : with common values, voters may share all their information and then all vote for the efficient decision (Gerardi & Yariv, 2009)

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Under communication, there are no welfare differences across voting rules under the best equilibrium.

$\Rightarrow$ Under communication, M becomes efficient

- Intuition : with common values, voters may share all their information and then all vote for the efficient decision (Gerardi & Yariv, 2009)
- Individual votes are not pinned down by equilibrium analysis

The experiment

Experimental Design

- Fixed groups of 5/9 subjects
- Except for the voting rule, the set of parameters was fixed throughout the session
- Three parts:
  - Parts 1&2: 20 rounds of voting using either Majority or CV
    - Different rules in parts 1 and 2
    - Balanced different orders

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- Three parts:
    - Parts 1&2: 20 rounds of voting using either Majority or CV
        - Different rules in parts 1 and 2
        - Balanced different orders
    - Part 3
        - Group decides which rule to use (random dictator)
        - 10 round with the chosen rule

Experimental Design

One Round

- The color of a **triangle** is chosen randomly ▲ or ▲
  - Probabilities $\Pr(\alpha)$ and $1 - \Pr(\alpha)$ respectively

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- Subjects receive a 'hint' about the color of triangle
  - Ball drawn from an urn filled with 100 (blue and red) balls
  - Proportion of balls of each color depends on the type of voter

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- Subjects receive a ‘hint’ about the color of triangle
  - Ball drawn from an urn filled with 100 (blue and red) balls
  - Proportion of balls of each color depends on the type of voter
- Subjects vote (with either M or CV)
- Payoffs
  - 100 (0) if the group guessed color was (not) correct
  - 50 in case of a tie

Experimental Design

Voting Mechanisms

- Majority:
  - Vote for Blue, vote for Red or Abstain

Experimental Design

Voting Mechanisms

- Majority:
  - Vote for Blue, vote for Red or Abstain
- Continuous Voting
  - Vote for Blue or vote for Red
  - "Indicate the number of points you allocate to the color you vote for. You can allocate any number between 0 and 20 to the color you vote for, including decimals"

Experimental Design

Treatments

Parameters	n	Prior	Prob. of each Precision 55%	60%	75%	95%	Eq M vote
Baseline (B)	5	0.5	0.15	0.7	-	0.15	All

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Parameters	n	Prior	55%	60%	75%	95%	Eq M vote
Baseline (B)	5	0.5	0.15	0.7	-	0.15	All
Distrib (D)	5	0.5	0.25	0.5	-	0.25	iff prec $\geq$ 95

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Distrib (D)	5	0.5	0.25	0.5	-	0.25	iff prec $\geq$ 95
Size (S)	9	0.5	0.15	0.7	-	0.15	iff prec $\geq$ 95

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Size (S)	9	0.5	0.15	0.7	-	0.15	iff prec $\geq$ 95
$+$ Types (MT)	5	0.5	0.15	0.5	0.2	0.15	iff prec $\geq$ 75

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Parameters	n	Prior	Prob. of each Precision 55%	60%	75%	95%	Eq M vote
Baseline (B)	5	0.5	0.15	0.7	-	0.15	All
Distrib (D)	5	0.5	0.25	0.5	-	0.25	iff prec $\geq$ 95
Size (S)	9	0.5	0.15	0.7	-	0.15	iff prec $\geq$ 95
+ Types (MT)	5	0.5	0.15	0.5	0.2	0.15	iff prec $\geq$ 75
Asym Prior (A)	5	0.3	0.15	0.7	-	0.15	t_A iff prec $\geq$ 95 t_B iff prec $\geq$ 60

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+ Types (MT)	5	0.5	0.15	0.5	0.2	0.15	iff prec $\geq$ 75
Asym Prior (A)	5	0.3	0.15	0.7	-	0.15	t_A iff prec $\geq$ 95 t_B iff prec $\geq$ 60
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Asym Prior (A)	5	0.3	0.15	0.7	-	0.15	t_A iff prec $\geq$ 95 t_B iff prec $\geq$ 60
Comm. (C)	5	0.5	0.15	0.7	-	0.15	

- Equilibrum under CV (symmetric treatments):

Precision	55%	60%	75%	95%
Eq. Weight	1.36	2.75	7.46	20

  - In A: voters vote asymmetrically to compensate

Experimental Procedures

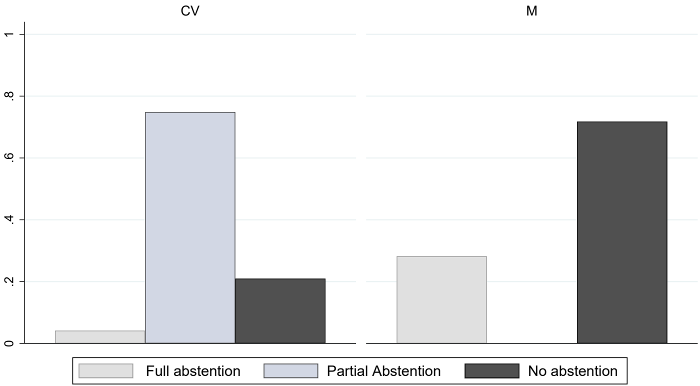
- Experiments were conducted at LINEEX (U. Valencia)
- December 2017 - February 2018
- 408 participants (all of them students)
- Computerized interactions (Ztree)
- No subject participated in more than one session
- Average payoff: €14.54 Euros for approximately one hour

Experimental results

Behaviour

Partial Abstention

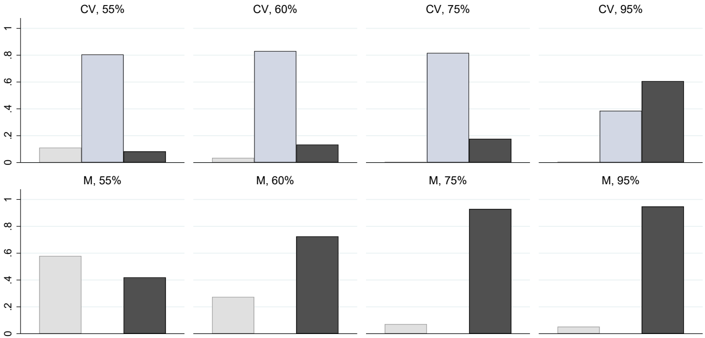
- Do participants make use of partial abstention?



Behaviour

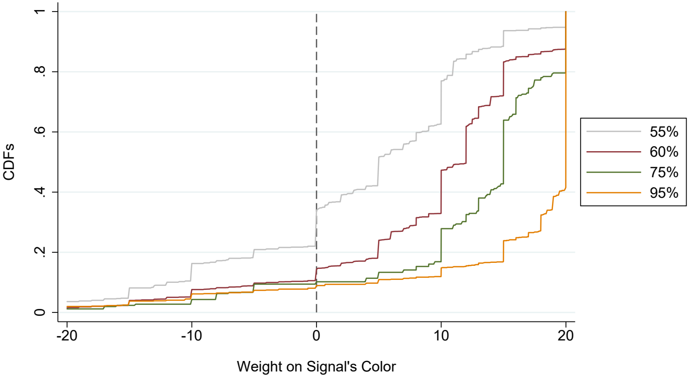
Partial Abstention

- Is the use correlated with the strength of information?



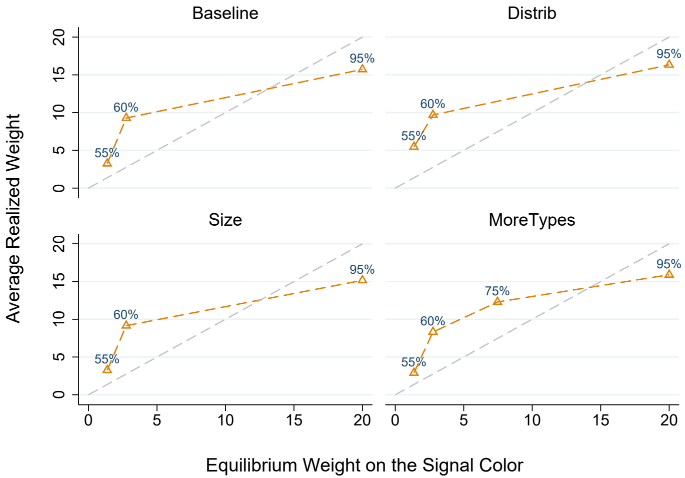
Behaviour

Vote Weight Distribution by Type



Behaviour

CV: Realized weights vs Equilibrium



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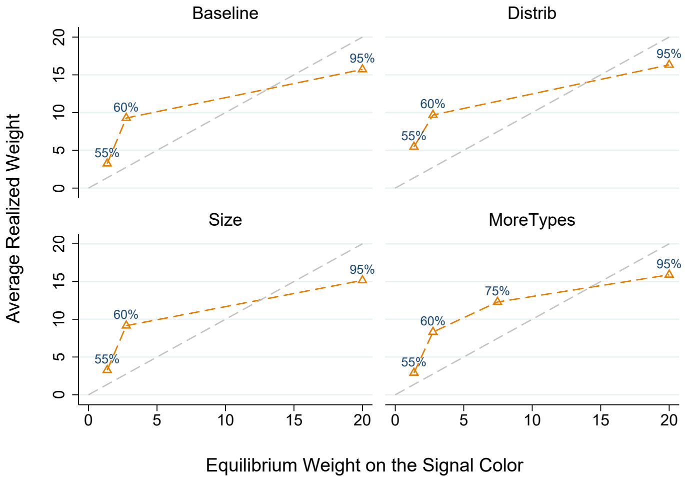
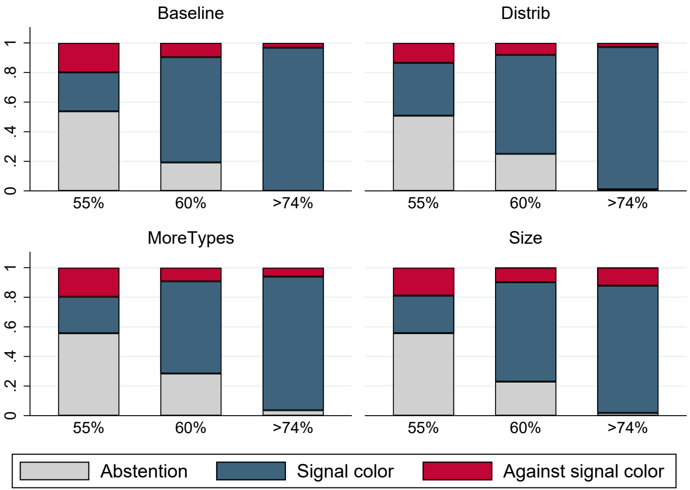


Behaviour

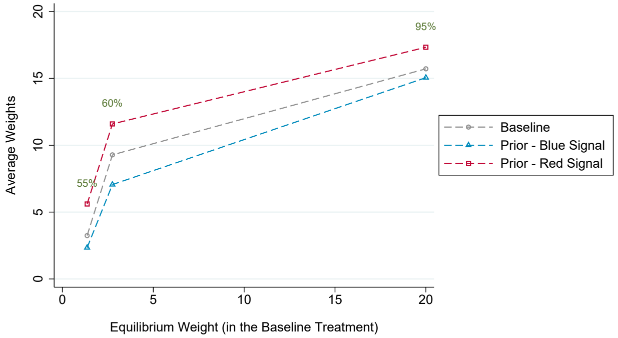
M: Voting Behaviour by Type



Behaviour

CV: The effect of the Prior

- In the Prior03 Treatment, $Pr(blue) = 0.3$
  - They need stronger evidence to choose blue: vote ‘more red’



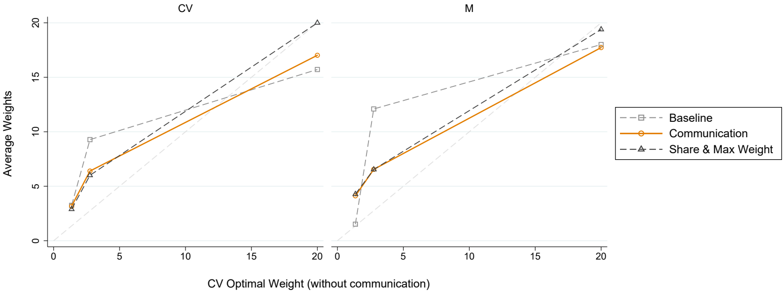
Behaviour

CV: The effect of Communication

- Ambiguous effect of communication on voting weights (CV)
    1. Players can ignore communication and play equilibrium weights
    2. They can share information and vote in the same manner
       $\rightarrow$ weaker relation between signals and weights
    - Note that both equilibria are efficient

Behaviour

CV: The effect of Communication



Welfare

Average Payoffs

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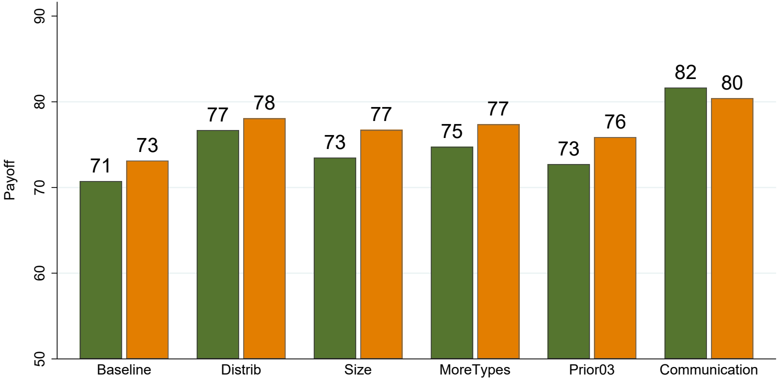
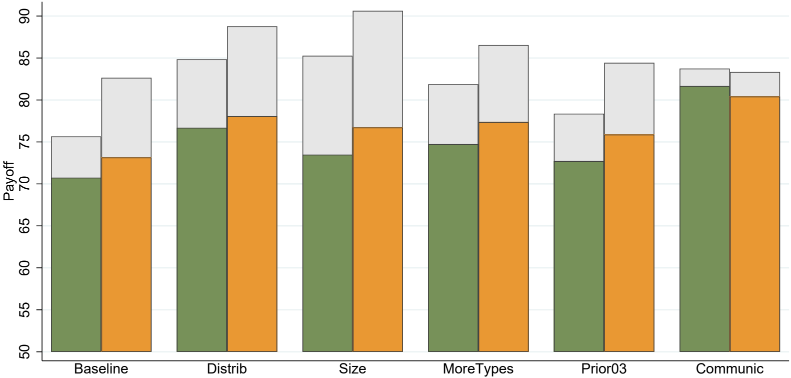


Welfare

Average Payoffs



Choice of Voting Rule

- In part 3, subjects had to select the voting rule
- If no frictions: forward-looking voters should choose CV
  - frictions: additional time, cognitive cost
  - if backward looking $\rightarrow$ depends on realized payoff

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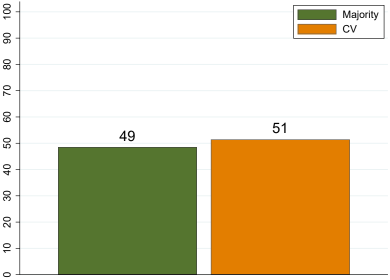

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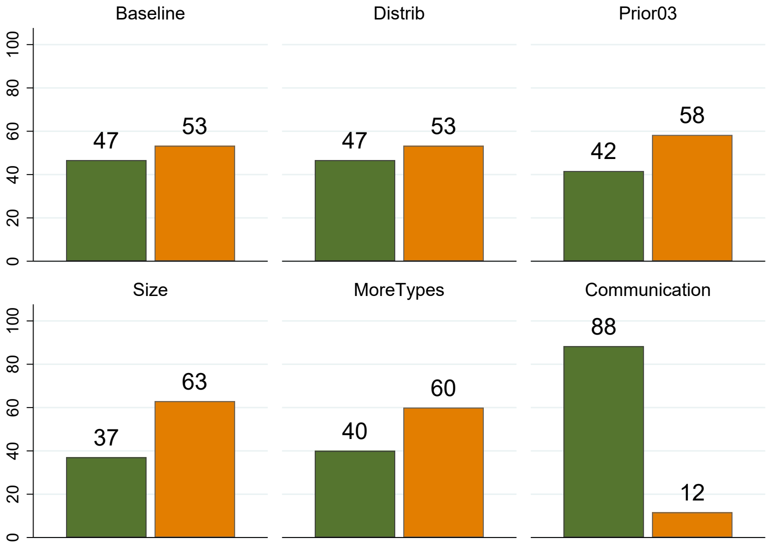

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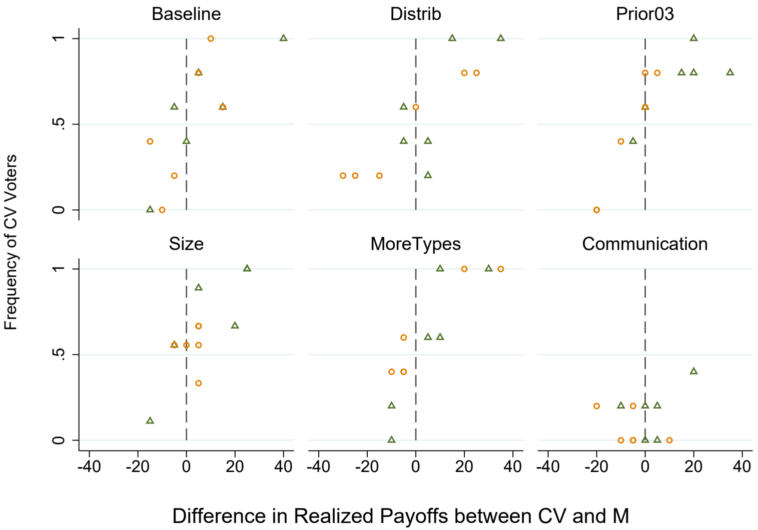
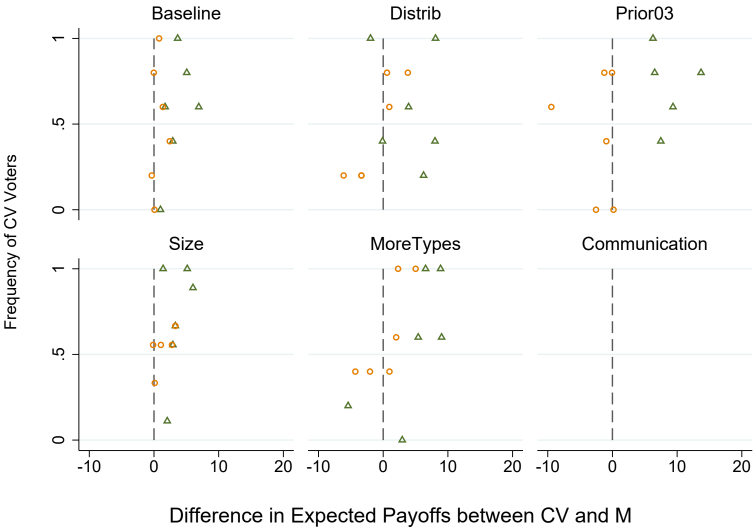


- Positive correlation with realized performance

Choice of Voting Rule



Choice of Voting Rule

DV: System Choice	(1)	(2)	(3)	(4)	(5)	(6)
CV Realized Payoff	0.018***		0.018***	0.017***	0.017***	0.017***
	(0.002)		(0.003)	(0.003)	(0.003)	(0.003)
M Realized Payoff	-0.015***		-0.014***	-0.014***	-0.014***	-0.014***
	(0.002)		(0.002)	(0.002)	(0.002)	(0.002)
CV Simulated Payoff		0.032***	0.004	0.005	0.007	0.007
		(0.010)	(0.008)	(0.008)	(0.007)	(0.008)
M Simulated Payoff		-0.031***	-0.005	-0.006	-0.008	-0.010
		(0.009)	(0.006)	(0.006)	(0.006)	(0.007)
Time CV					0.000	0.000
					(0.000)	(0.000)
Time M					-0.000	-0.000
					(0.000)	(0.000)
Time Control Questions M						-0.001
						(0.001)
Time Control Questions CV						-0.002
						(0.001)
Constant	0.247	0.398	0.314	0.277	0.205	0.409
	(0.228)	(0.736)	(0.442)	(0.547)	(0.531)	(0.512)
Questionnaire Controls				✓	✓	✓
Observations	348	348	348	348	348	348
Clusters	42	42	42	42	42	42
R-squared	0.249	0.063	0.250	0.258	0.260	0.271

Conclusion

- Flexibility of ballot space and information aggregation
- Comparison of MV and CV
  - CV dominates MV
  - Underperforms theoretical predictions
- Choice of voting rule
  - Voters are backward looking $\rightarrow$ inefficiencies

Thanks!