

# Voter Dynamics

A simple voter-politician attraction model

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# Our Inspiration



## Singapore's next General Election likely to be held in late 2024 at the earliest, analysts say

This comes after Prime Minister Lee Hsien Loong revealed he will hand the reins to Deputy Prime Minister Lawrence Wong before the next General Election, and by November 2024 "if all goes well".



 Louise Tang

 Tang See Kit

 [@DianaKCTG](#)

08 Nov 2023 07:58PM

(Updated 08 Nov 2023 08:44AM)

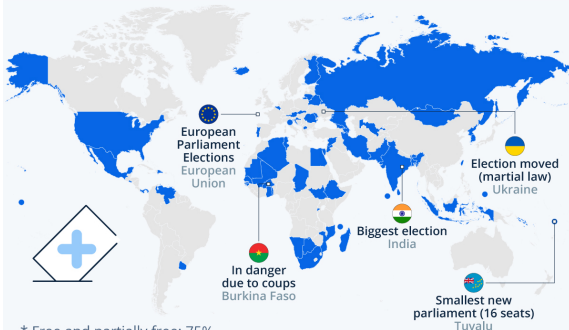


# Our Inspiration

## 2024: The Super Election Year

Countries where a national election is/was held in 2024

Expected number of voters: **2B** (~25% of world pop.) Share of free elections\*: **38%**



\* Free and partially free: 75%

General, parliamentary, presidential and economic union elections

Sources: Anchor Change Election Cycle Tracker, Statista research



statista

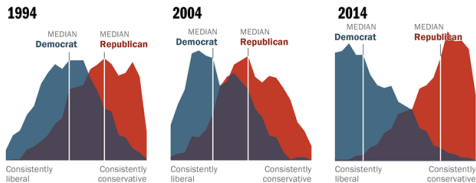
# Intuition behind our model

- ▶ Increasing political polarisation across democracies
- ▶ Confirmation bias
- ▶ Social Endorsement
- ▶ Budget:
  - ▶ Money invested in campaigning—social media, etc.
  - ▶ Political prowess

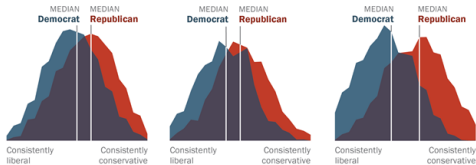
## Polarization Surges Among the Politically Engaged

*Distribution of Democrats and Republicans on a 10-item scale of political values, by level of political engagement*

### Among the politically engaged



### Among the less engaged



Source: 2014 Political Polarization in the American Public

Notes: Ideological consistency based on a scale of 10 political values questions (see Appendix A). Republicans include Republican-leaning independents; Democrats include Democratic-leaning independents (see Appendix B). Politically engaged are defined as those who are registered to vote, follow government and public affairs most of the time and say they vote always or nearly always.

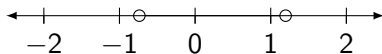
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# How can we model voters & politicians?

- ▶ We create numerically defined “issues/interests”:

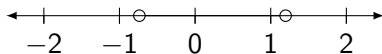
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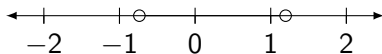
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- ▶ Allows us to assess whether voters are “aligned” with politicians
- ▶ Could foreseeably be used to encode real life data



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- ▶  $B_p$  is the budget of politician  $p$ ,
- ▶  $\rho_{v,p}$  is the *correlation coefficient* on **all the issues** between voter  $v$  and politician  $p$ ,
- ▶ and  $(p_i - v_i)$  is the difference between voter  $v$  and politician  $p$  on one specific issue.

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3. We assume that politicians **don't change** during their campaign.
4. We assume that the only thing that varies among individuals is where they stand on these "issues".
5. We don't account for voter-voter interaction.

# Model Implementation

For each voter, for each politician, determine how voters shift their stance:

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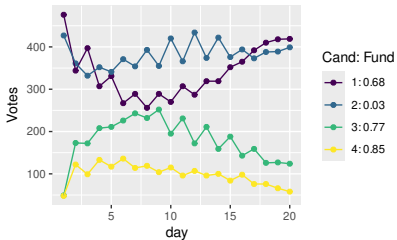
```
VI_data = rnorm(ni*nv)
PI_data = rnorm(ni*np)
b_data = runif(np, min = 0, max = 1)
VI = matrix(data = VI_data, nrow = nv, ncol = ni)
PI = matrix(data = PI_data, nrow = np, ncol = ni, byrow = T)
b = matrix(data = b_data, ncol = np, nrow = nv, byrow = T)
for (day in 1:days) {
  rho <- cor(t(rbind(PI,VI)))[(np+1):(np+nv),1:np])
  ME <- rho * b
  del_VI <- matrix(data = 0, nrow = nv, ncol = ni)
  for(v in 1:nv){
    for(p in 1:np){
      if (ME[v,p] > 0) {
        del_VI[v,] = del_VI[v,] + (PI[p,] - VI[v,])*ME[v,p]
      }
    }
  }
  VI <- VI + del_VI
}
```

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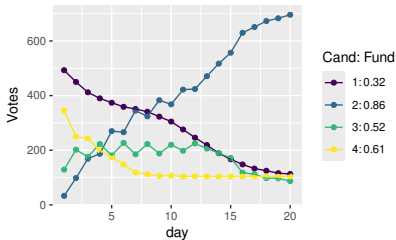
# Initial Findings

Process leads to varying outcomes w/ same parameters

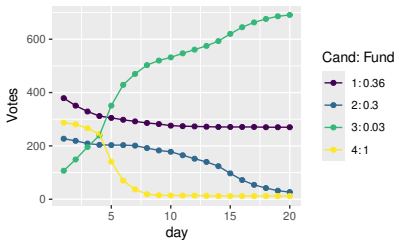
Voting Pattern under seed: 234



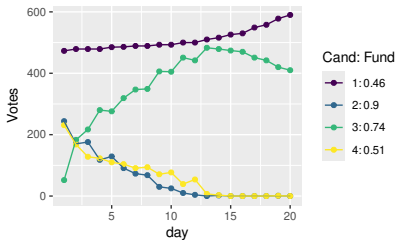
Voting Pattern under seed: 236



Voting Pattern under seed: 545



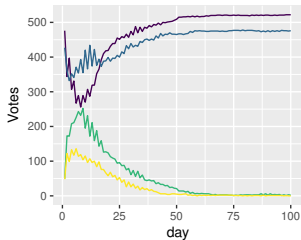
Voting Pattern under seed: 990



# Initial Findings

Voters tend to converge towards a politician—stable points!

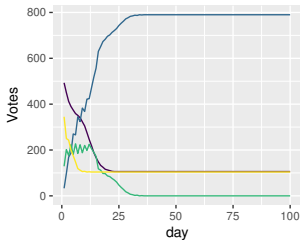
Voting Pattern under seed: 234



Cand: Fund



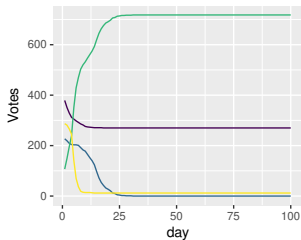
Voting Pattern under seed: 236



Cand: Fund



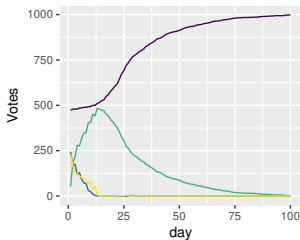
Voting Pattern under seed: 545



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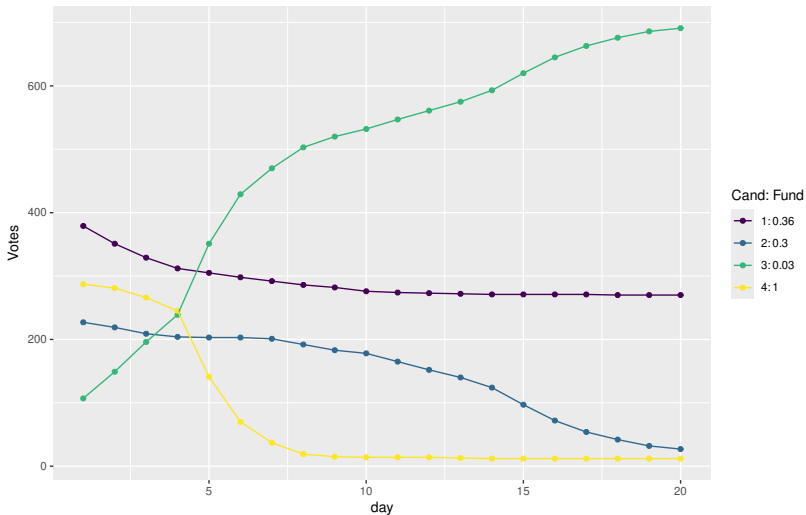
Cand: Fund



# Initial Findings

Higher budget  $\neq$  winning

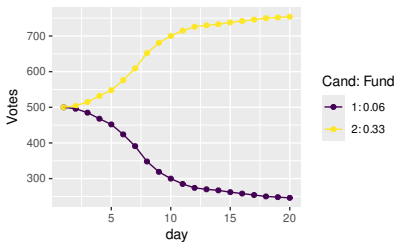
Voting Pattern under seed: 545



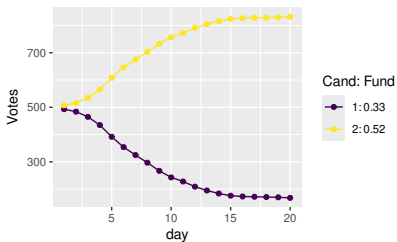
# Interesting Findings

Higher budget  $\approx$  winning for low number of politicians

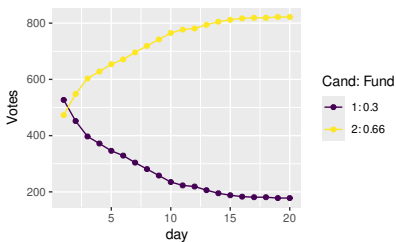
Voting Pattern under seed: 385



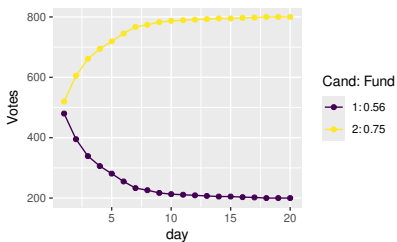
Voting Pattern under seed: 594



Voting Pattern under seed: 468



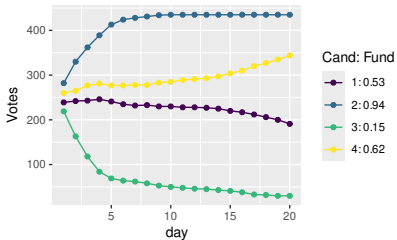
Voting Pattern under seed: 547



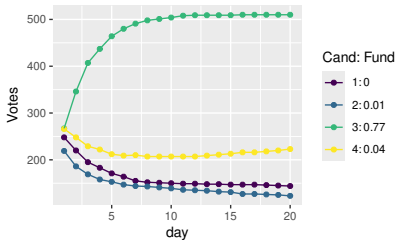
# Interesting Findings

Higher budget  $\approx$  winning for high number of politicians for large no. of issues

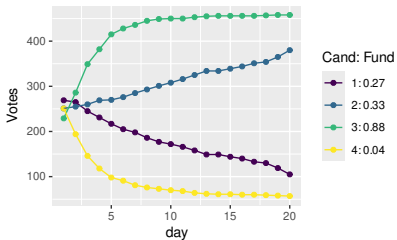
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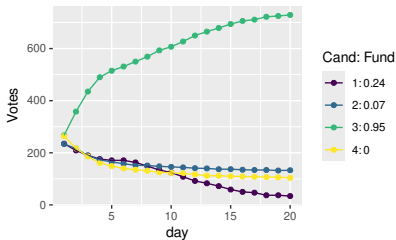
Voting Pattern under seed: 981



Voting Pattern under seed: 617



Voting Pattern under seed: 894



*The End.*