FORECASTING MULTI-DISTRICT ELECTIONS

Rohan Alexander, University of Toronto
Patrick Dumont, Australian National University
Lauren Kennedy, Columbia University
Patrick Leslie, Australian National University

Australian Society for Quantitative Political Science, Melbourne, Australia
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MOTIVATION

- Polling is used all the time by the media, and by campaigns. But it hasn't done well the past few years.
- Rarely transparent, and statistical uncertainty is downplayed.
- In multi-district systems, it's not measuring the critical aspect: seat counts.

FRAMEWORK

A reasonable model would:

1. be interpretable and provide reasonable estimates of the number of electoral divisions that each party will win;
2. account for preferences and/or turnout;
3. operate in a reproducible and transparent way;
4. produce results that account for the fact that it is a probability model; and
5. not be worse than traditional approaches in terms of speed or cost.

IMPLEMENTATION

1. Use survey data and multi-level regression with post-stratification to estimate electoral-division-level first-preference shares.

2. Then train a model to estimate electoral-division-level two-party-preferred shares.

CONTRIBUTIONS

- Our approach performs (well) out-of-sample, and it has additional advantages over traditional polling including improved interpretability, transparency, and better communication of statistical uncertainty.
- Our framework allows the consistent evaluation of forecasting models of elections in a parliamentary system.
- Our paper improves our understanding of the circumstances in which MRP is appropriate.

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A USEFUL MODEL…

First we characterize the five features that a useful model would have.

1) PROVIDES REASONABLE ESTIMATES

Reasonable estimates are:

- probabilistic outputs, that are,
- consistent with available, relevant, evidence ex anti,
- inaccurate, ex post, for discernible reasons,
- come from an interpretable model, and
- explicitly output electoral division counts.

2) ACCOUNTS FOR PREFERENCES

Account for preferences in a probabilistic way because this propagates uncertainty. Otherwise, too much confidence in central estimates.

In Australia preferences are important, but in Canada/UK, this consideration would be replaced by turnout.

3) IS REPRODUCIBLE & TRANSPARENT

- Reproducibility is now a minimum requirement of quantitative approaches.
- Polling is no where near that, so let's start with transparency.
- But aim to get to replicability.
- The only way this happens is by academics taking the lead.
- If we don't do this then it will likely be forced on us or other restrictions will be imposed.

4) HAS INEXTRICABLE UNCERTAINTY

If a journalist can separate the central measure then they will.

Me:

I'm wondering why you say:
Elizabeth Warren now "leads" Joe Biden in [redacted] aggregate of 2020 Democratic primary polls (I put "leads" in scare quotes because they're still within the margin of error with each other), the first time this cycle that the vice-president has been dethroned:

If they're within your margin of error, then the model really isn't able to speak to one leading the other, right? So why go to the effort of the quotes etc? Why not just say 'Elizabeth Warren and Joe Biden are inseparable in [redacted] aggregate…". Is it just because you need the headline and the 'dethroned' language etc?

Journalist:

Fair question. Warren has been within the margin of error with Biden for around a week, but only just recently is she ahead of him in our aggregate. I think it's fair to argue that this language is meaningless and sensational, but I think it's also important to mark these instances with understandable language. It's important when Biden is no longer "in first" because it represents the point in the primary when voters *probably* have decided on someone else overall. But your note on uncertainty is right, and why I include the parenthetical note in the piece.

5) IS NOT SLOW OR EXPENSIVE

We want our alternative to be widely ~~copied~~ adopted. This means it needs to be better in all aspects, not just better in a trade-off, or on certain measures.

Other papers find that our approach should be competitive. We can encourage its use by making the pipeline easier e.g. Shiny app that takes a CSV and outputs the model outputs.

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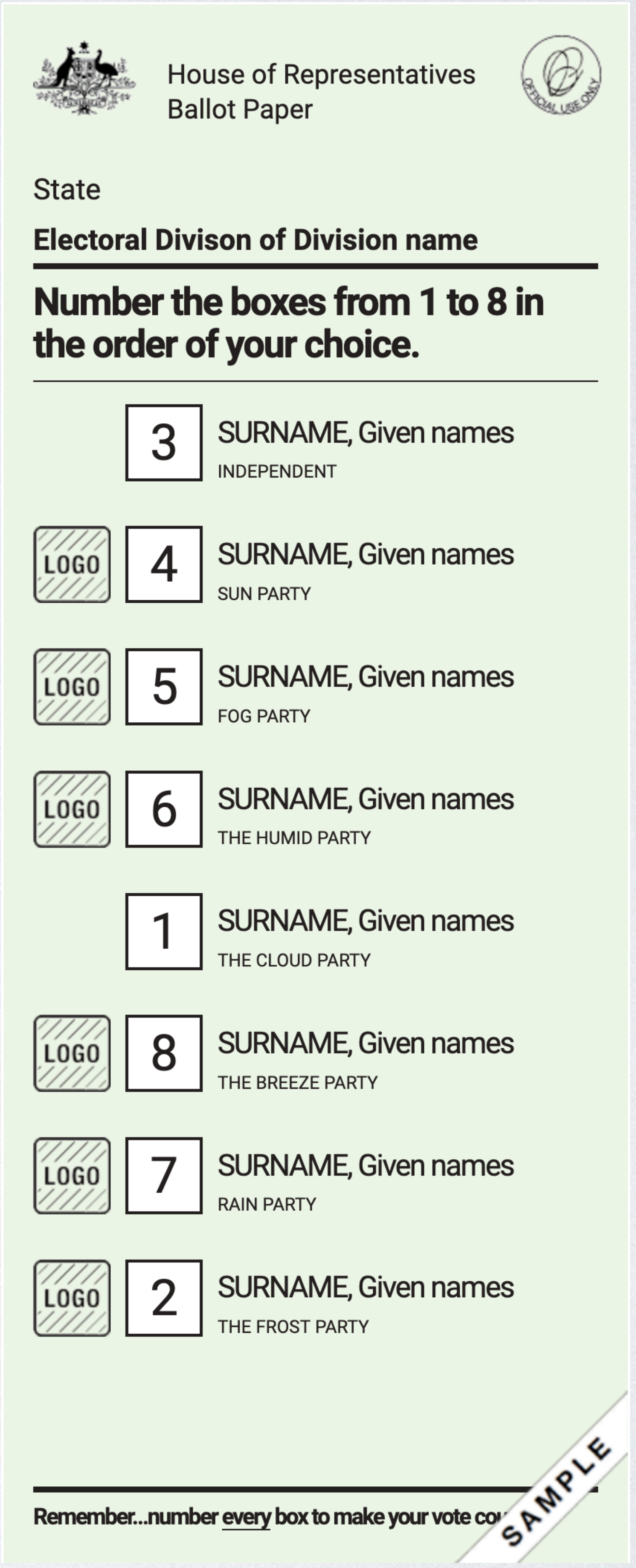
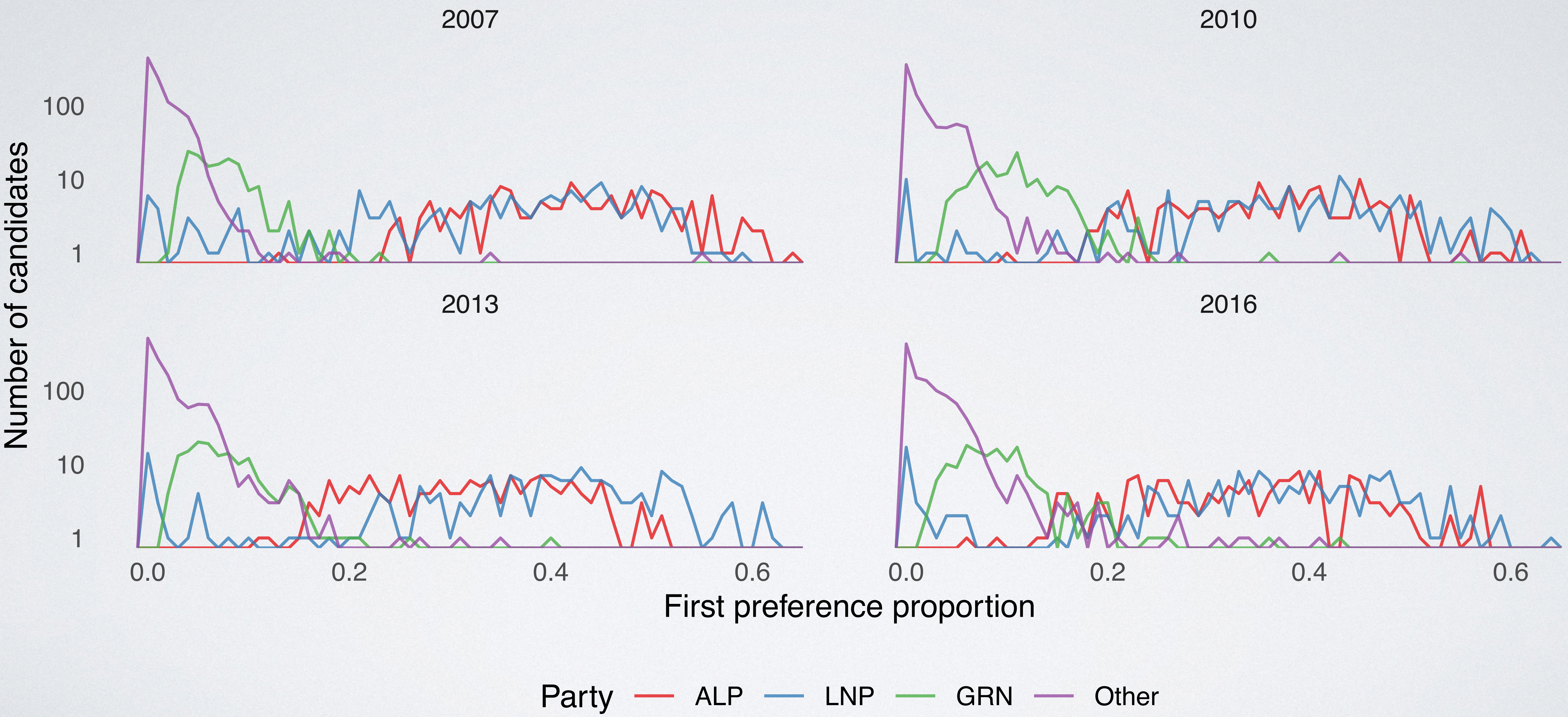
VOTING IN AUSTRALIA

- Voting is ‘compulsory’ (usually about 90 per cent).
- Two chambers; we focus on the lower house - ‘House of Representatives’.
- 151 electoral divisions, each of which with one representative.
- Boundaries are drawn by an independent commission.
- 5-10 candidates in each electoral division.
- Voters express preferences over candidates.

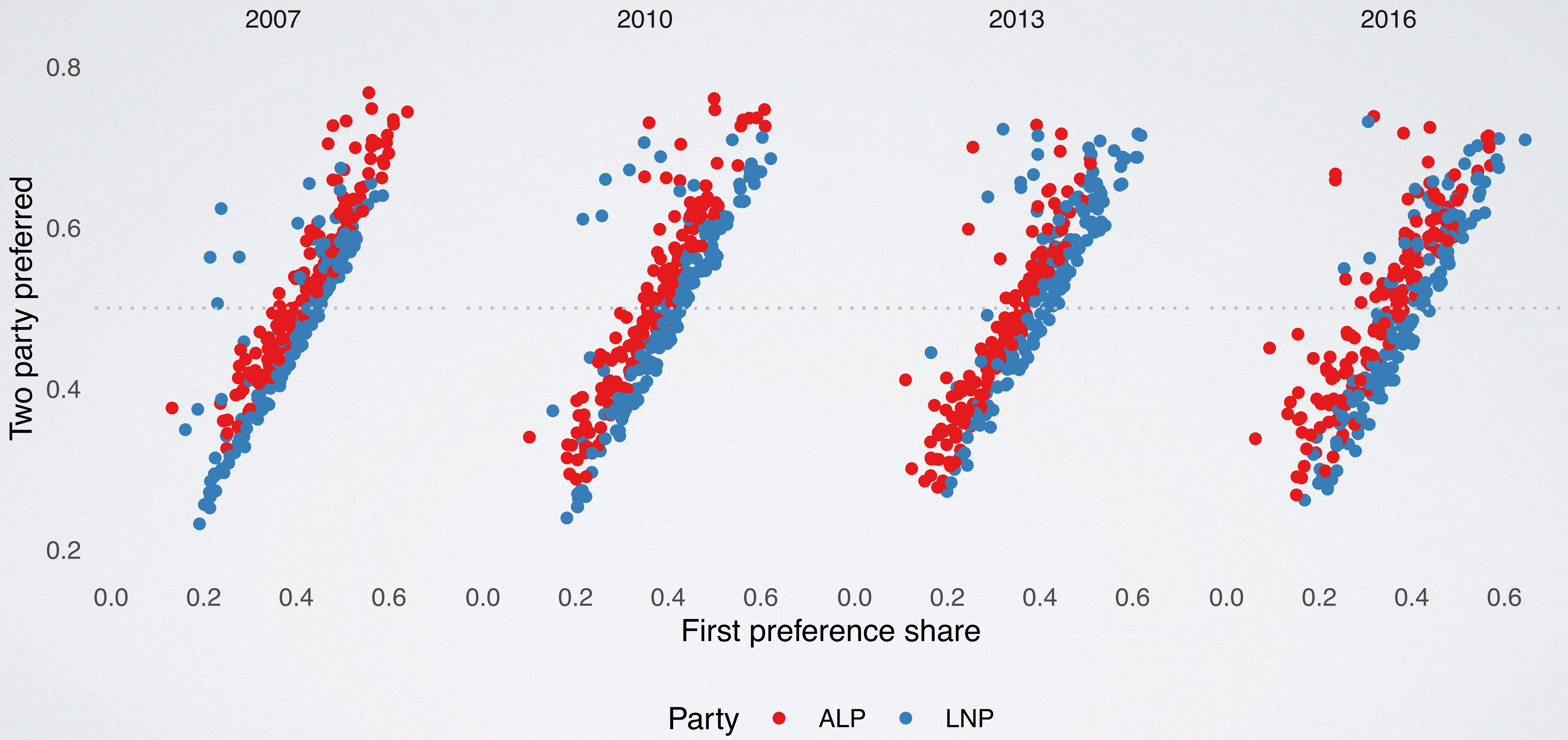


TWO PARTIES DOMINATE

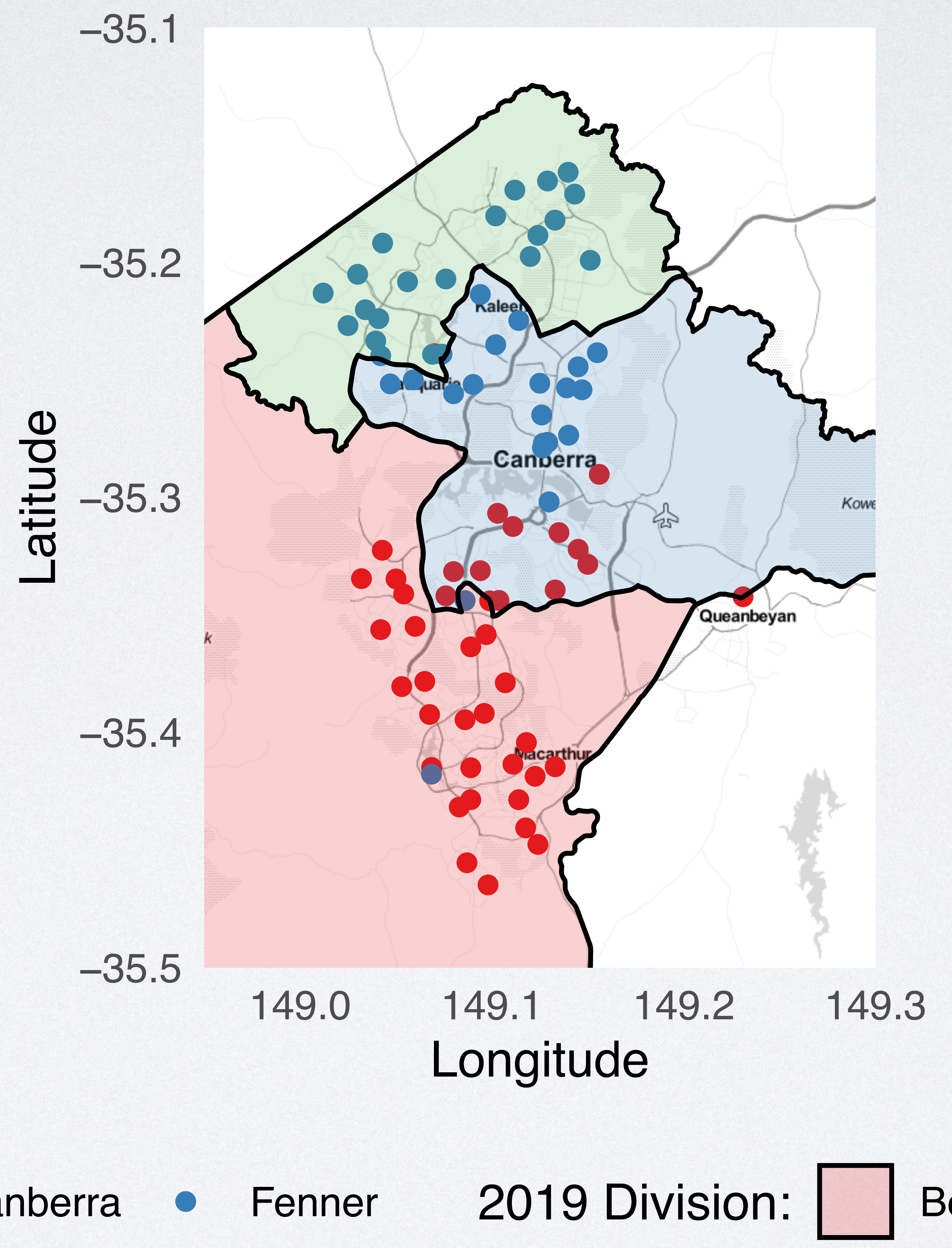


Data source: AEC

2PP AND PRIMARY ARE RELATED



BOUNDARIES CHANGE



OUR SURVEYS

Life in Australia

- Recurring panel survey.
- 2,054 responses.
- Not overly biased e.g. distributions by state and gender are fairly similar to the census.
- Slightly over-sampled respondents with a post-graduate degree; and substantially under-sampled 60+ respondents.

Smartvote Australia

- Voter advice application created for the 2019 election.
- 59,219 responses.
- Quite biased, e.g. NSW and VIC account for 41 and 35 per cent of the sample, but only make up 32 and 26 per cent of the Australian population. Males are also over-sampled.

OUR POST-STRATIFICATION DATA

- The data requirements of an MRP model can be onerous.
- We use 2016 Census data.
- For every level of every geographic and demographic feature we need to know the relative proportion of every combination in the population.
- Additional features compound, e.g. adding highest level of education by four categories pushes us to 32 sub-groups for every geographic area.

OUR DATASETS ARE PUBLIC

Linked dataset between all 1,776 politicians and all election results from Federation onward.

OUR DATASETS ARE PUBLIC

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Datasets

`AustralianPoliticians` is an R package that consists of a collection of datasets related to Australian politicians.

The datasets are:

- **all.rda**: The main dataset.
- **by_division_mps.rda**: Adds information about the division ('seat') of the politician.
- **by_party.rda**: Adds information about the party of the politician.
- **by_state_senators.rda**: Adds information about the state that a senator was representing.

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MODEL INDIVIDUAL RESPONSES

Model the survey responses:

$$\Pr(\hat{\text{FP}}_{i,p=1}) = \text{logit}^{-1}\left(\delta_0 + \delta_1 \text{gender}_i + \delta_2 \text{age}_i + \delta_3 \text{education}_i + \delta_4 \text{division}_{d[i]}\right)$$

A person's political preference depends on their gender, age-group, and education. Division enters as a random intercept.

POST-STRATIFY FIRST-PREFERENCES

Use that trained model on better data:

$$\Pr(\hat{\mathrm{FP}}^{PS}_{d,p=1}) = \frac{\left(\sum_{c=1}^{C} N_{c,d} \times \mathrm{logit}^{-1} \left(\hat{\delta}_0 + \hat{\delta}_1 \mathrm{gender}_c + \hat{\delta}_2 \mathrm{age}_c + \ldots \right) \right)}{\sum_{c=1}^{C} N_{c,d}}$$

Re-weighting based on the sub-cell proportions.

CHANGE FIRST-PREFERENCES INTO 2PP

Use that trained model on the post-stratified first-preferences estimates:

$$\text{2PP}_{d,p=1} = \hat{\beta}_0 + \hat{\beta}_1 \hat{\text{FP}}^{PS}_{d,p=1}$$

Propagate uncertainty by applying this to each posterior distribution.

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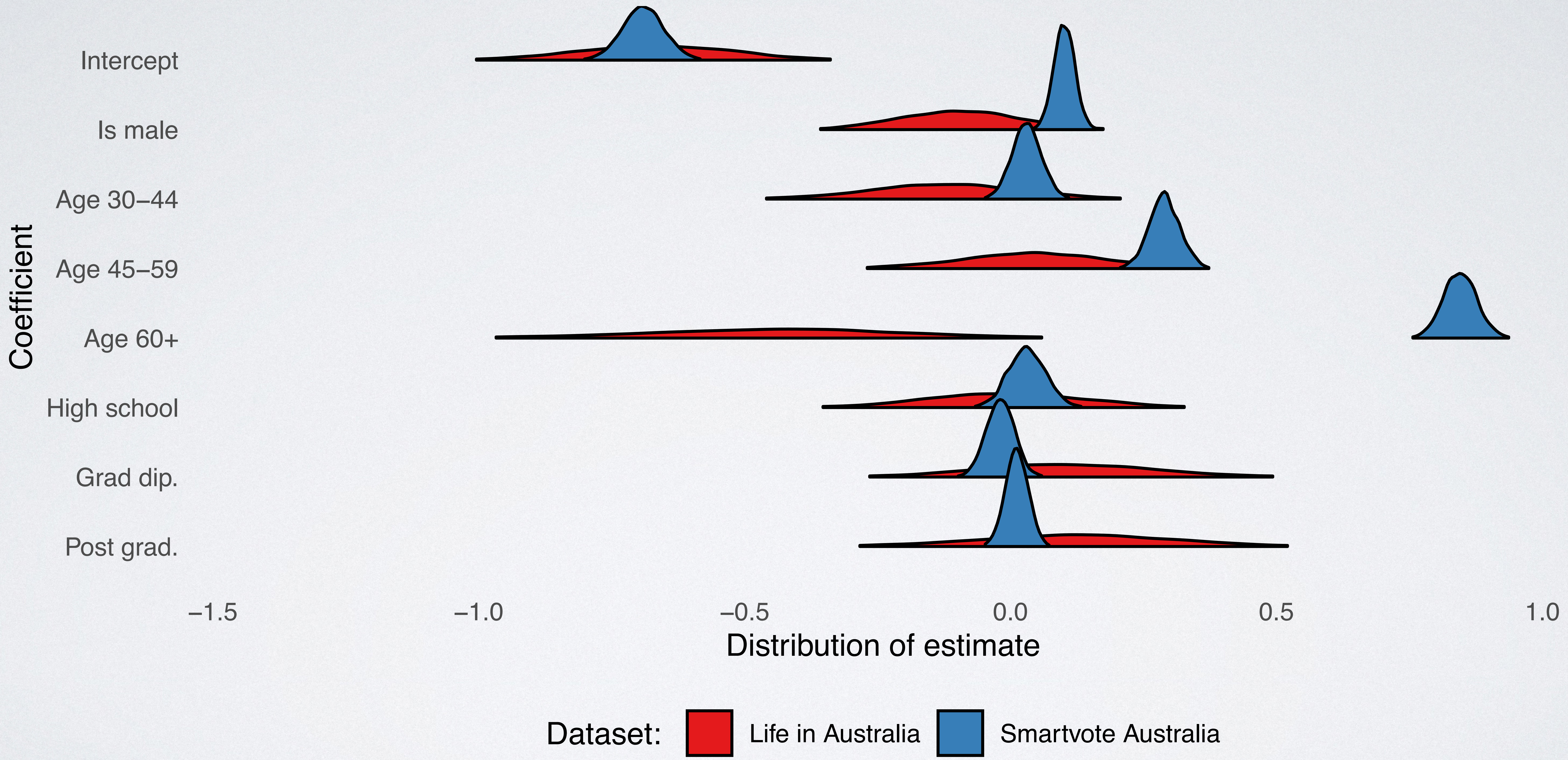
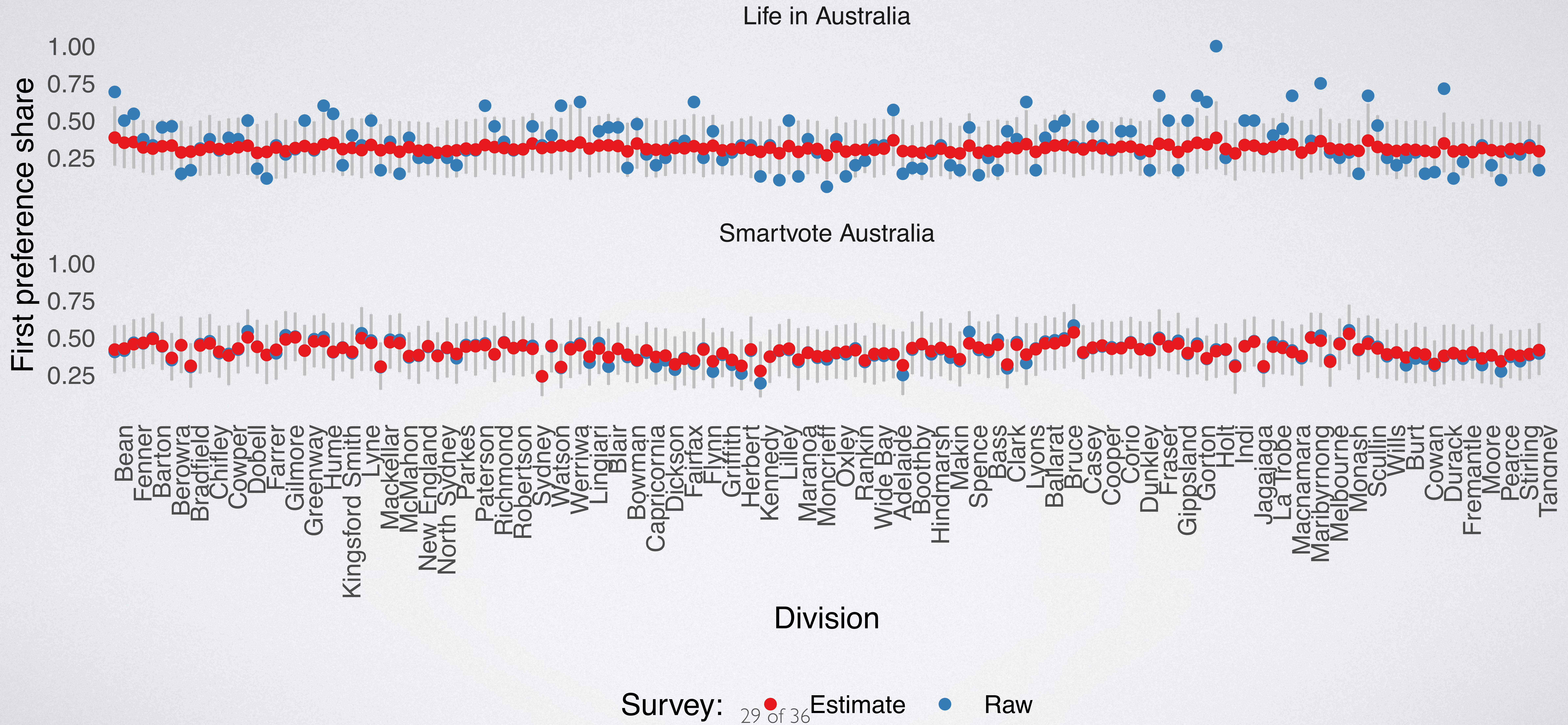
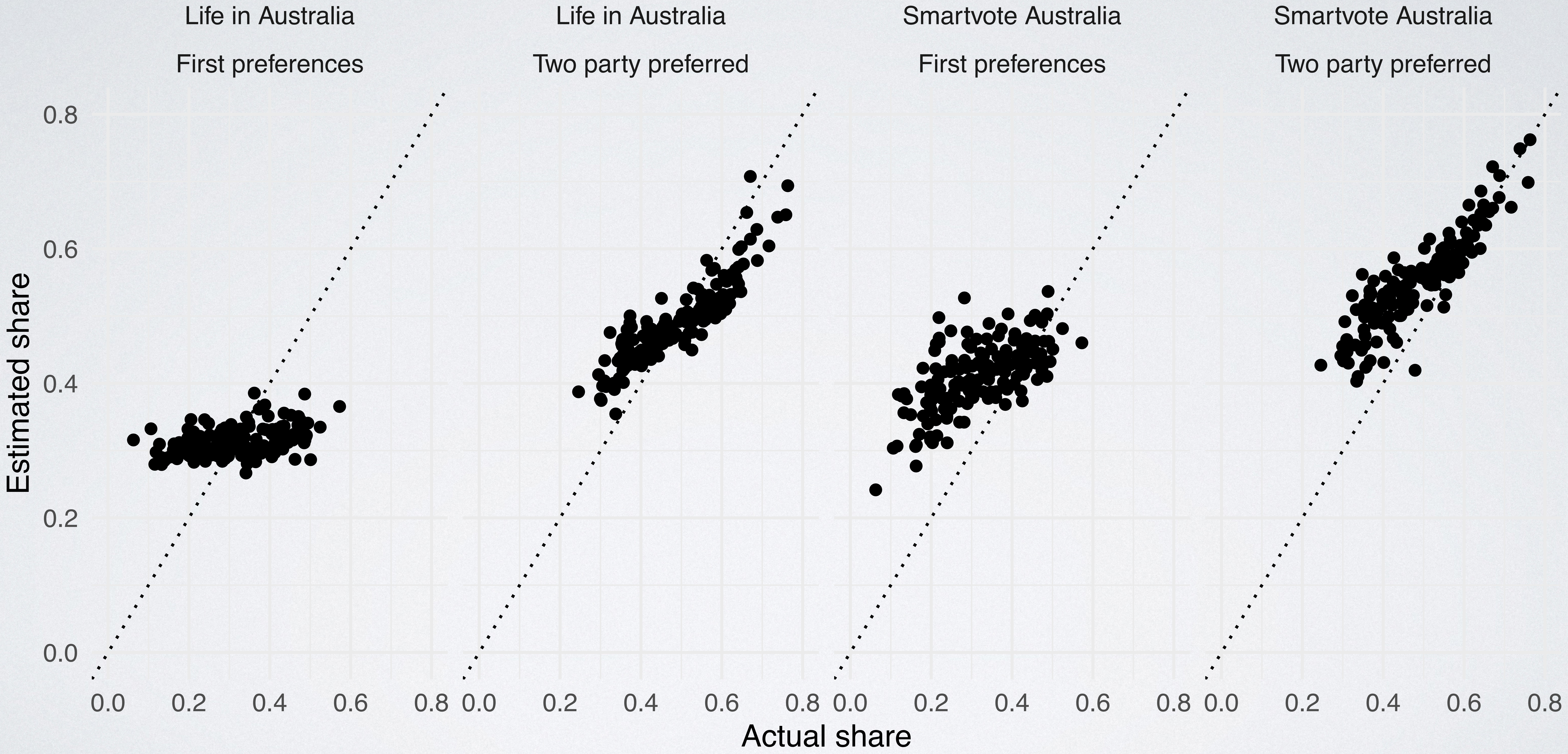
LINA IS VERY UNCERTAIN



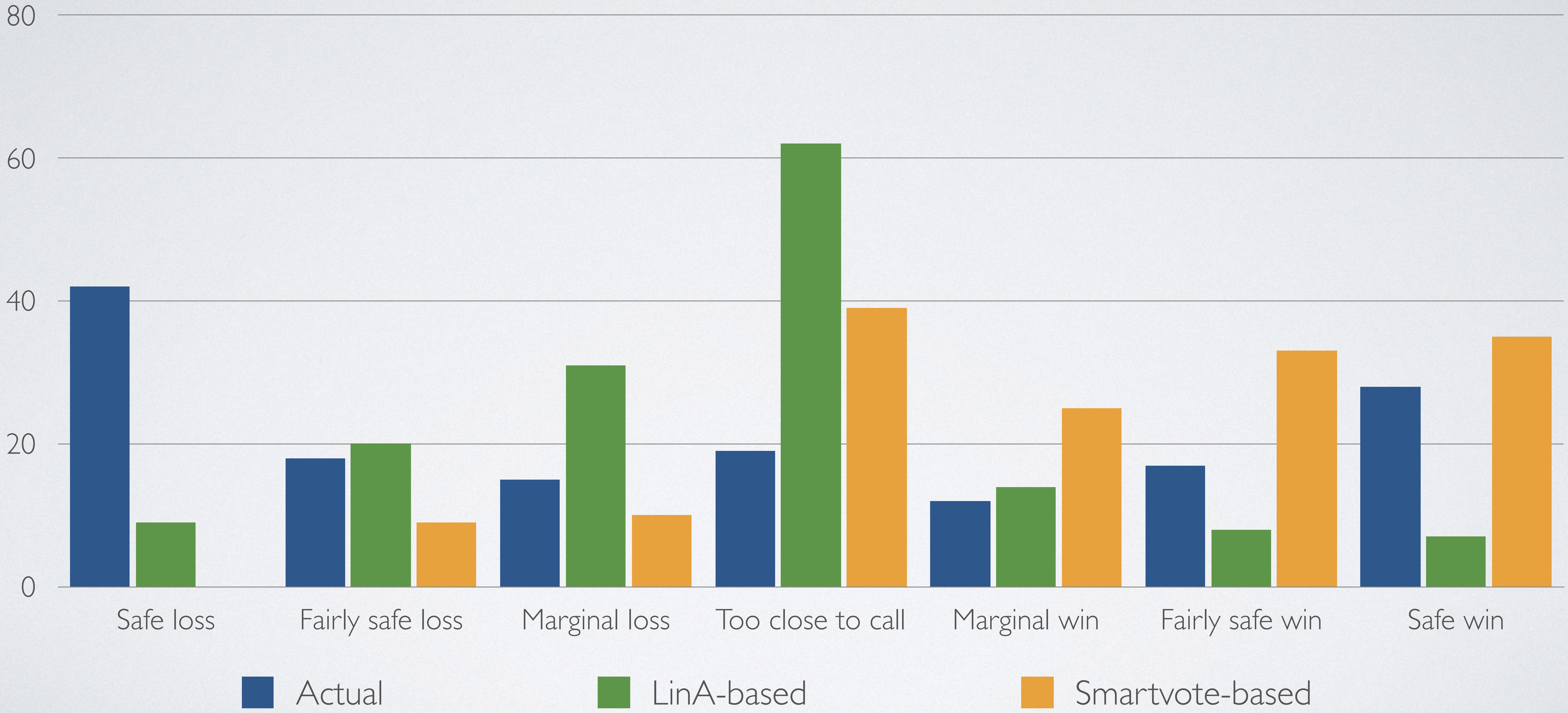
THERE'S A LOT OF DATA SHARING



NONETHELESS RESULTS ARE PROMISING



(KIND OF)


80
60
40
20
0
Safe loss
Fairly safe loss
Marginal loss
Too close to call
Marginal win
Fairly safe win
Safe win
Actual
LinA-based
Smartvote-based

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SUMMARY

1. Established a framework for evaluating forecasting models of parliamentary elections.

2. Sketched and implemented a model that could be used with existing datasets.

3. Compared the results when using two different surveys.

WEAKNESSES

Data

- Post-stratification dataset comes from the census.
- Not distinguishing between early and regular voting.

Model

- Binomial (for now).
- Anchored to the past, yet not really taking full advantage of this.
- Assumed parliament dominated by a few parties - no coalition concerns.

Communication

- Need to better communicate results.
- Replicability still requires confidence with stats and clean datasets.

GETTING STARTED

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Getting started with MRP

Multi-level regression with post-stratification (MRP) is a popular way to adjust non-representative samples to better analyse opinion and other survey responses. I recently ran a hands-on workshop at the ANU, aimed at interested, but not experienced, social scientists to help de-mystify MRP. The workshop aimed to give participants the ability and confidence to: 1) critically read papers that use it; and 2) apply it in their own work. Examples of how to implement MRP were illustrated in R using the brms package. The following post gives the outline of the workshop and the material and coding exercises covered.

AUTHOR	PUBLISHED	CITATION
Rohan Alexander	Dec. 3, 2019	Alexander, 2019

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FORECASTING PARLIAMENTARY ELECTIONS

This is a first draft and I would appreciate your critical comments:

- What do you think of the framework?
- What was confusing about the data used?
- Does the model make sense?
- What diagnostics would you like?
- What results would you like to see?
- Are there structural issues with the paper?

Email: rohan.alexander@utoronto.ca.

Code/data/model: https://github.com/RohanAlexander/ForecastingMultiDistrictElections.