Exploring the effects of socioeconomic factors on voter preferences:

A case-study of France 2022

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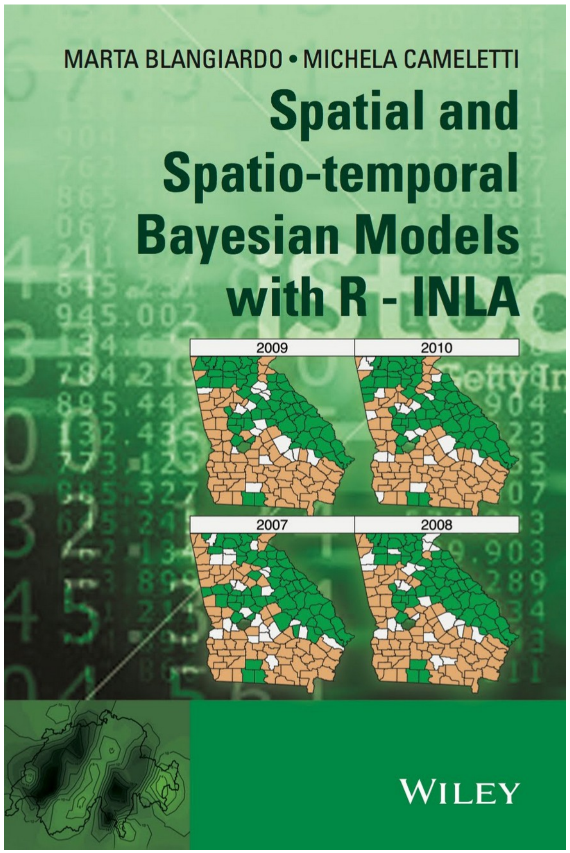
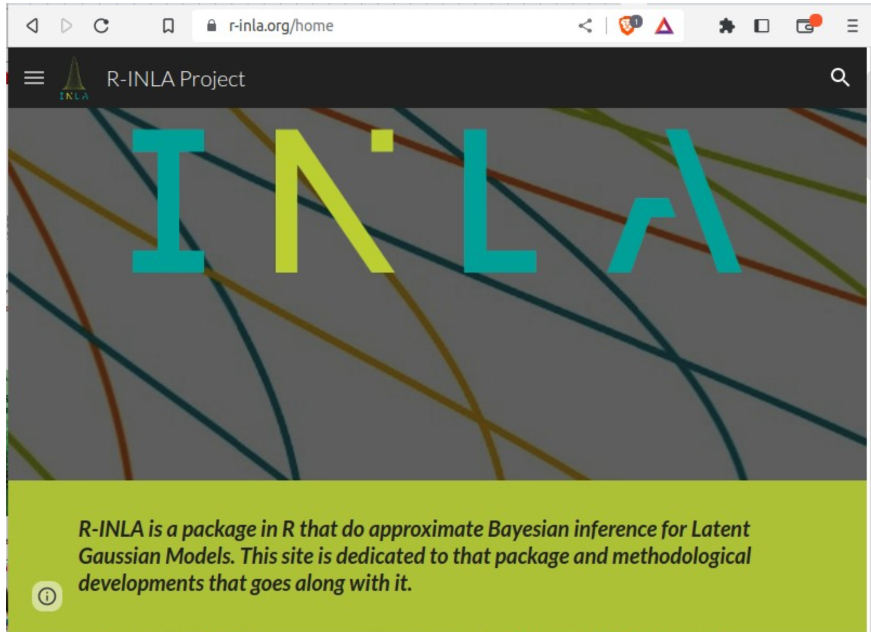
For what's next

Our motivation(s) for this project





What is the relationship between different socioeconomic factors and voters' preferences?

Are there any significant effects that have not been considered?

Data and source code – reproducibility

Raw census data files for departments, raw 2022 first-round French election result data and the **French departments' boundaries data** are extracted from **INSEE**(2), **Open Data France**(3) and **Berkeley library**(4) websites

[2] https://www.insee.fr/fr/accueil
[3] https://www.data.gouv.fr/
[4] https://geodata.lib.berkeley.edu/

Model data preparation

Election results

1st-round voting

- 12 candidates

2nd-round voting

- 2 candidates

Census data (6)

- Immigration rate
- Poverty rate
- Higher education rate
- Average life expectancy
- Unemployment rate
- White-collar rate

French metropolitan boundaries

Regions

- 13 regions

Departments

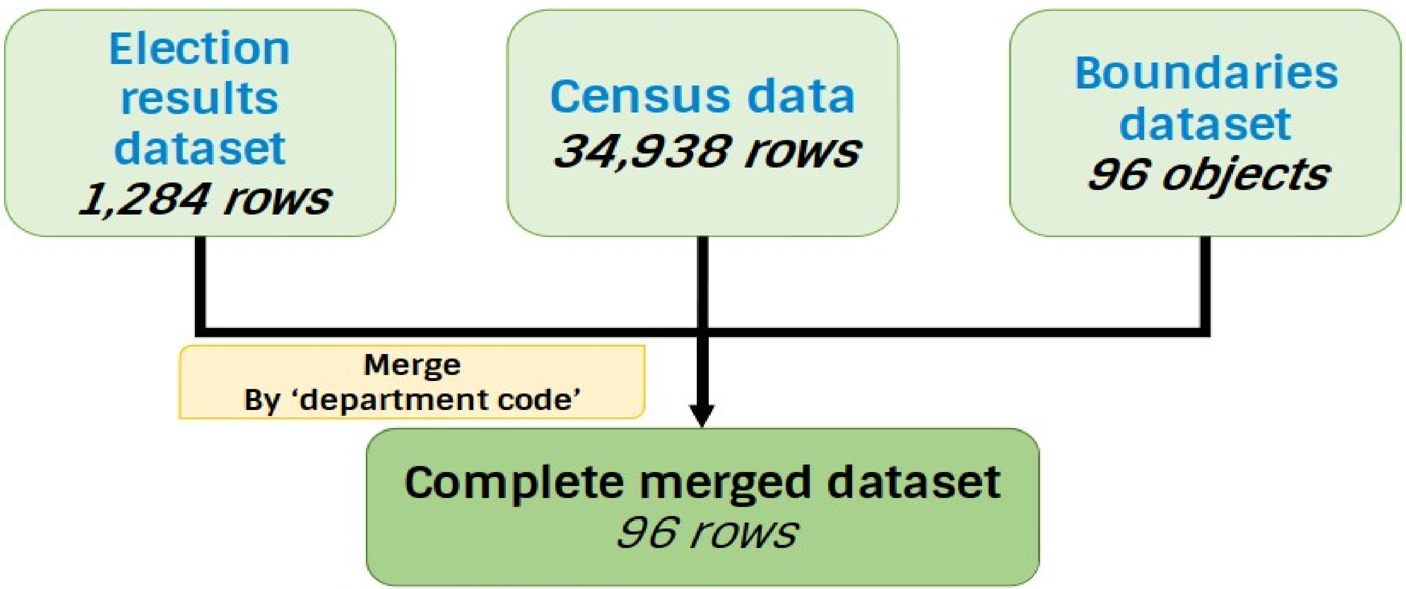
- 96 departments

Cantons

- 1,995 cantons

Communes

- 3,4826 communes



Model formulation

The Poisson log-linear model used here is defined as follows:

$$y_{ij} \sim Poisson\left(\lambda_{ij}\right)$$
$$\log\left(\lambda_{ij}\right) = \phi_i + X_i B_j + s_{ij}$$

where y_{ij} is the number of votes for candidate j in the department i, ϕ_i is the intercept for department i, X_i is the vector of covariates for department i, B_j is the vector of coefficients for candidate j, and s_{ij} is the spatial random effect for candidate j in department i.

Besag model

$$s_i \mid s_{k \neq i} \sim N\left(\frac{1}{n_i}\sum_{k \sim i} s_i, \frac{\sigma_s^2}{n_i}\right)$$

We've dropped the j subscript for simplicity

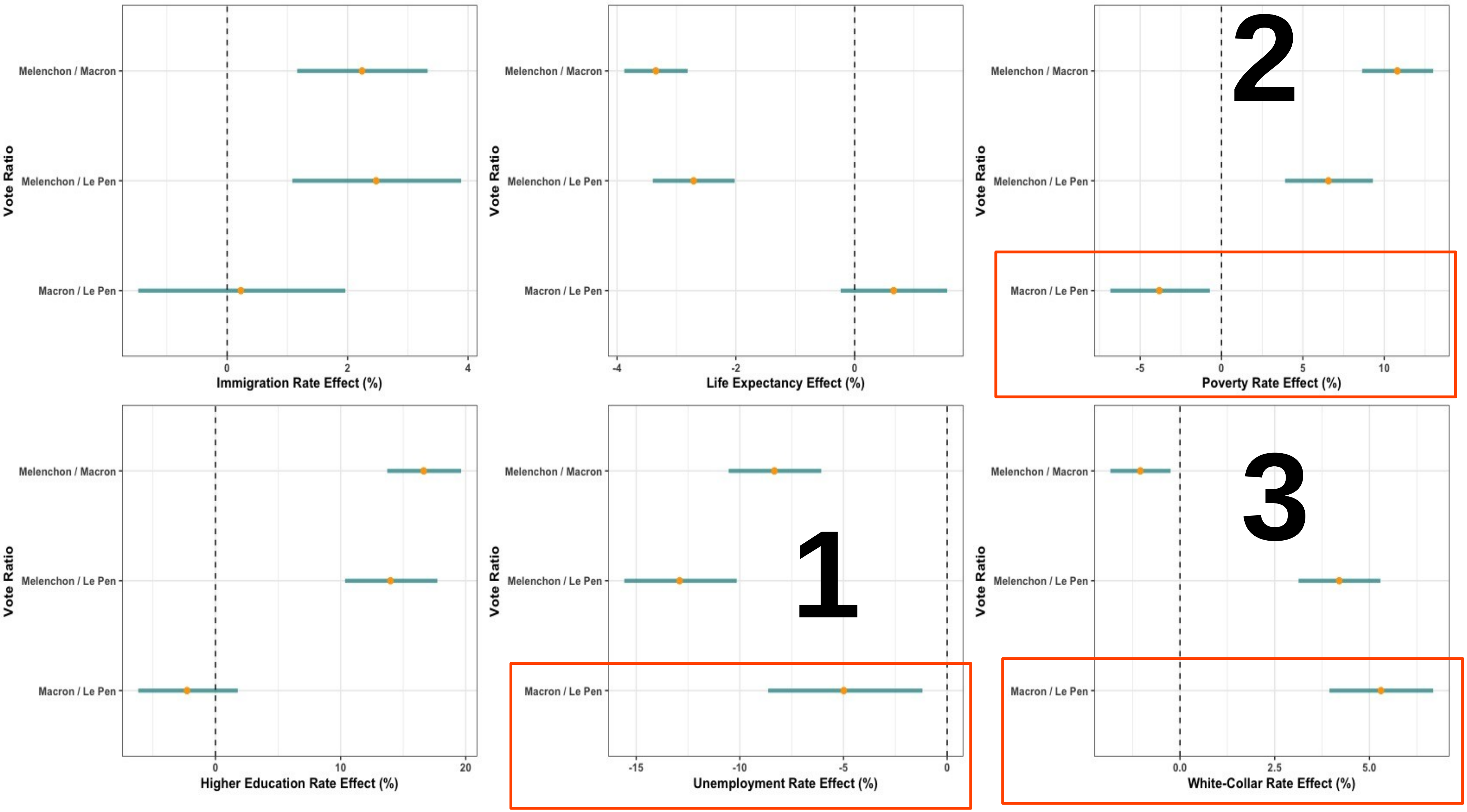
where $k \sim i$ refers to all neighbors of the department i, with n_i representing the total number of neighbors and σ_s^2 is the variance of the spatial random effect.

Efforts to make this approach less computationally expensive

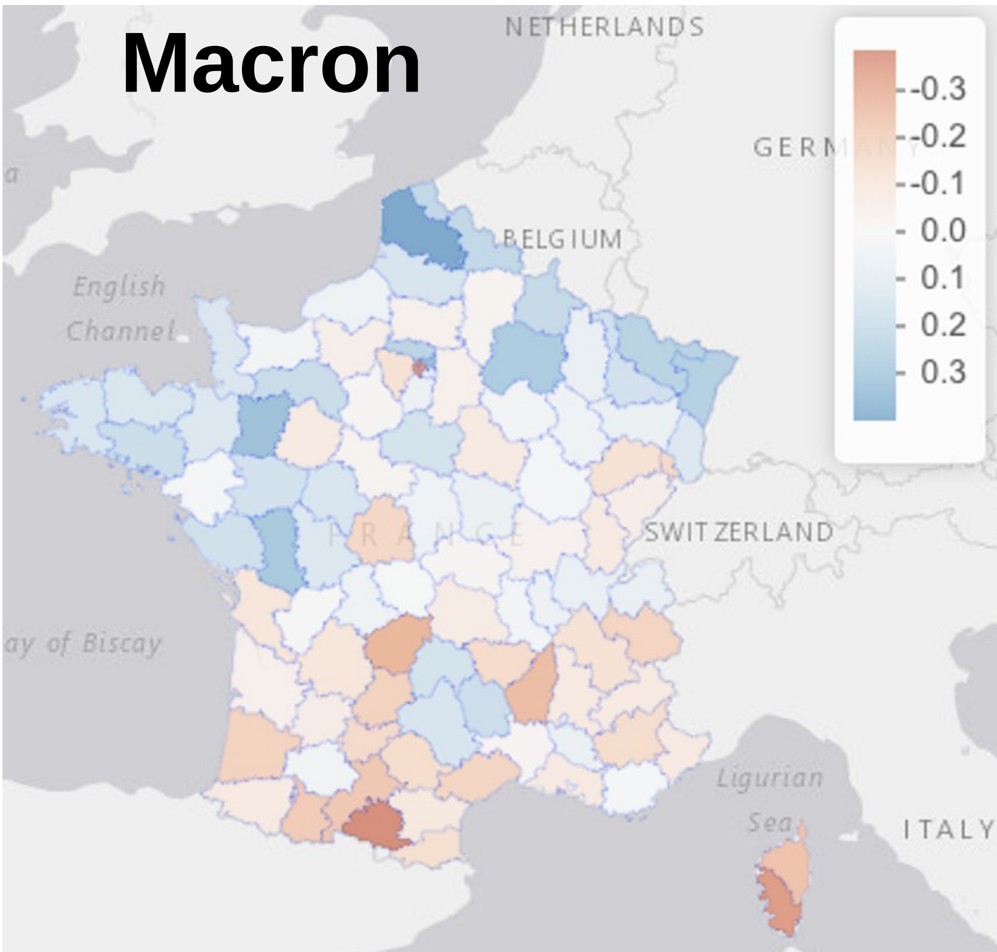
this shoudlnt be candidates' votes in each department

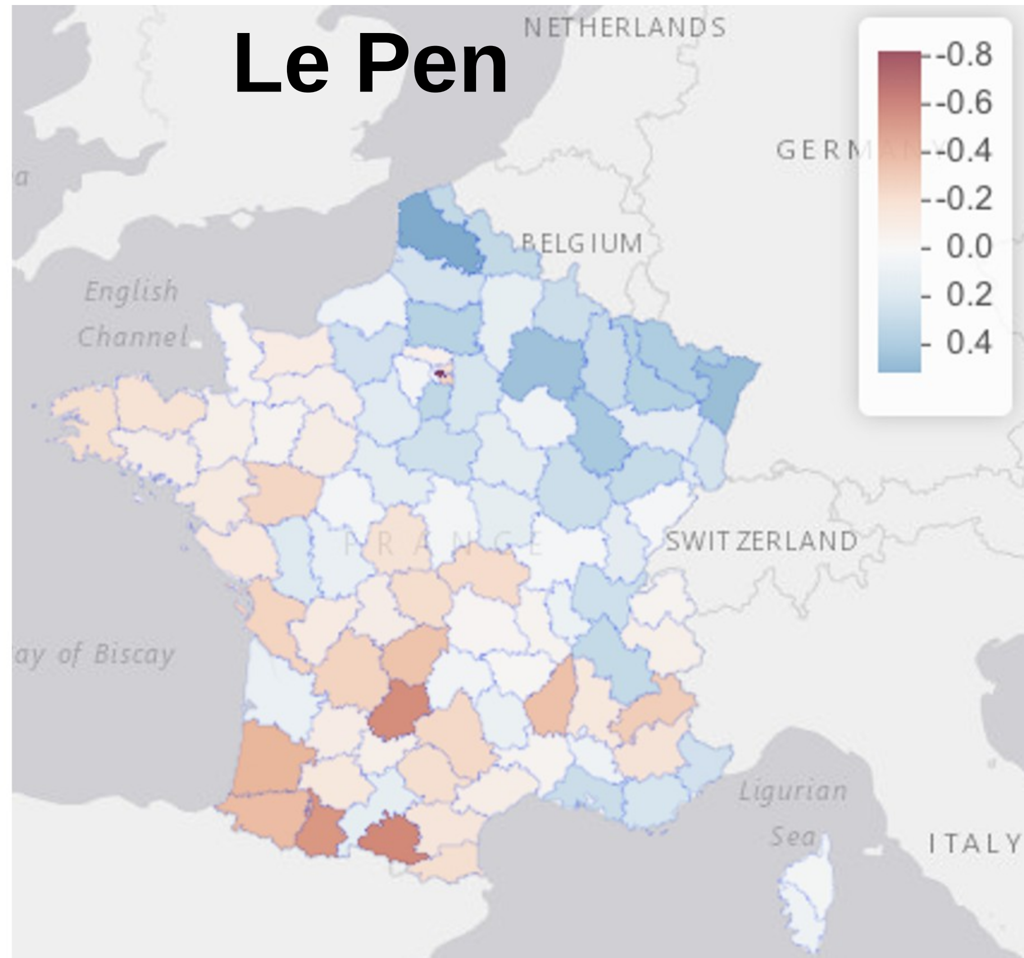
- Candidate votes each in a department follow a multinomial distribution (expensive)
- **Convert this distribution to a less expensive Poisson distribution**
- Poisson Log-linear – faciliated by INLA in R.
- However: **coefficients of covariates are no longer identifiable** (but **we have the ratio of covariates for each pair of candidates**)

Results – our 6 predictors



Maps of the spatial random effect in latent space



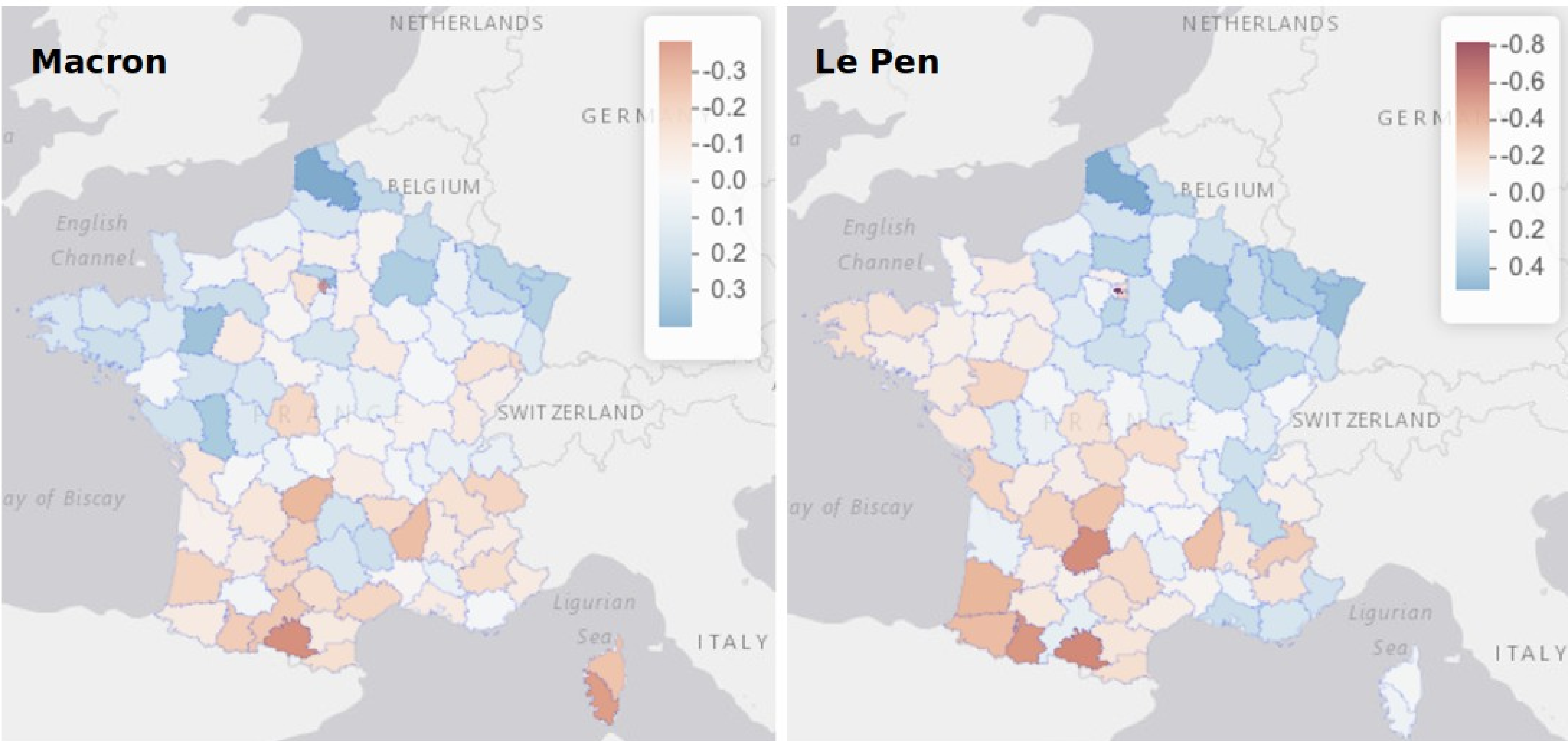


What is the relationship between different socioeconomic factors and voters' preferences?

Candidates	Higher Education Rate	Unemployment Rate	White-collar Rate	Poverty Rate	Immigration Rate	Average Life Expectancy
Melenchon / Macron	↗	↘	↘	↗	↗	↘
Melenchon / Le Pen	↗	↘	↗	↗	↗	↘
Macron / Le Pen	Not Significant	↘	↗	↘	Not Significant	Not Significant

Are there any significant effects that have not been considered?

- Spatial effect accounted for the variance not explained by the predictors of our dataset.



Conclusions from our work

- The **socioeconomic factors significantly shape voters' preferences towards candidates** for the French presidential election and **their impact varies spatially**.
- It is **crucial to consider the spatial random effects** in order to effectively capture the tendencies of over and underestimation in our model.
- **Openly available data and strong software support** makes this work possible.

Future and further work

- **Consider analysis of 2012 and 2017 French presidential elections** (for comparisions)
- **Test the effectiveness of the model in other countries** and compare to observations from the French presidential election(s)
- **Look at other problems outside of voting and elections** for application of this approach

An investigation of the effects of lockdowns and COVID-19 vaccinations in Ireland

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Abstract. The COVID-19 pandemic resulted in many deaths and much upheaval worldwide. Public health responses to the pandemic differed greatly between countries. In 2023, as we emerge from the aftermath of the pandemic, it is now timely to assess the impact of specific public health response measures such as lockdowns and vaccinations. This assessment can help inform the development of evidence-based strategies for future public health responses in pandemic scenarios. We describe the implementation of a Bayesian Hierarchical Poisson Regression (BHPR) model to estimate the impact of pandemic response measures and vaccination on all-cause deaths, including COVID-19, in Irelan
mentation of lockdown measu
cination timeline were effecti
of deaths in Ireland by, most l
19 mortality rate. We believe
to assess the impact of pande
vaccination in other countries
available.

Keywords. COVID-19 pand
gency index, vaccination rat
modelling

1 Introduction and motivat

The COVID-19 pandemic, wh
one of the most globally impa
ory. No continent, country, or
by the effects of the pandemi
2022, over 8,250 people in Irel
19 infection (Dong et al., 20
ing, COVID-19 is still circulat
fatalities in many countries.
the emergence of new varian
2020). In the early days of th

cine or pharmaceutical treatment, efforts to contain the spread of COVID-19 focused on isolation measures for confirmed cases and self-quarantine for those who had been exposed. However, due to the high transmissibility of the virus, including spread from asymptomatic cases, these measures were not sufficient alone to fully contain the spread (Kissler et al., 2020b). Pandemic response measures, such as closing schools, public spaces, and non-essential businesses, were also implemented in an effort to reduce social interaction and opportunities for person-to-person transmission. The intended impact was to reduce the risk of overwhelming health systems and allow-

[1]https://covid19.who.int

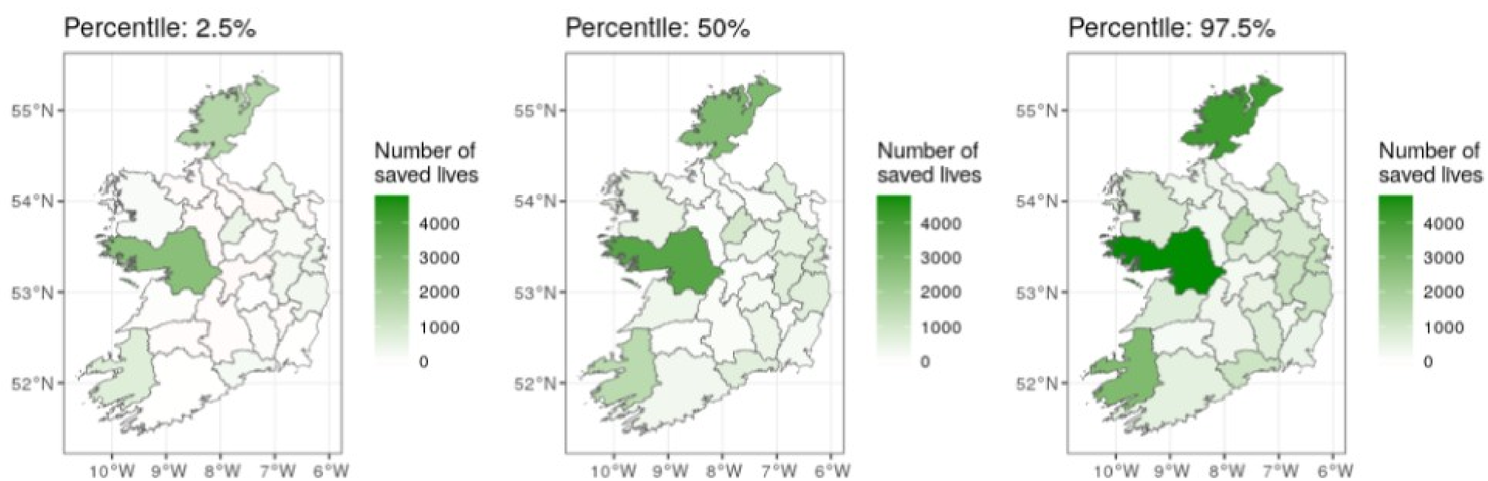

Figure 3. The number of lives saved because of lockdowns and vaccination in each county is depicted. From left to right, the maps are associated with 2.5%, 50% and 97.5% cumulative probability for the estimated numbers, respectively. The numbers in the 2.5% and the 97.5% maps indicate the 95% credible interval for saved lives in each county.

Acknowledgements etc