A Spatial Analysis of The Indian Farmers' Protest

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INTRODUCTION

In September 2020, the Indian government passed **3 new** agricultural laws (Singh, 2021):

- Farmers' Produce Trade and Commerce
- Farmers Agreement on Price Assurance
- Contract Farming Act (+Amendement)

The newly introduced acts and amendments led to over **2 years of the worlds largest protest.**

LITERATURE

- **Sentiment Analysis of Media:** Studies have shows polarization in sentiment on social media towards the protests from different actors. (Kronstadt, K. A. 2021).
- **Union Involvement**: There is discourse on whether the protests are led by farmers or traders and if political religious groups are involved. (Walia, H. 2021)
- **Nature of the Protest**: Protests are often confronted by a massive, intimidating police presence (or police violence) (Todhunter, 2021).
- **Spatial Analysis of Protests**: Researchers highlights spatializing the study of continuous politics or using event-level data to explore protest mobilization and diffusion (Ceccato et al., 2022)

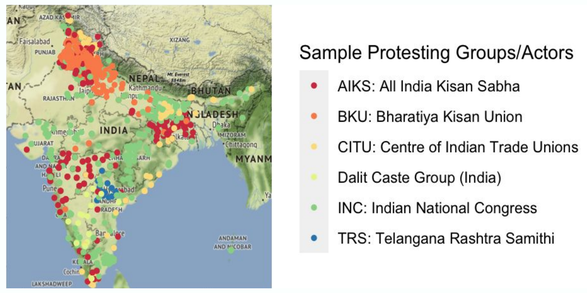
RESEARCH Qs

- **What impact do actors have on the Farmers' Protests from 2019-2021?**
- Is the spatial distribution of protests involving **trade** unions different from protests involving **non-trade** unions?
- How do **regional** vs **central** organizations play different roles in where protests happen?
- Do **political** vs **religious** organizations play different roles in the spatial distribution of protests?

DATA

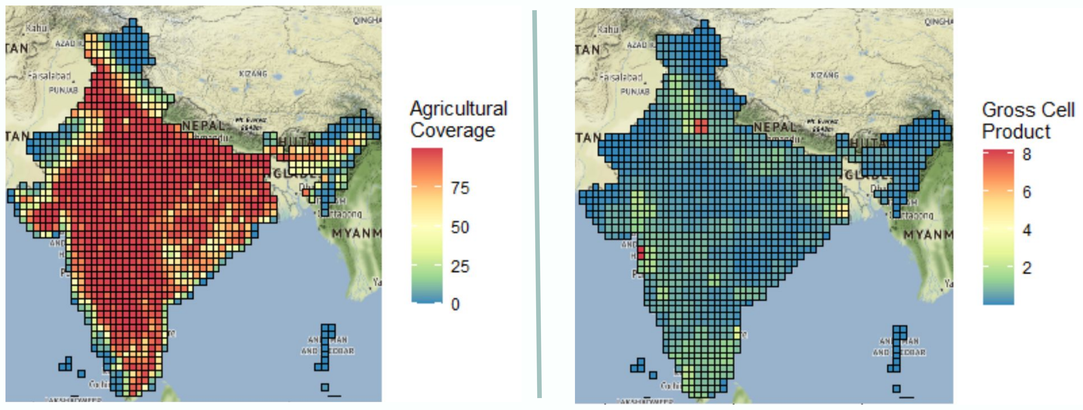
ACLED: The Armed Conflict Location & Event Data Project

- Over 6,000 unique protests reported between 2019-2021
- **4 out of 17** variables were used: event id , latitude, longitude, Population of 2020



Demographic and Socioeconomic Data:

- PRIO-GRID dataset is a standardized spatial **grid structure** with global terrestrial coverage.
- Variables used: agricultural coverage, child malnutrition rate, population, gross cell (domestic) product (in USD)



METHODS

We utilize a log Gaussian Cox process for our analysis of the following form:

$$\lambda(s) = \exp(X'\beta + \omega(s))$$

The Gaussian process utilizes an exponential correlation function with scale parameter σ and range parameter ϕ.

Model Notation:

- X: PRIO socioeconomic variables
- $\lambda(s)$: spatial intensity
- Parameters estimated from the data with MCMC: β and σ (ϕ is fixed)

Computational Approach:

- Bayesian hierarchical model using NIMBLE R Package
- Normal(0,100) priors for regression coefficients and Inverse Gamma prior for σ, based on related work
- Convergence assessed with effective sample size and trace plots

RESULTS FRAMEWORK

In order to analyze the potential impact of actors on the Farmers' Protests, we seek to compare regression coefficients (β) across three different axes.

We compare the regression coefficients in the spatial intensities of protest events that include the following actor types. We note that the sample sizes for these comparisons can differ dramatically, and we include them below in parentheses.

1. Trade union (n = 171) vs Not-trade union (2,742)
2. Regional (2,008) vs Central (2,360) Organizations
3. Political (1,166) vs Religious (80)

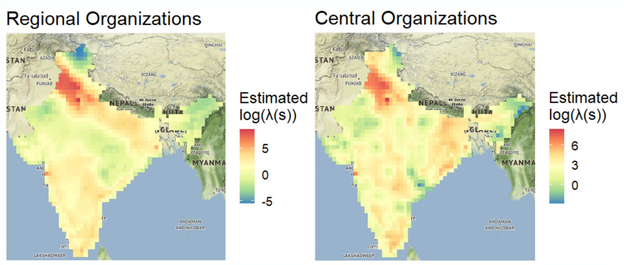
We present posterior mean estimates for β after removing burnin in the following section. Complete results will be posted on arXiv soon.

RESULTS

- We include posterior mean estimates and 95% credible intervals below.
- Through comparison of regression coefficients, we find that the effect of most variables are consistent across actor types
- In the table below, we see that the impact of gross cell product on the spatial intensity of protests changes based on the actors involved
- The effect of GCP is negative for many actor types and positive for central organizations
- Events with religious actors had many repeated locations, results are omitted.

Actors	Agri. Coverage	Child Mal. Rate (Mean)	Population	Gross Cell Product
Trade Union	0.02 (0.01, 0.03)	-0.03 (-0.13, 0.04)	8.73×10^{-7} (6.31×10^{-7}, 1.13×10^{-6})	-1.03 (-1.60, -0.44)
Farmers' Union	0.02 (0.02, 0.03)	-0.11 (-0.13, -0.09)	2.47×10^{-7} (2.19×10^{-7}, 2.75×10^{-7})	0.01 (-0.06 0.07)
Regional	0.03 (0.02, 0.04)	-0.13 (-0.15, -0.11)	3.01×10^{-7} (2.67×10^{-7}, 3.39×10^{-7})	-0.08 (-0.17, -0.01)
Central	0.03 (0.02, 0.04)	-0.06 (-0.07, -0.03)	2.58×10^{-7} (1.80×10^{-7}, 3.07×10^{-7})	0.12 (0.03, 0.37)
Political	0.02 (0.02, 0.03)	-0.06 (-0.10, -0.04)	4.38×10^{-7} (3.75×10^{-7}, 5.06×10^{-7})	-0.26 (-0.42, -0.11)

In the figures below, we compare estimates of the spatial intensity for central vs regional protest events:



DISCUSSION

In summary, investigation of the potential differential effects of socioeconomic characteristics to provide insight into the dynamics of the Farmers' Protests in India. The interaction between GCP and regional vs central organizations defines how the organizations attempt to represent diverse socioeconomic backgrounds.

Future work:

- Incorporation of temporal changes in the spatial intensity of protests
- Incorporate *bounded* spatial actors (eg. regional unions) and their interaction in subgroups.
- Investigate additional variables

Citations:

- Kronstadt, K. A. (2021). Farmer protests in india.
- Singh, K. et al. (2021). My crop my right: The farmer's act 2020. IAHRW International Journal of Social Sciences Review, 9(3):197–198.
- Singh, N. (2021). Agrarian crisis and the longest farmers' protest in indian history. In New Labor Forum, volume 30, pages 66–75. SAGE Publications Sage CA: Los Angeles, CA.
- Todhunter, C. (2021). Smashing the heads of farmers: A global struggle against tyranny.
- Walia, H. (2021). The Indian farmers' protest is a window on a new world. Briarpatch Magazine.
- Ceccato (2022). Pandemic Restrictions and Spatiotemporal Crime Patterns in New York, São Paulo, and Stockholm." Journal of Contemporary Criminal Justice, vol. 38, no. 1, Feb. 2022, pp. 120–49. EBSCOhost, https://doi.org/10.1177/10439862211038471.