A Bayesian Measurement Model of Political Support for Endorsement Experiments, with Application to the Militant Groups in Pakistan

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Motivation I

- Measuring support for political actors (e.g., candidates, parties)
- Standard survey questions: Likert scale, feeling thermometer, etc.
- Sensitive questions:

  nonresponse, social desirability bias, safety concerns

- Existing survey techniques:
  - Randomized response technique
  - Item count technique

- Endorsement experiments: Ask respondents to rate their support for a set of policies endorsed by randomly assigned political actors

Motivation II

- Item response theory:
  - Originates in the educational testing literature
  - Ideal point estimation in US Congress
  - Scaling justices (via votes), newspapers (via editorials), etc.

- A Bayesian measurement model for endorsement experiments:
  - Measuring support and issue ownership on the ideal points scale
  - Hierarchical modeling for efficient partial pooling
  - Individual level covariates and poststratification

Endorsement Experiments

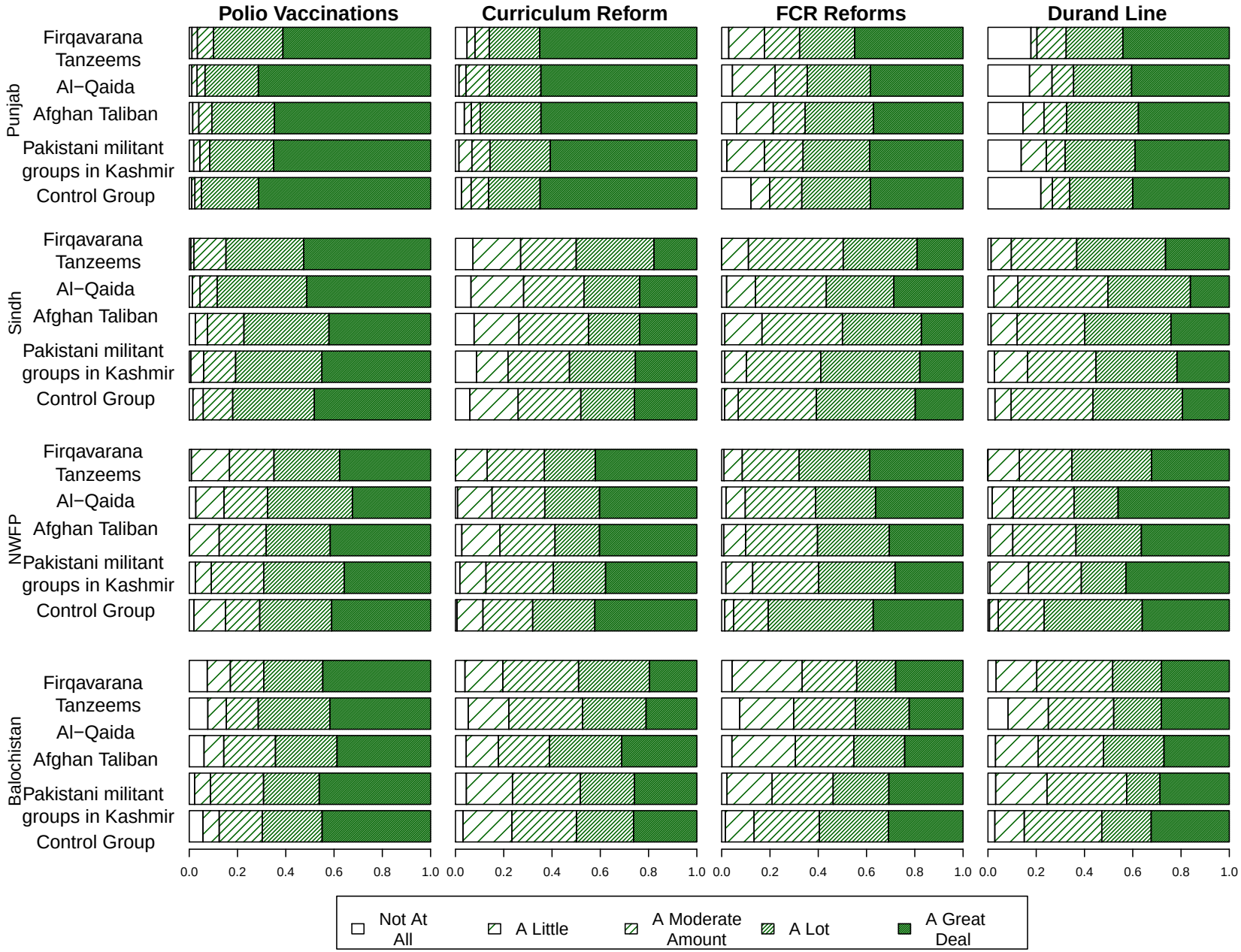
- Goals:
  1. Measure the strength of support and issue ownership
  2. Reduce nonresponse rate
  3. Minimize social desirability bias
  4. Address safety concerns

- Experimental design:
  1. Select policy questions
  2. Randomly divide sample into control and treatment groups
  3. Across respondents and questions, randomly assign political actors for endorsement (no endorsement for the control group)
  4. Compare support level for each policy endorsed by different actors

The Pakistani Survey Experiment

- 6,000 person urban-rural sample
- Four different groups:
  - Pakistani militants fighting in Kashmir (a.k.a. Kashmiri tanzeem)
  - Militants fighting in Afghanistan (a.k.a. Afghan Taliban)
  - Al-Qa'ida
  - Firqavarana Tanzeems (a.k.a. sectarian militias)
- Four policies:
  - WHO plan to provide universal polio vaccination across Pakistan
  - Curriculum reform for religious schools
  - Reform of FCR to make Tribal areas equal to rest of the country
  - Peace jirgas to resolve disputes over Afghan border (Durand Line)
- Response rate; over 90%

Distribution of Responses



Endorsement Experiments Framework

- Data from an endorsement experiment:
  - N respondents
  - J policy questions
  - K political actors
  - $Y_{ij} \in \{0, 1\}$: response of respondent i to policy question j
  - $T_{ij} \in \{0, 1, \ldots, K\}$: political actor randomly assigned to endorse policy j for respondent i
  - $Y_{ij}(t)$: potential response given the endorsement by actor t
  - Covariates measured prior to the treatment

The Proposed Model

- Quadratic random utility model:

$$\begin{aligned} U_i(\zeta_{j1}, k) &= -\|(x_i + s_{ijk}) - \zeta_{j1}\|^2 + \eta_{ij}, \\ U_i(\zeta_{j0}, k) &= -\|(x_i + s_{ijk}) - \zeta_{j0}\|^2 + \nu_{ij}, \end{aligned}$$

  where x_i is the ideal point and s_{ijk} is the support level

- The statistical model (item response theory):

$$\begin{aligned} \Pr(Y_{ij} = 1 \mid T_{ij} = k) &= \Pr(Y_{ij}(k) = 1) = \Pr(U_i(\zeta_{j1}, k) > U_i(\zeta_{j0}, k)) \\ &= \Pr(\alpha_j + \beta_j(x_i + s_{ijk}) > \epsilon_{ij}) \end{aligned}$$

- Hierarchical modeling:

$$\begin{aligned} x_i &\overset{\text{indep.}}{\sim} \mathcal{N}(Z_i^\top \delta,\ \sigma_x^2) \\ s_{ijk} &\overset{\text{indep.}}{\sim} \mathcal{N}(Z_i^\top \lambda_{jk},\ \omega_{jk}^2) \\ \lambda_{jk} &\overset{\text{i.i.d.}}{\sim} \mathcal{N}(\theta_k, \Phi_k) \end{aligned}$$

- "Noninformative" hyper prior on $(\alpha_j, \beta_j, \delta, \theta_k, \omega_{jk}^2, \Phi_k)$

Quantities of Interest and Model Fitting

- Average support level for each militant group k

$$\begin{aligned} \tau_{jk}(Z_i) &= Z_i^\top \lambda_{jk} \quad \text{for each policy } j \\ \kappa_k(Z_i) &= Z_i^\top \theta_k \quad \text{averaging over all policies} \end{aligned}$$

- Standardize them by dividing the (posterior) standard deviation of ideal points
- Issue ownership: variation of average support for each group across policies

- Bayesian Markov chain Monte Carlo algorithm
- Multiple chains to monitor convergence
- Implementation via `JAGS` (Plummer)

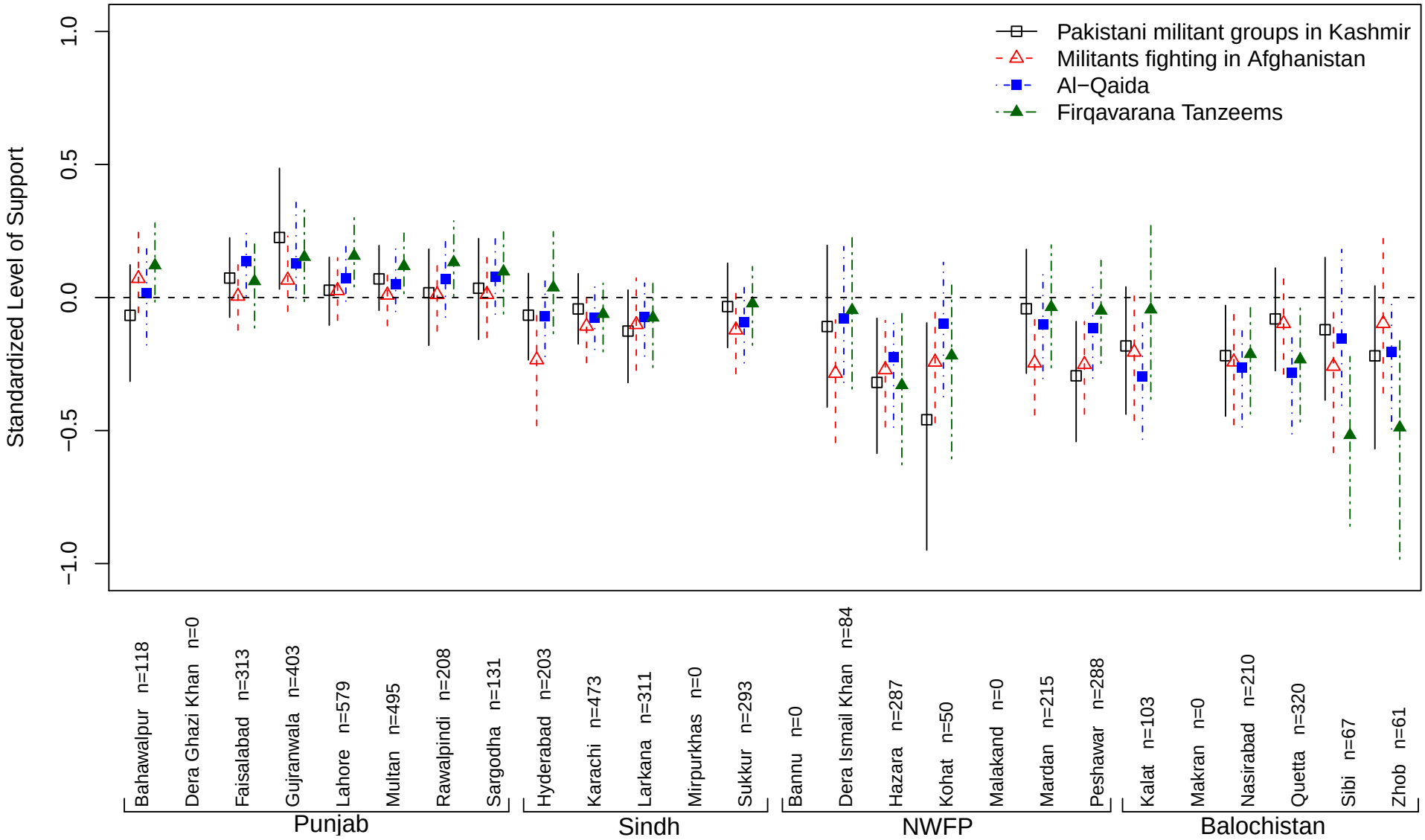
Model for the Division Level Support

- Ordered response with an intercept α_{jl} varying across divisions
- The model specification:

$$
\begin{aligned}
x_i &\overset{\text{indep.}}{\sim} \mathcal{N}(\delta_{\text{division}[i]}, 1) \\
s_{ijk} &\overset{\text{indep.}}{\sim} \mathcal{N}(\lambda_{k,\text{division}[i]}, \omega_k^2) \\
\delta_{\text{division}[i]} &\overset{\text{indep.}}{\sim} \mathcal{N}(\mu_{\text{province}[i]}, \sigma^2_{\text{province}[i]}) \\
\lambda_{k,\text{division}[i]} &\overset{\text{indep.}}{\sim} \mathcal{N}(\theta_{k,\text{province}[i]}, \Phi_{k,\text{province}[i]})
\end{aligned}
$$

- Averaging over policies
- Partial pooling across divisions within each province

Estimated Division Level Support



Model with Individual Covariates

- Ordered response with an intercept α_{jl} varying across divisions
- The model specification:

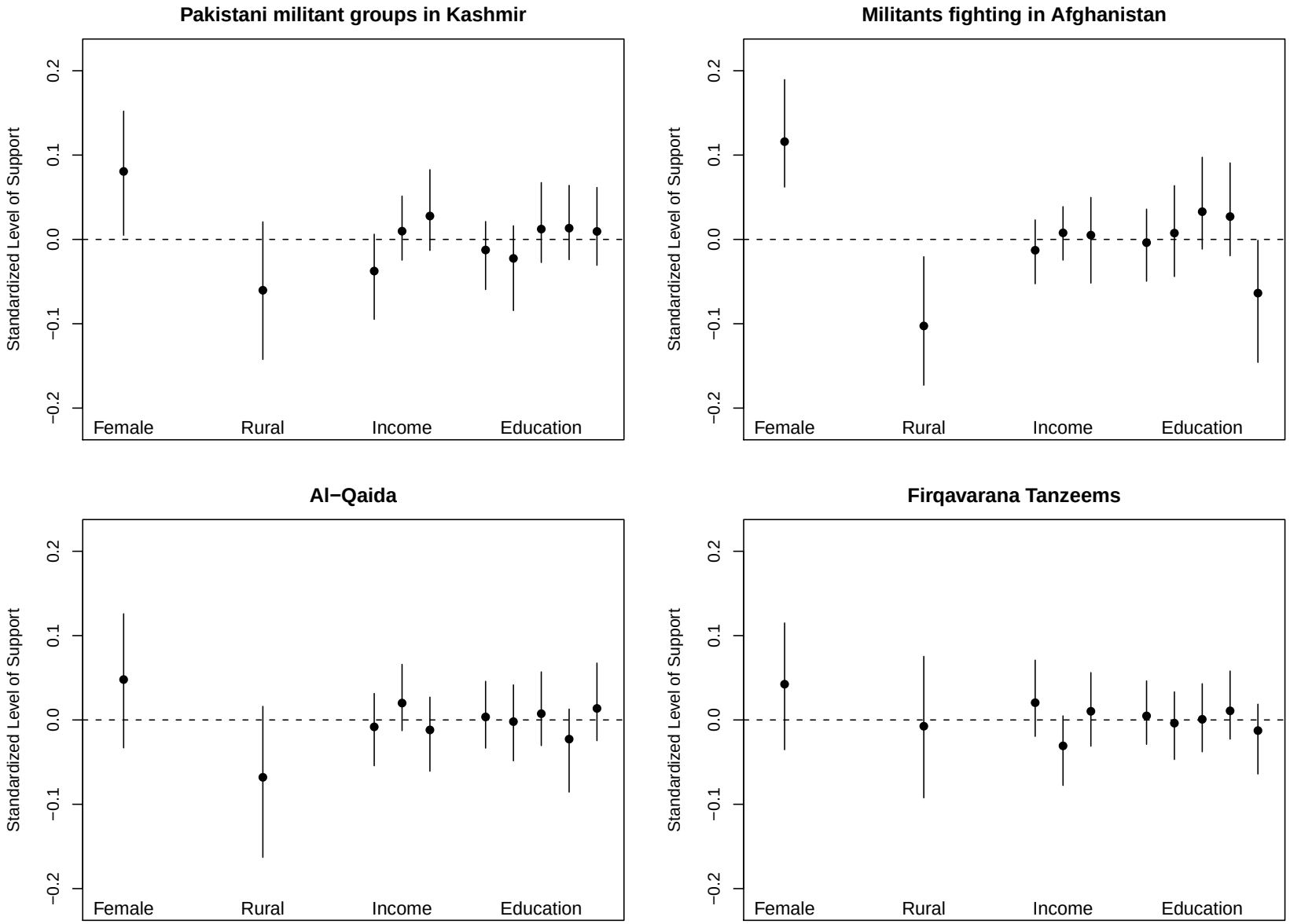
$$
\begin{aligned}
x_i &\overset{\text{indep.}}{\sim} \mathcal{N}(\delta_{\text{division}[i]} + Z_i^\top \delta^Z, 1) \\
s_{ijk} &\overset{\text{indep.}}{\sim} \mathcal{N}(\lambda_{k,\text{division}[i]} + Z_i^\top \lambda_k^Z, \omega_k^2) \\
\delta_{\text{division}[i]} &\overset{\text{indep.}}{\sim} \mathcal{N}(\mu_{\text{province}[i]}, \sigma^2_{\text{province}[i]}) \\
\lambda_{k,\text{division}[i]} &\overset{\text{indep.}}{\sim} \mathcal{N}(\theta_{k,\text{province}[i]}, \Phi_{k,\text{province}[i]})
\end{aligned}
$$

- Expands upon the division level model to include individual level covariates:

  gender, urban/rural, education, income

- Individual level covariate effects after accounting for differences across divisions
- Poststratification on these covariates using the census

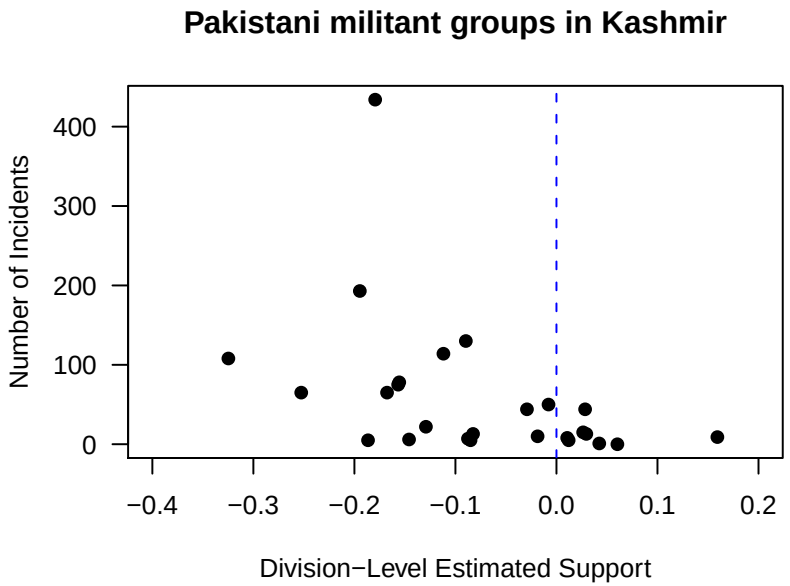
Estimated Effects of Individual Covariates

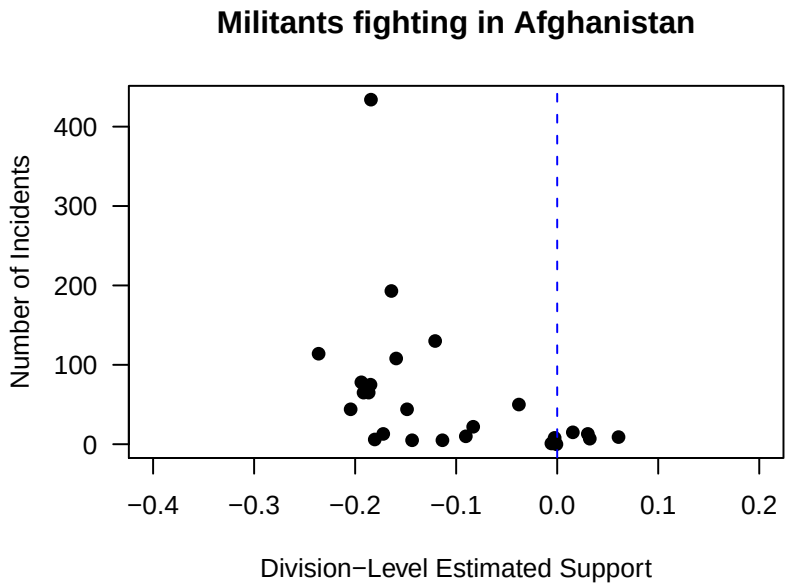


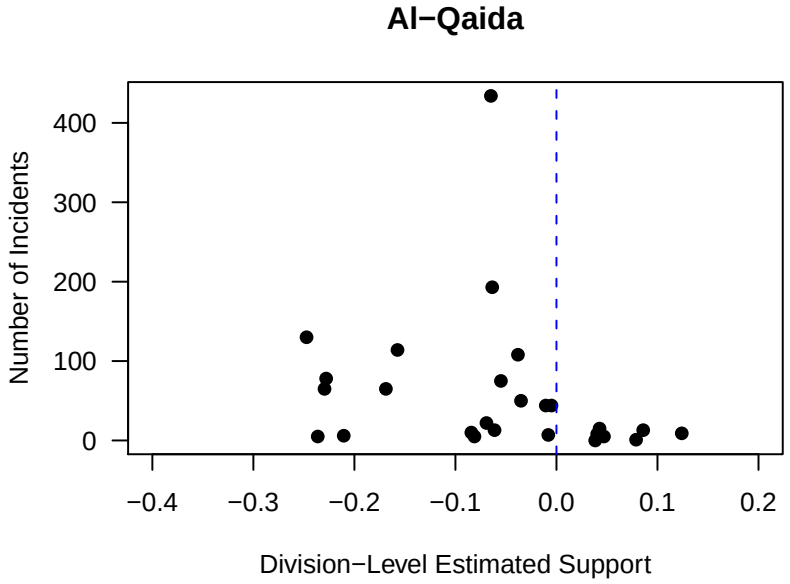
- Demographics play a small role in explaining support for groups

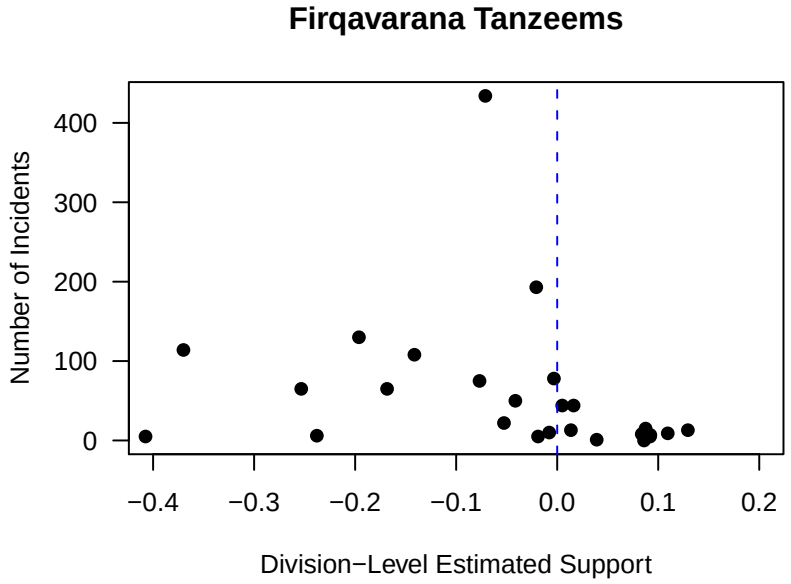
Regional Clustering of the Support for Al-Qaida

Correlation between Support and Violence







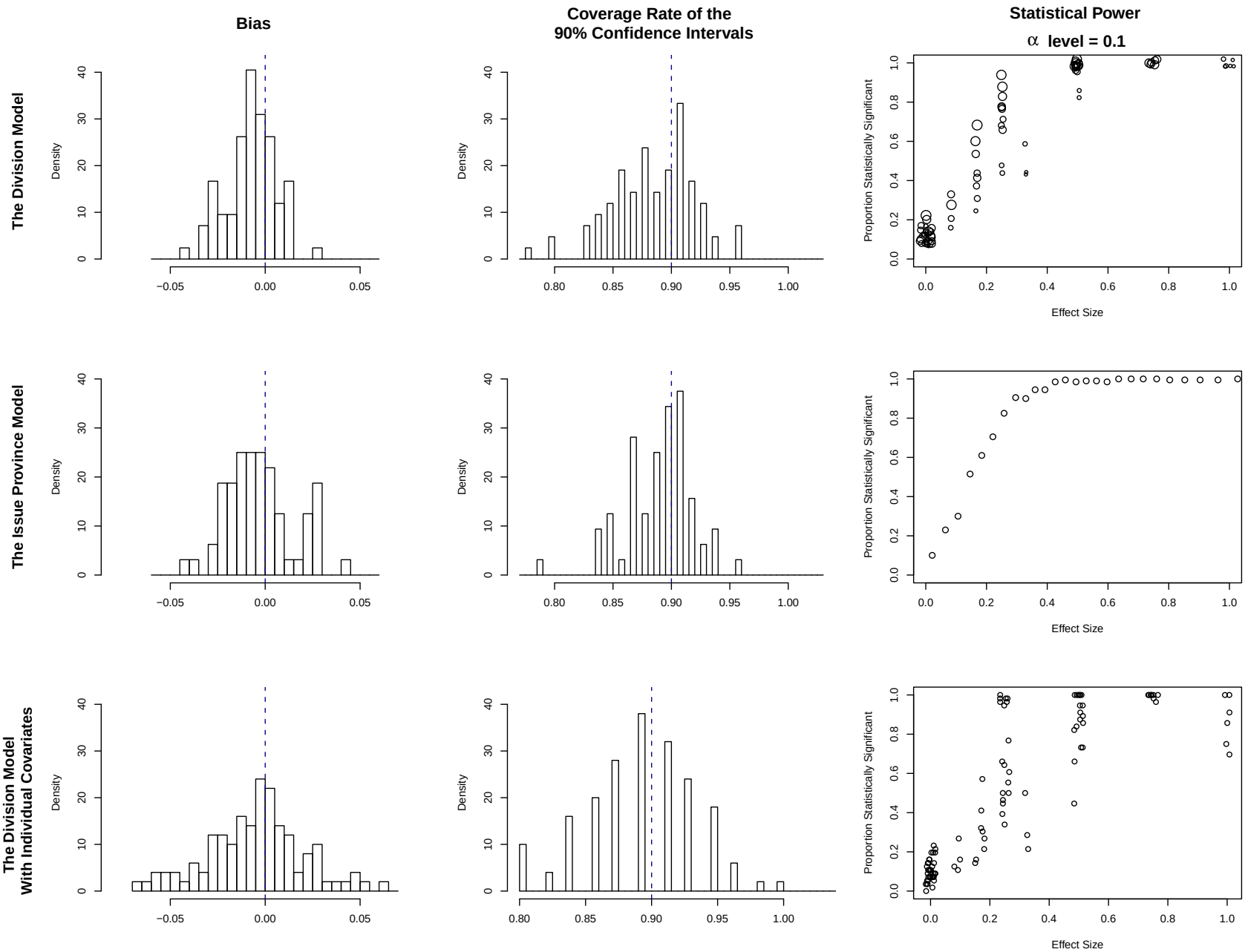


Simulation Studies

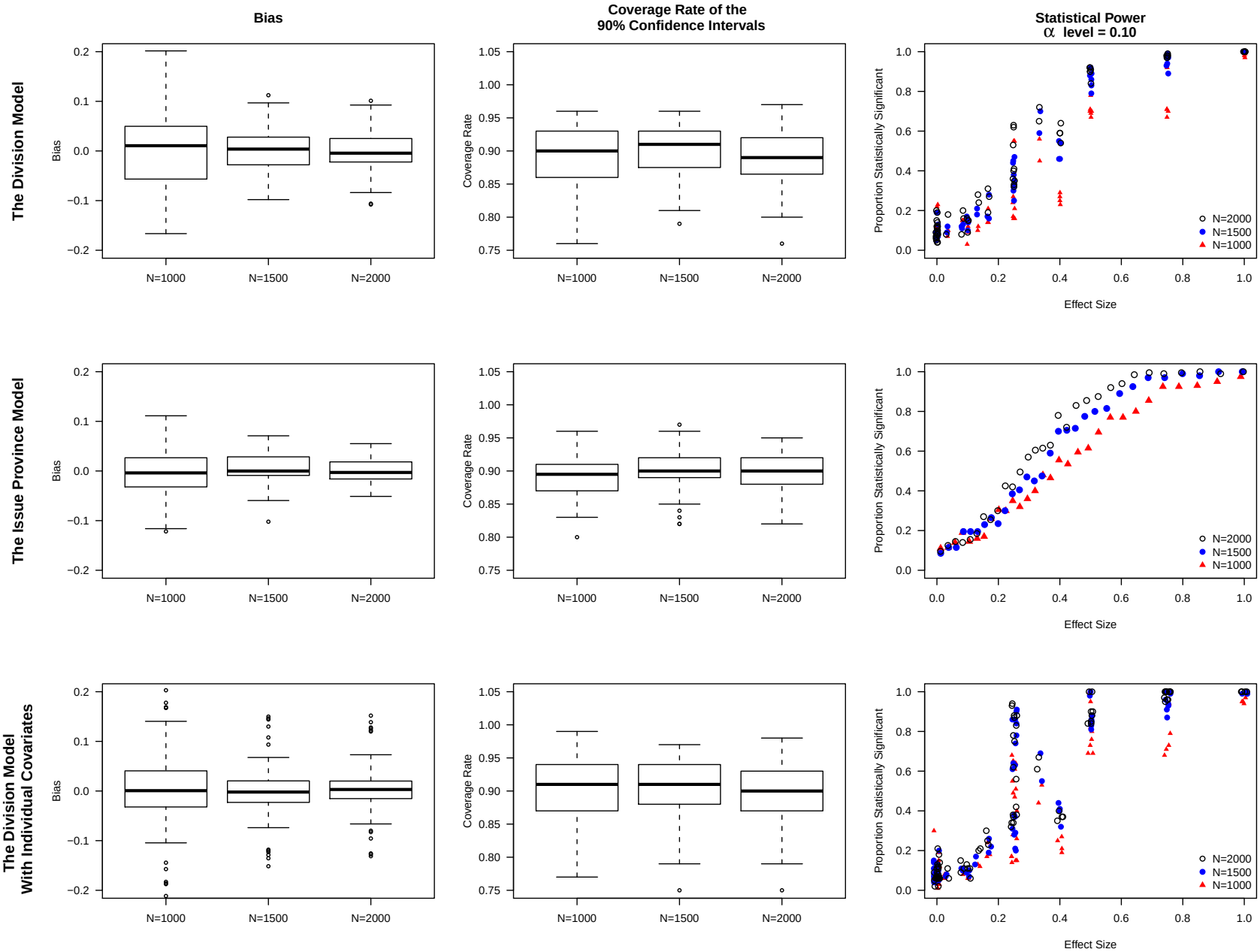
1. Based on the Pakistani Data
   - Same 2 models plus province-level issue ownership model
   - Top-level parameters held constant across simulations
   - Sample sizes and distribution same as before
   - Ideal points, endorsements and responses follow IRT models
2. Varying sample sizes
   - Model for division-level estimates with no covariates
   - Model for province-level estimates with no covariates but support varying across policies
   - $N = 1000, 1500, 2000$
   - Again, top-level parameters held constant across simulations while ideal points, endorsements and responses follow IRT models

- 100 simulations under each scenario (3 chains, 60000 iterations)
- Frequentist evaluation of Bayesian estimators

Monte Carlo Evidence based on the Pakistani Data



Monte Carlo Evidence with Varying Sample Size



Concluding Remarks

- Endorsement experiment as an alternative to the randomized response technique when studying sensitive questions
- A hierarchical Bayesian measurement model; partial pooling across policies and regions

- Empirical findings:
  - Substantial within-province variation in support for militancy
  - Small across-group variation in support
  - Conditional on division effects, covariates matter relatively little
  - The politics of militancy are intensely local

- Simulation evidence:
  - Model and estimation procedure have good frequentist properties
  - Similar studies with smaller sample sizes are also feasible

Further Research on Sensitive Survey Questions

- Item count technique as another alternative to the randomized response technique
- Also known as list experiment and unmatched count technique
- Use aggregation to protect privacy
- Example: The 1991 National Race and Politics Survey
- The script for the *randomized* control group

```
Now I'm going to read you three things that sometimes
make people angry or upset. After I read all three,
just tell me HOW MANY of them upset you. (I don't
want to know which ones, just how many.)
(1) the federal government increasing the tax on
gasoline;
(2) professional athletes getting million-dollar-plus
salaries;
(3) large corporations polluting the environment.
```

Further Research on Sensitive Survey Questions

- Item count technique as another alternative to the randomized response technique
- Also known as list experiment and unmatched count technique
- Use aggregation to protect privacy
- Example: The 1991 National Race and Politics Survey
- The script for the *randomized* treatment group

Now I'm going to read you four things that sometimes make people angry or upset. After I read all four, just tell me HOW MANY of them upset you. (I don't want to know which ones, just how many.)
(1) the federal government increasing the tax on gasoline;
(2) professional athletes getting million-dollar-plus salaries;
(3) large corporations polluting the environment.
(4) a black family moving next door to you.

New Methodology for Item Count Technique

- Easy for researchers to implement
- Easy for respondents to understand
- More widely applicable than endorsement experiments
- Need to carefully choose non-sensitive items
- Aggregation $\Longrightarrow$ loss of efficiency
- Need for multivariate analysis but not possible with existing methods

- Two new regression estimators
  - Two-step nonlinear least squares
  - Maximum likelihood estimators with EM algorithm
  - Bayesian hierarchical modeling
- Development of an R package
- Application in Afganistan; support for Taliban

Project Reference

- Bullock, Will, Kosuke Imai, and Jacob Shapiro. "Measuring Political Support and Issue Ownership Using Endorsement Experiments, with Application to Militant Groups in Pakistan."
- Imai, Kosuke. "Statistical Inference for the Item Count Technique."
- Available at http://imai.princeton.edu/projects/sensitive.html