# Alliance Participation and Military Spending

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How alliance treaty participation affects military spending depends on alliance treaty scope and state capability.

**1: Though alliance participation usually increases major power military spending, growth is lower in broad treaties.**

**1: Though alliance participation usually increases major power military spending, growth is lower in broad treaties.**

**2: Though alliance participation usually decreases non-major power military spending, growth is higher in broad treaties.**
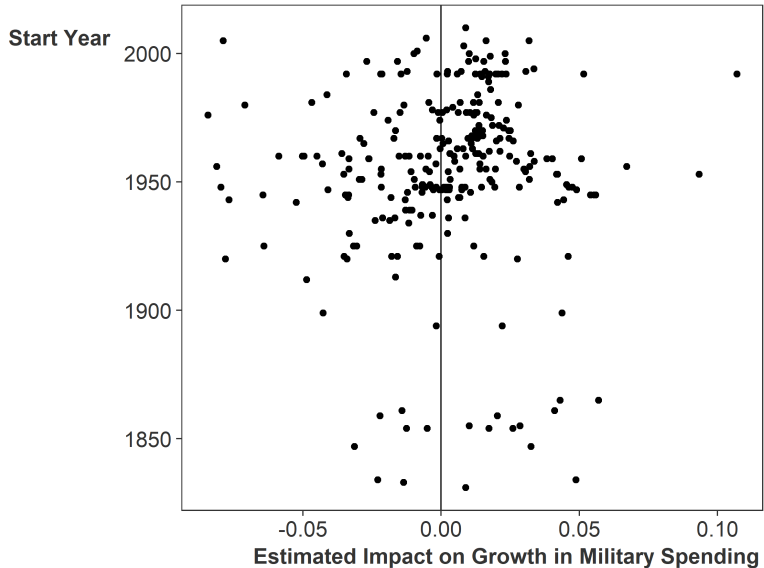
# Does alliance participation increase military spending?

# Does alliance participation increase military spending? Or decrease it?

## Competing Results

|                          | Decrease | Increase | Null |
|--------------------------|----------|----------|------|
| Most & Siverson 1987     |          |          | X    |
| Conybeare 1994           | X        |          |      |
| Diehl 1994               |          | X        |      |
| Goldsmith 2003           |          |          | X    |
| Morgan & Palmer 2006     |          | X        |      |
| Quiroz-Flores 2011       |          | X        |      |
| Digiuseppe & Poast 2016  | X        |          |      |
| Horowitz et al 2017      |          | X        |      |

# Omission: Alliance Heterogeneity



Scatter plot with x-axis "Estimated Impact on Growth in Military Spending" (ranging from -0.05 to 0.10) and y-axis "Start Year" (ranging from before 1850 to 2000).

I use alliance treaty scope and state capability to explain some of these differences between alliances.

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1. Argument: Treaty Scope and State Capability

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## Outline

I make my claim about alliance participation and military spending in three ways:

1. Argument: Treaty Scope and State Capability
2. Statistical Analysis
3. Illustrative Argument Using NATO

# Argument

- States pursue domestic consumption and foreign policy goods.

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- Security and influence are the two main foreign policy goods, which states get through alliances and military spending.
- Military spending has opportunity costs, which decrease with state size.
- Alliances are a costly signal of shared foreign policy interests: credible commitment to intervene.

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## Treaty Scope

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1. Conditions on military support.

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1. Conditions on military support.
2. Other costly promises of cooperation.

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1. Foreign policy gains.

## Implications of Treaty Scope

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1. Foreign policy gains.
2. Freedom of action.

- Alliances & Spending: External Influence

## State Capability: Major Powers

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- Influence from issue linkages.

**Hypothesis 1: As alliance treaty scope increases, growth in major power military spending from alliance participation will decrease.**

- Alliances & Spending: Territorial Security.

## State Capability: Non-Major Powers

- Alliances & Spending: Territorial Security.
- Replace domestic expenditure with allied capability.

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- Replace domestic expenditure with allied capability.
- Alliance participation usually *decreases* military spending.

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## Treaty Scope and Non-Major Powers

- Broad treaties restrict freedom of action.
- Alliance is more valuable.
- Allies have more influence.

**Hypothesis 2: As alliance treaty scope increases, growth in non-major power military spending from alliance participation will increase.**

# Empirical Analysis

I need two things to test these predictions:

## Research Design

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1. Measure of treaty scope— measurement model.

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1. Measure of treaty scope— measurement model.
2. Connect alliance-level variation with state-level outcomes— multilevel analysis.

I use a latent variable model to infer treaty scope from observed promises.

## Measuring Treaty Scope

I use a latent variable model to infer treaty scope from observed promises.

The posterior mean of the latent factor measures scope for each alliance.

- Multiple observed indicators of scope (ATOP):
    - *Military Support*: offense, defense, neutrality, consultation, non-aggression, unconditional military support.
    - *Other Cooperation*: bases, integrated command, economic/military aid, IO formation, conclude multiple other agreements, no other alliances.

## Details of Measure

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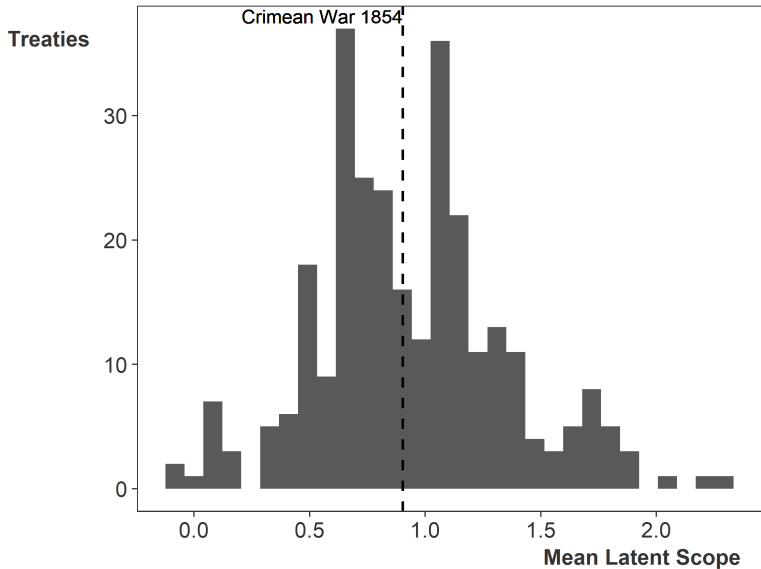- Generates a posterior distribution of scope for each alliance.
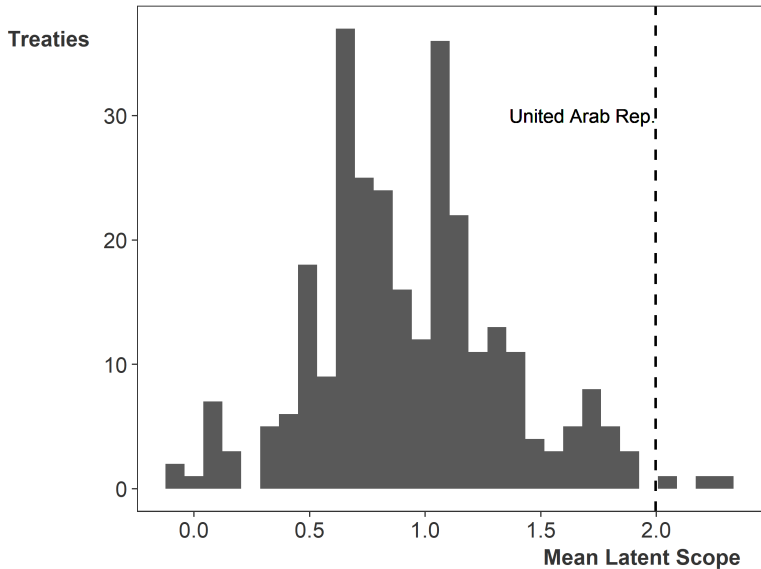
# Latent Measure of Treaty Scope
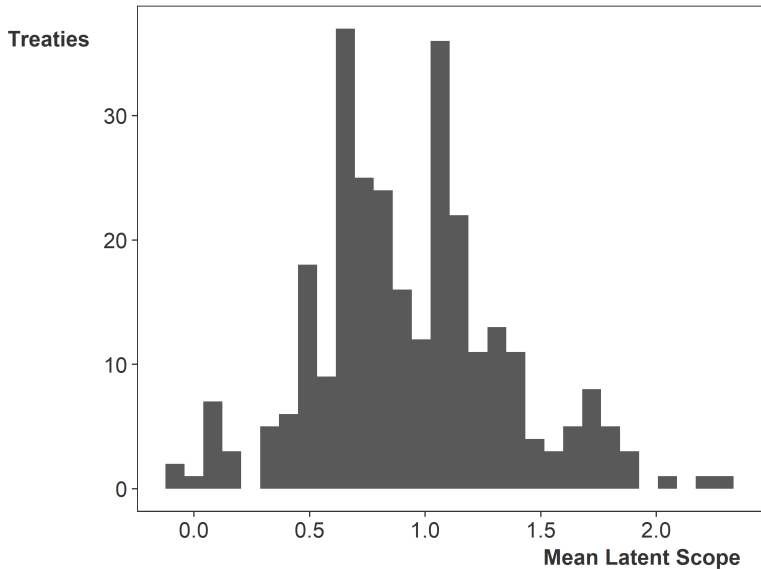
# Latent Measure of Treaty Scope: Narrow
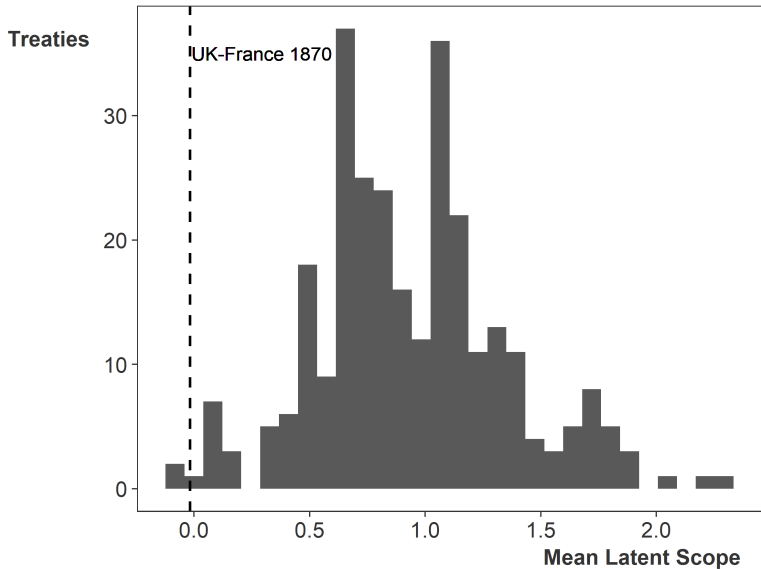
# Latent Measure of Treaty Scope: Typical

# Latent Measure of Treaty Scope: Broad

- Link alliance-level variation with state-level outcomes.

## Empirical Analysis: Multilevel Model

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- Link alliance-level variation with state-level outcomes.
- Two connected regressions: alliance and state-level.
- Alliance characteristics modify the association between alliance membership and spending growth.

## ML Model

$$\text{Growth} = \text{Varying} + \text{State} + \text{Alliance}$$
$$\text{Mil. Ex.} \quad \text{Intercepts} \quad \text{Vars.} \quad \text{Participation}$$

$$\begin{array}{cccccc}
 & & & & & \text{Alliance} \\
 & & & & & \text{Characteristics} \\
 & & & & & \\
 & & & & & \downarrow \\
\text{Growth} = & \text{Varying} & + & \text{State} & + & \text{Alliance} \\
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\end{array}$$

## ML Model

$$\lambda = \begin{array}{c} \text{Alliance} \\ \text{Characteristics} \\ \alpha_{all} + \beta_1 \text{Scope} + \mathbf{X}\beta \\ \downarrow \end{array}$$

| Growth = | Varying | + | State | + | Alliance |
|----------|---------|---|-------|---|----------|
| Mil. Ex. | Intercepts | | Vars. | | Participation |
| $y =$ | $\alpha + \alpha^{st} + \alpha^{yr}$ | + | $\mathbf{W}\gamma$ | + | $\mathbf{Z}\lambda$ |

## ML Model Specification

$$y \sim student_t(\nu, \mu, \sigma) \tag{1}$$

$$\mu = \alpha + \alpha^{st} + \alpha^{yr} + \mathbf{W}_{n \times k}\gamma + \mathbf{Z}_{n \times a}\lambda \tag{2}$$

$$\lambda_a \sim N(\theta_a, \sigma_{all}) \tag{3}$$

$$\theta = \alpha_{all} + \beta_1 \text{Treaty Scope} + \mathbf{X}_{a \times l}\beta \tag{4}$$

## Example

$$\mu_{it} = \alpha + \alpha^{st} + \alpha^{yr} + W_{it}\gamma + Z_{it}\lambda$$

Example year:

Argentina 1955 = Overall mean

+ Argentine Intercept + 1955 Intercept

+ Argentine Characteristics

+ $\lambda_{OAS}$ * OAS Expenditure + $\lambda_{Rio}$ * Rio Pact Expenditure

$$\lambda_{Rio} = \alpha_{all} + \beta_1 \text{Treaty Scope} + \text{Controls}$$

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$$\lambda_{Rio} = \alpha_{all} + \beta_1 \text{Treaty Scope} + \text{Controls}$$

| State-Year | Rio Pact | Warsaw Pact | ... |
|---|---|---|---|
| Argentina 1954 | .347 | 0 | ... |
| Argentina 1955 | .418 | 0 | ... |
| ⋮ | ⋮ | ⋮ | ... |

## Sample and Key Variables

- **Split Sample**: major and non-major power states— 1816-2007. Alliances with military support.

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- **Alliance-Level IV**: Mean Treaty Scope

- **State-Level Controls**: Interstate war, Civil War, Annual MIDs, GDP growth, POLITY, Cold War, Rival military expenditures.

## Controls

- **State-Level Controls**: Interstate war, Civil War, Annual MIDs, GDP growth, POLITY, Cold War, Rival military expenditures.

- **Alliance-Level Controls**: Share of Democracies, Number of Members, wartime, asymmetric obligations, US member (Cold War), USSR member.

# Association Between Treaty Scope and Growth in Military Spending
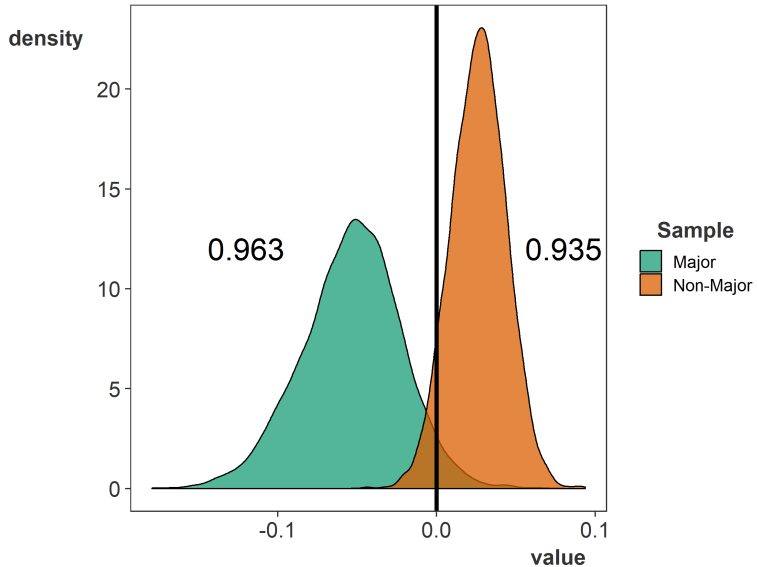
# Importance

| Sample | Posterior Mean | Median Ex. Growth |
|--------|----------------|-------------------|
| Major  | -0.05          | 0.04              |

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**US spent \$36.0 billion on NATO in 2018, or 5.5% of the total defense spending.**
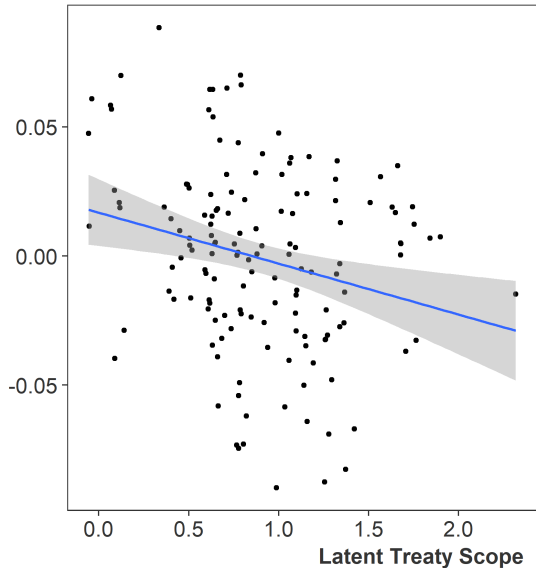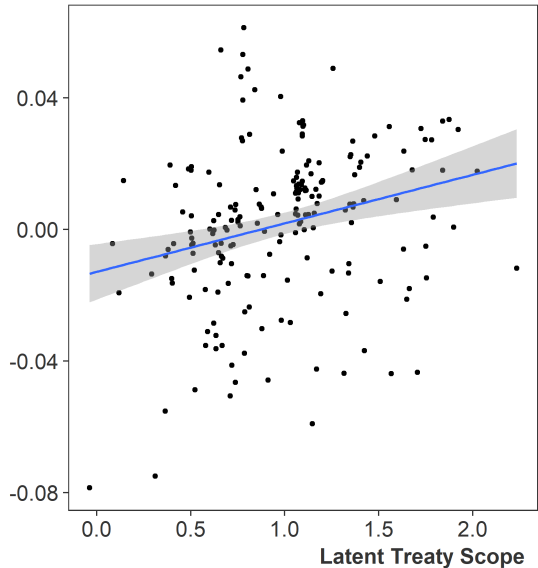
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# Conclusion

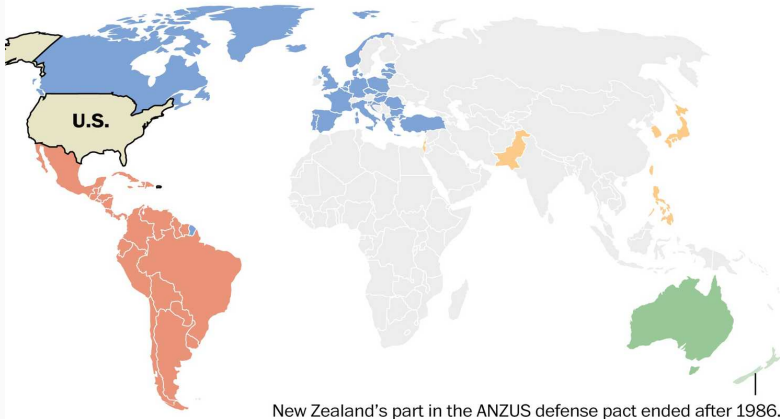## Conclusion

How alliance treaty participation affects military spending depends on state capability and alliance treaty scope.

**US defense pacts, 1947–2014**

● OAS  ● NATO  ● ANZUS  ● Bilateral

U.S.

New Zealand's part in the ANZUS defense pact ended after 1986.

Note: OAS stands for Organization of American States; NATO for North Atlantic Treaty Organization; and ANZUS for Australian, New Zealand, United States Security Treaty.

Source: Belfer Center of Harvard University, CIA

THE WASHINGTON POST

# Looking Ahead

This paper is part of a more general theory of alliance participation and military spending.

## My Research Agenda

The political economy of security, with a focus on formal institutions.

### International Security

- Alliance Participation and Military Spending
- Reassessing the Public Goods Theory of Alliances

### Intra-State Conflict

- Conflict Management Institutions and FDI
- Sanctioning Terrorist Groups: Can it Work?
- Weapon of the Weak?: Rebel Groups' International Law Talk, 1974–2011

**Thank you!**

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## Limitations

1. Domestic political economy of military spending.

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3. Strategic alliance design

## Alliance-Level Regression Table: Major Powers

930 observations, with 130 alliances.

|  | mean | S.D. | 5% | 95% | n_eff | $\hat{R}$ |
|---|---|---|---|---|---|---|
| Constant | 0.038 | 0.038 | -0.025 | 0.102 | 3380.954 | 1.000 |
| Latent Str. | -0.054 | 0.031 | -0.107 | -0.005 | 3278.923 | 1.000 |
| Number Members | 0.000 | 0.002 | -0.003 | 0.003 | 4000.000 | 0.999 |
| Democratic Membership | -0.009 | 0.033 | -0.065 | 0.042 | 4000.000 | 1.000 |
| Wartime | -0.057 | 0.035 | -0.115 | -0.001 | 4000.000 | 1.001 |
| Asymmetric | 0.053 | 0.035 | 0.001 | 0.115 | 2218.509 | 1.000 |
| US Member | 0.002 | 0.031 | -0.051 | 0.051 | 4000.000 | 1.000 |
| USSR Member | 0.023 | 0.033 | -0.028 | 0.079 | 4000.000 | 1.000 |
| $\sigma$ Alliances | 0.066 | 0.029 | 0.019 | 0.117 | 599.081 | 1.007 |

## Alliance-Level Regression Table: Non-Major Powers

8,668 observations and 192 alliances.

|  | mean | sd | 5% | 95% | n_eff | $\hat{R}$ |
|---|---|---|---|---|---|---|
| Constant | -0.018 | 0.018 | -0.047 | 0.012 | 2211.374 | 1.000 |
| Latent Str. | 0.026 | 0.017 | -0.002 | 0.054 | 2191.382 | 1.000 |
| Number Members | 0.000 | 0.001 | -0.001 | 0.001 | 4000.000 | 1.000 |
| Democratic Membership | -0.031 | 0.015 | -0.056 | -0.009 | 3213.621 | 1.000 |
| Wartime | 0.041 | 0.023 | 0.002 | 0.078 | 4000.000 | 1.000 |
| Asymmetric | -0.031 | 0.021 | -0.065 | 0.003 | 4000.000 | 0.999 |
| US Member | 0.013 | 0.018 | -0.016 | 0.042 | 2895.419 | 1.000 |
| USSR Member | 0.011 | 0.031 | -0.041 | 0.062 | 4000.000 | 1.000 |
| $\sigma$ Alliances | 0.014 | 0.009 | 0.002 | 0.030 | 1254.268 | 1.001 |

## Priors

4 Chains with 2,000 samples and 1,000 warmup iterations.

$$p(\alpha) \sim N(0, 1)$$
$$p(\sigma) \sim \text{half-}N(0, 1)$$
$$p(\alpha^{yr}) \sim N(0, \sigma^{yr})$$
$$p(\sigma^{yr}) \sim N(0, 1)$$
$$p(\alpha^{st}) \sim N(0, \sigma^{st})$$
$$p(\sigma^{st}) \sim \text{half-}N(0, 1)$$
$$p(\sigma^{all}) \sim \text{half-}N(0, 1)$$
$$p(\beta) \sim N(0, 1)$$
$$p(\gamma) \sim N(0, 1)$$
$$p(\nu) \sim gamma(2, 0.1)$$

## Details of Measurement Model

- Bayesian Gaussian Copula Factor Model: for mixed data.
- Uses copulas to break dependence between latent factors and marginal distributions.
- Treats marginals as unknown and keeps them free of dependence.
- IMH proposal, 10,000 iteration warmup, 20,000 samples, thinned every 20 draws.
- Generalized double Pareto prior for the factor loading— flexible generalized Laplace distribution with a spike at zero and heavy tails.

# Single-Level Robust Regression