Alliance Participation and Military Spending

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

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

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

Why Should You Care?

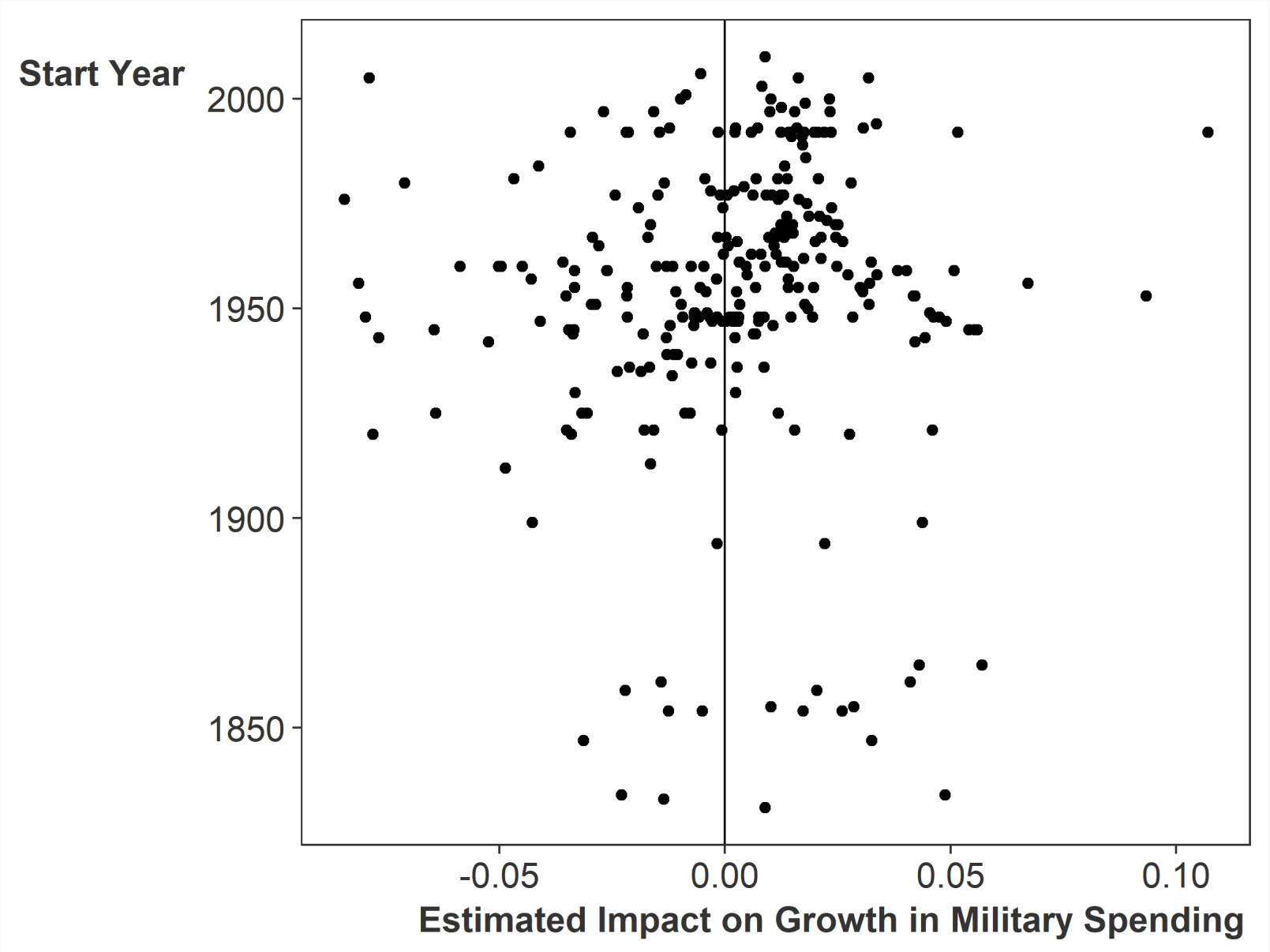
Does alliance participation increase military spending?

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



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

Outline

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

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1. Argument: Treaty Scope and State Capability

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

Argument

Assumptions

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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.

Treaty Scope

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

Implications of Treaty Scope

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Greater treaty scope generates a tradeoff between:

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2. Freedom of action.

The implications of treaty scope depend on state capability.

State Capability: Major Powers

- Alliances & Spending: External Influence

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Treaty Scope and 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.

State Capability: Non-Major Powers

- Alliances & Spending: Territorial Security.

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- Replace domestic expenditure with allied capability.

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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

Research Design

I need two things to test these predictions:

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

Measuring Treaty Scope

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

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

Details of Measure

- 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.

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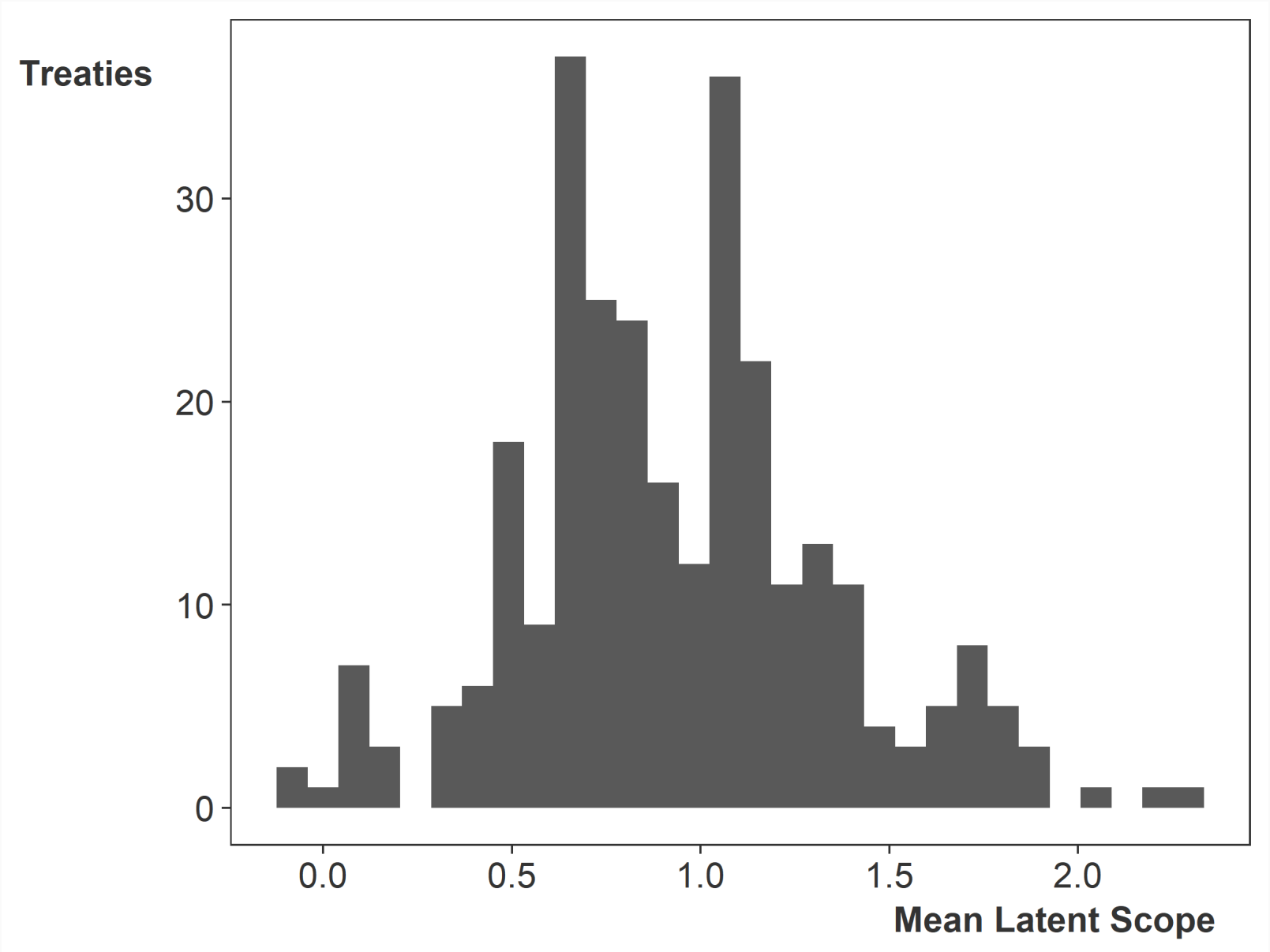
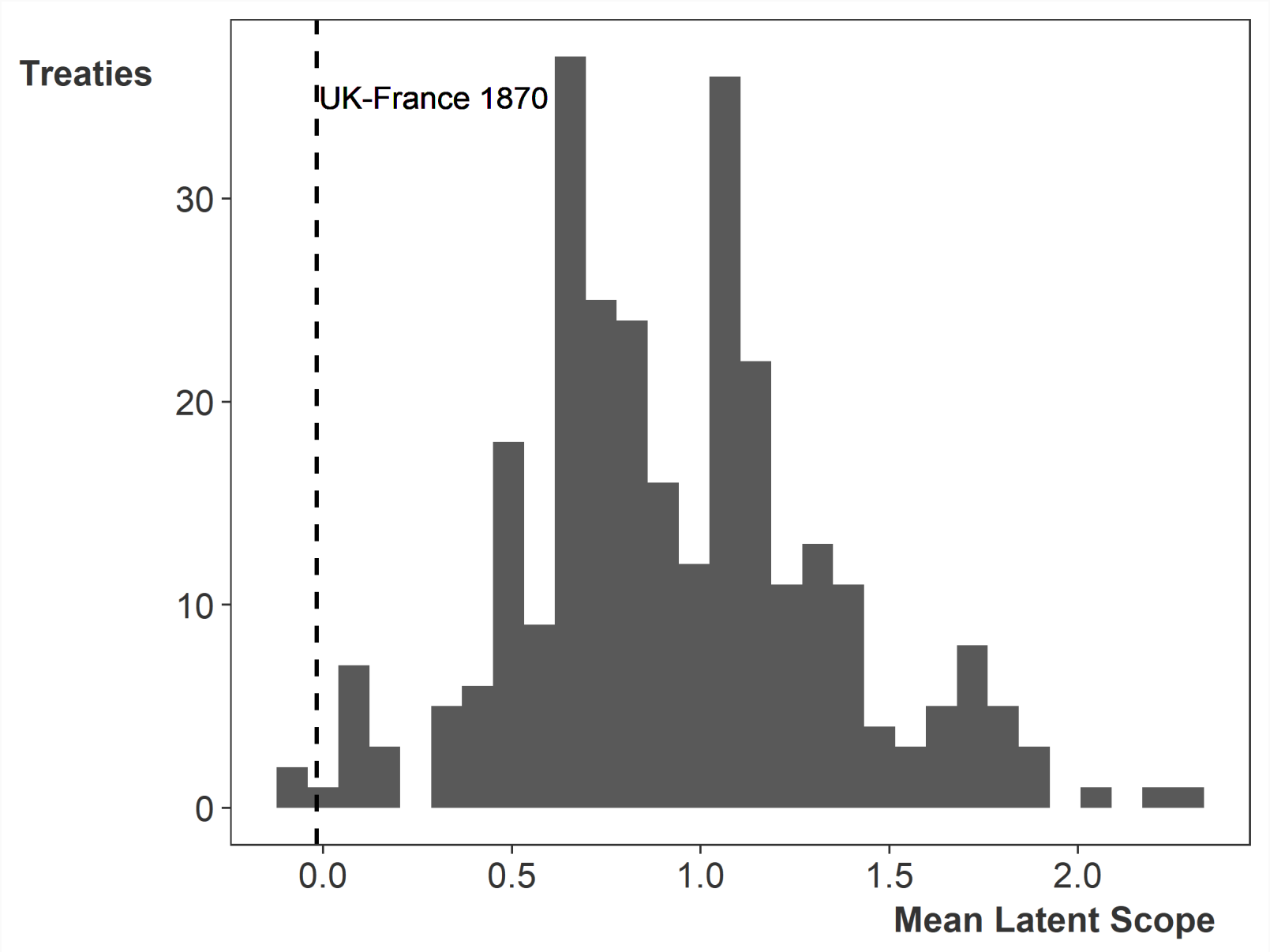
- Generates a posterior distribution of scope for each alliance.

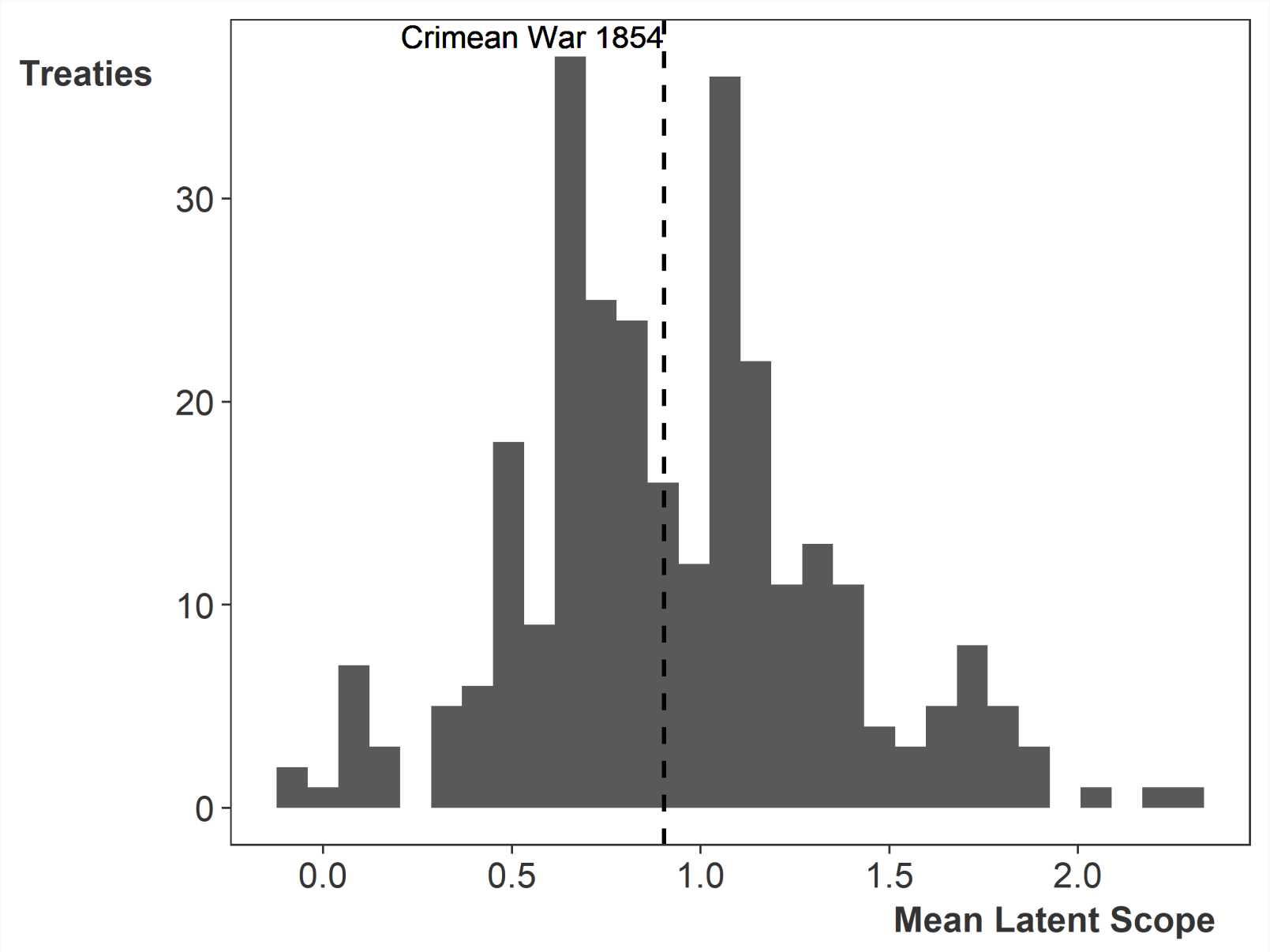
Latent Measure of Treaty Scope



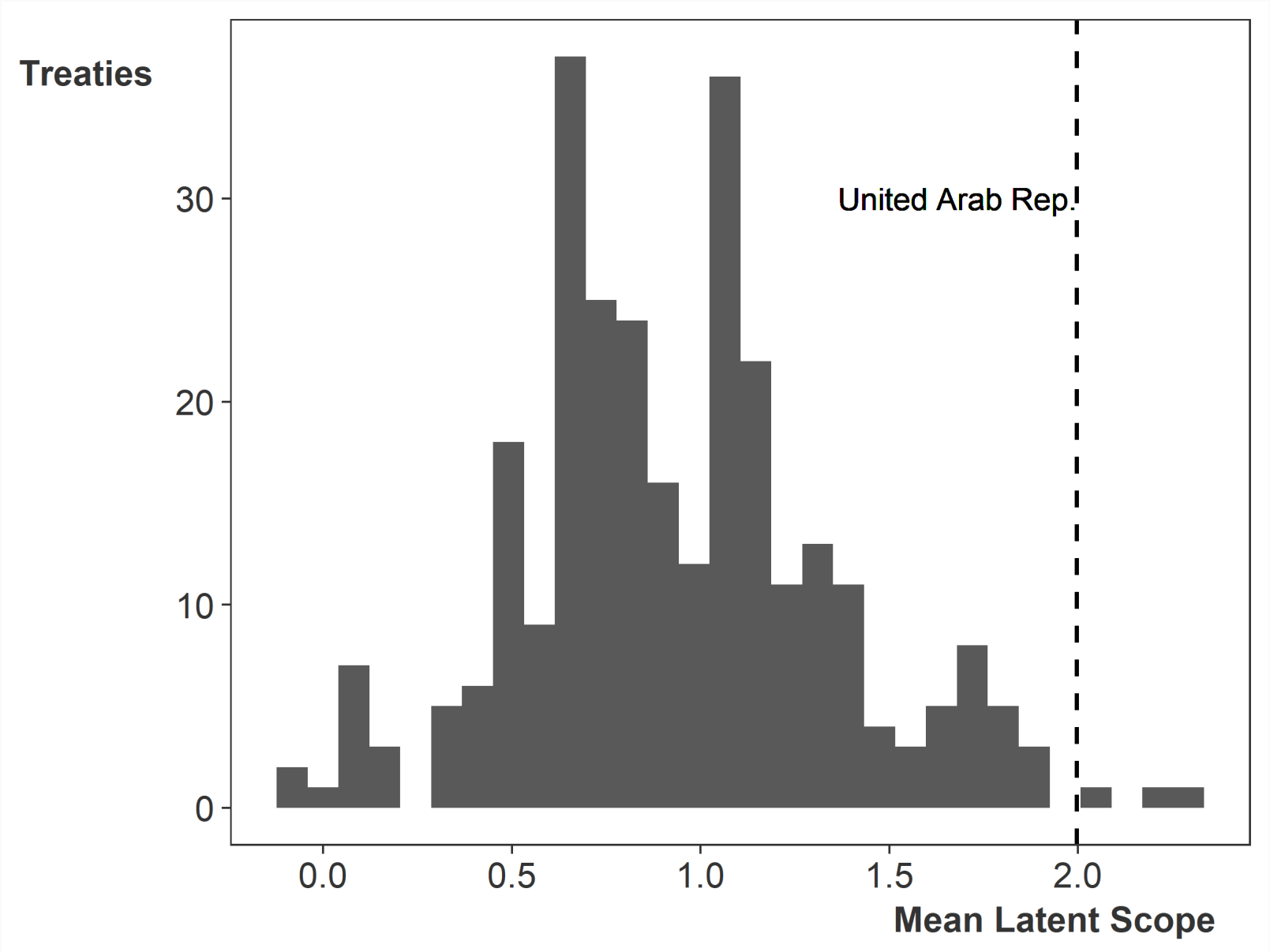
Latent Measure of Treaty Scope: Narrow



Latent Measure of Treaty Scope: Typical



Latent Measure of Treaty Scope: Broad



Empirical Analysis: Multilevel Model

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

ML Model

$$\begin{array}{ccccccc} \text{Growth} = & \text{Varying} & + & \text{State} & + & \text{Alliance} \\ \text{Mil. Ex.} & \text{Intercepts} & & \text{Vars.} & & \text{Participation} \end{array}$$

ML Model

$$\text{Growth in Mil. Ex.} = \text{Varying Intercepts} + \text{State Vars.} + \underset{\downarrow}{\text{Alliance Characteristics}} \text{ Alliance Participation}$$

ML Model

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

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ML Model Specification

$$y \sim \mathit{student}_t(\nu, \mu, \sigma) \tag{1}$$

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

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

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

Example

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

Example year:

$$\begin{aligned}\text{Argentina 1955} &= \text{Overall mean} \\ &+ \text{Argentine Intercept} + \text{1955 Intercept} \\ &+ \text{Argentine Characteristics} \\ &+ \lambda_{OAS} * \text{OAS Expenditure} + \lambda_{Rio} * \text{Rio Pact Expenditure}\end{aligned}$$

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

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Z

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

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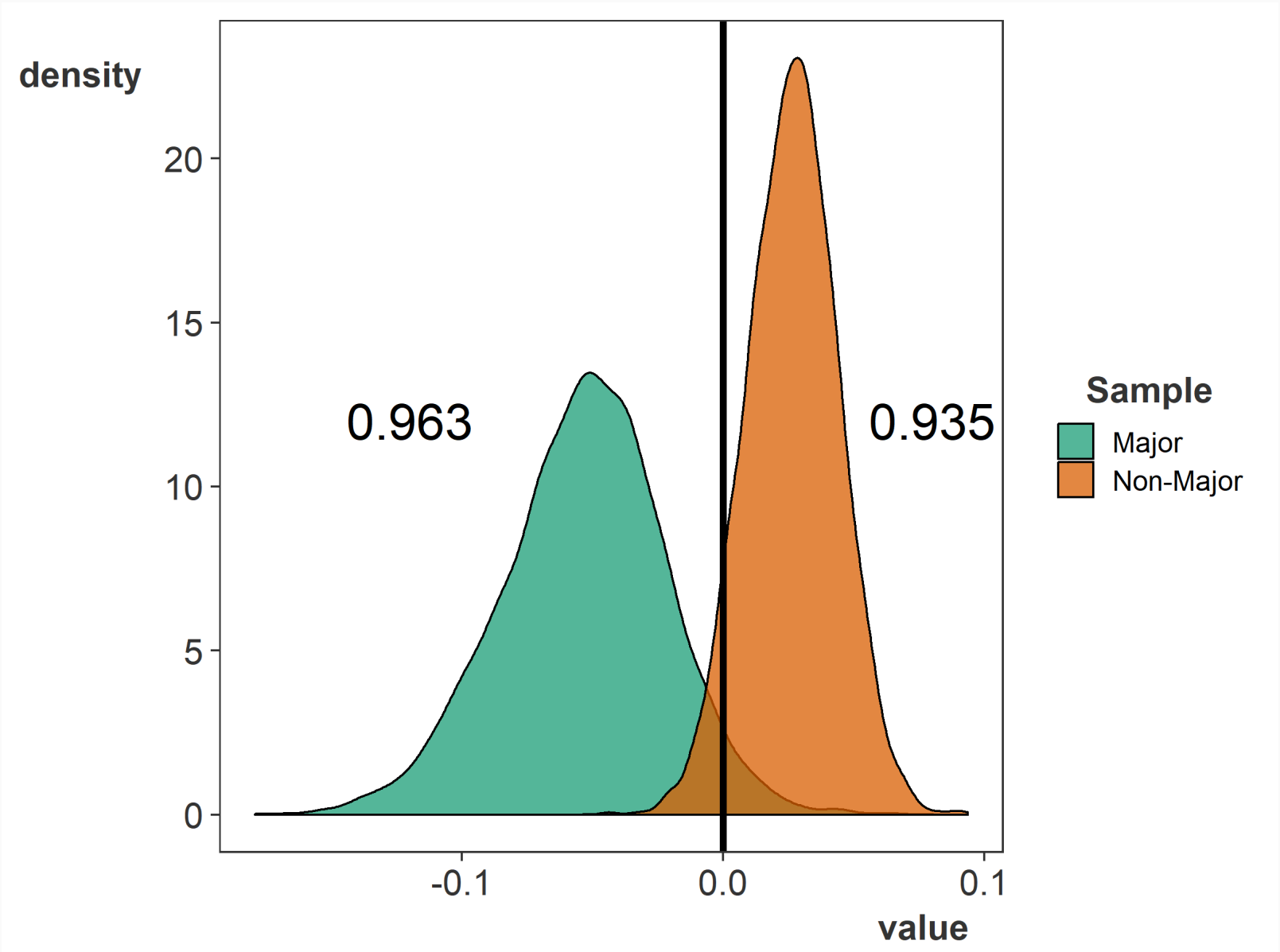
- **Alliance-Level Controls**: Share of Democracies, Number of Members, wartime, asymmetric obligations, US member (Cold War), USSR member.

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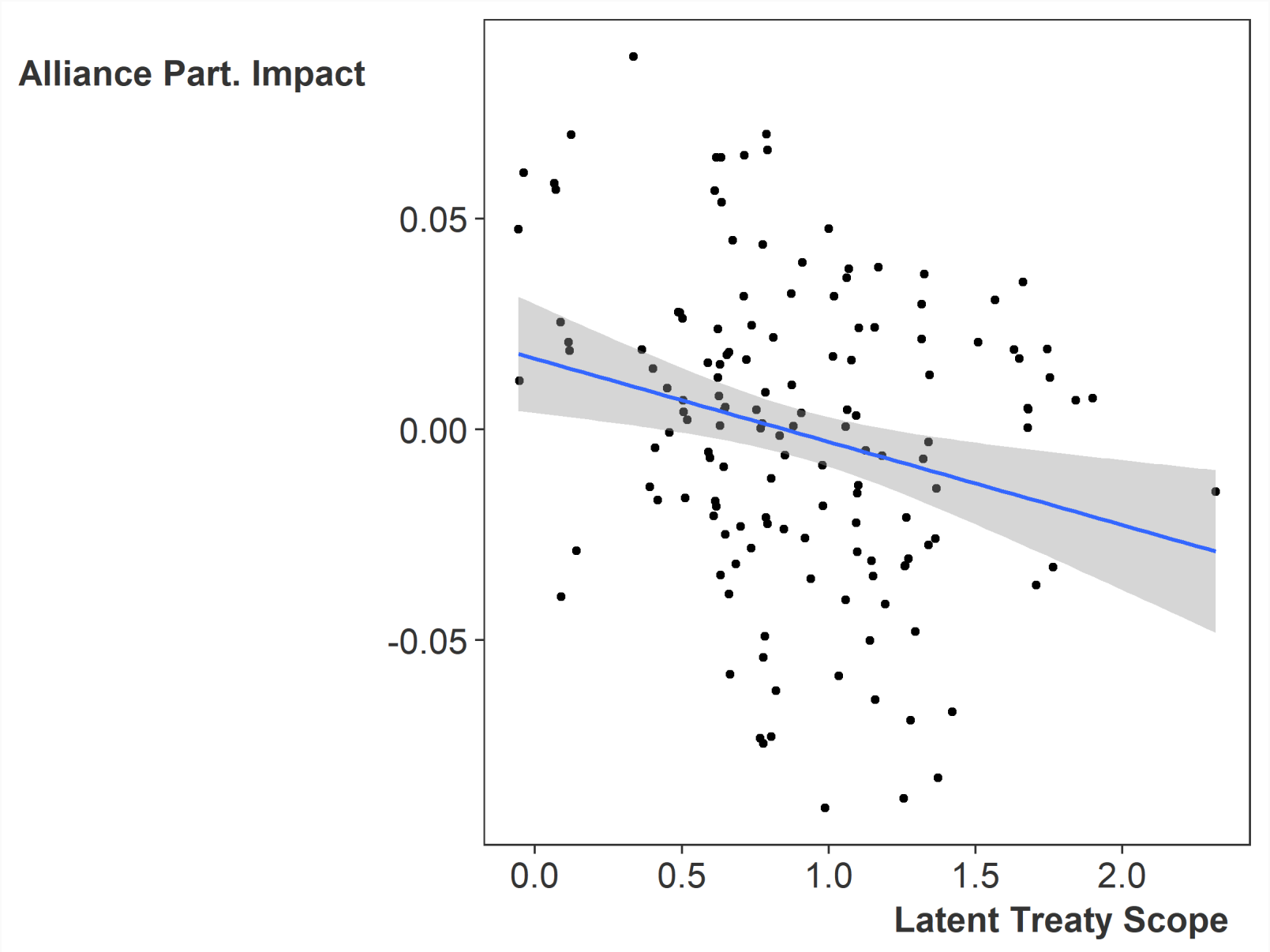
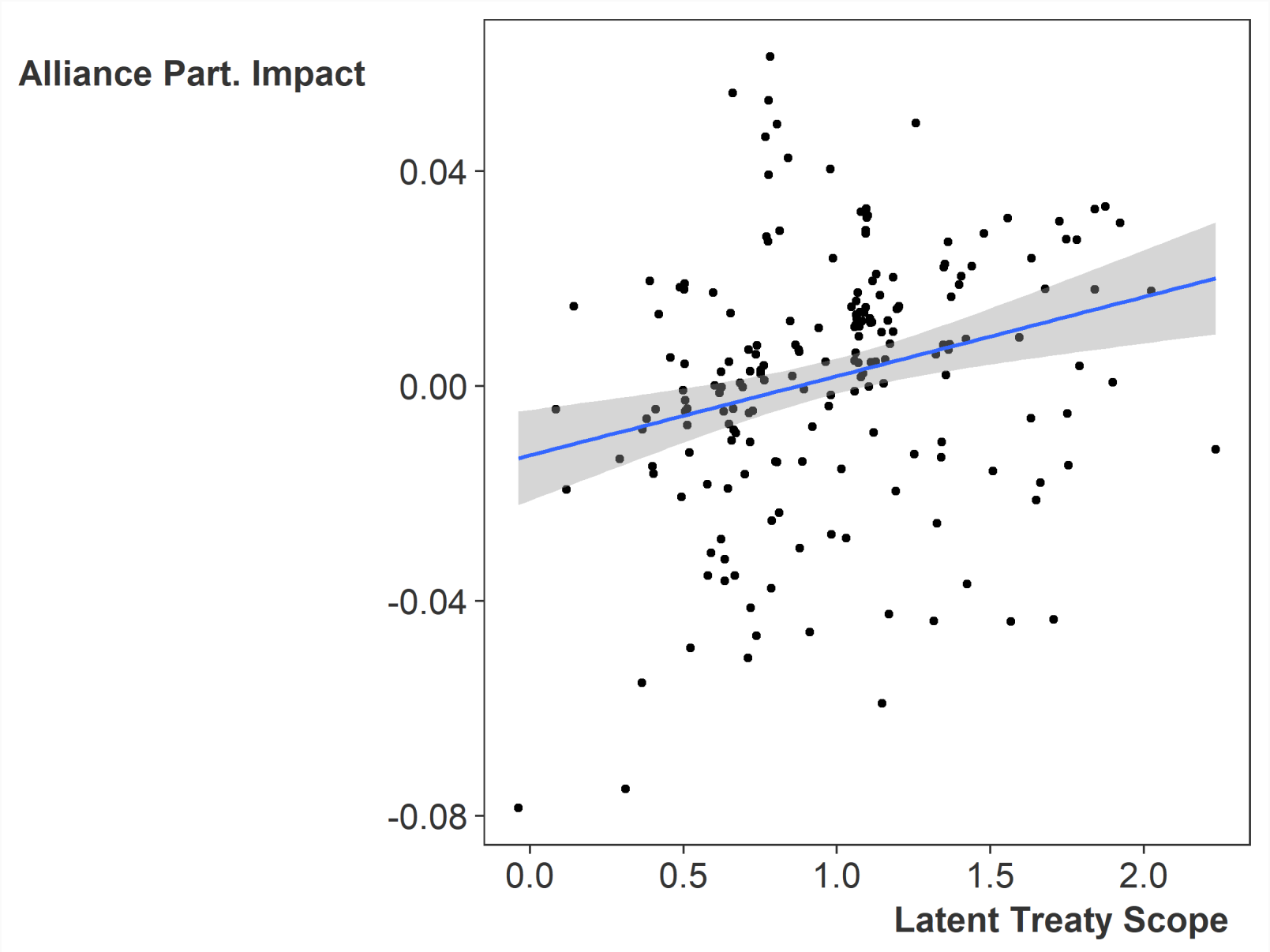
US spent $36.0 billion on NATO in 2018, or 5.5% of the total defense spending.

Treaty Scope and λ: Major Powers



Treaty Scope and λ: Non-major Powers



NATO

Foreign Entanglement and Formal Obligations

“The Parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all...”

“assist the Party or Parties so attacked by taking forthwith, individually and in concert with the other Parties, such action as it deems necessary, including the use of armed force”

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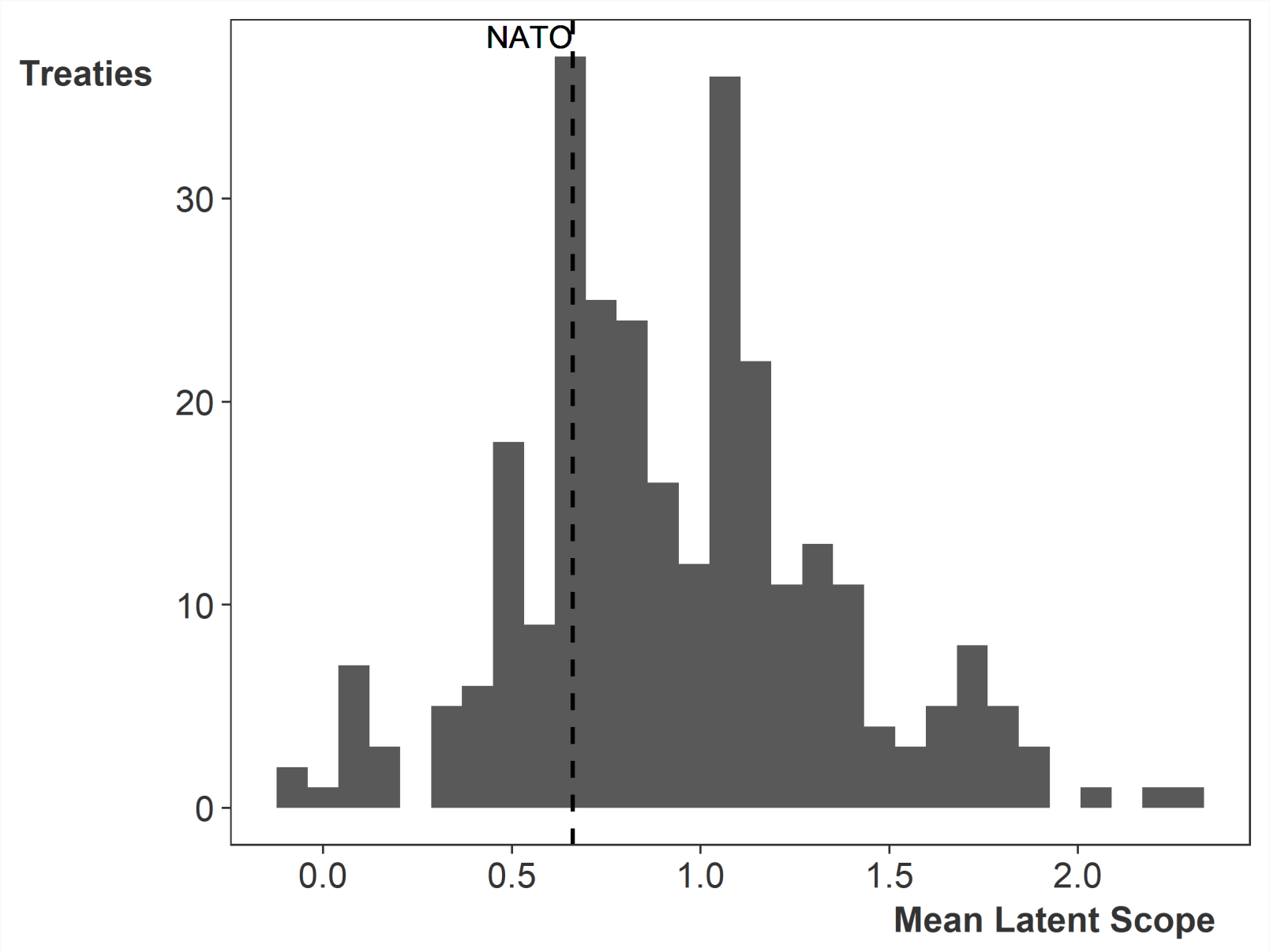
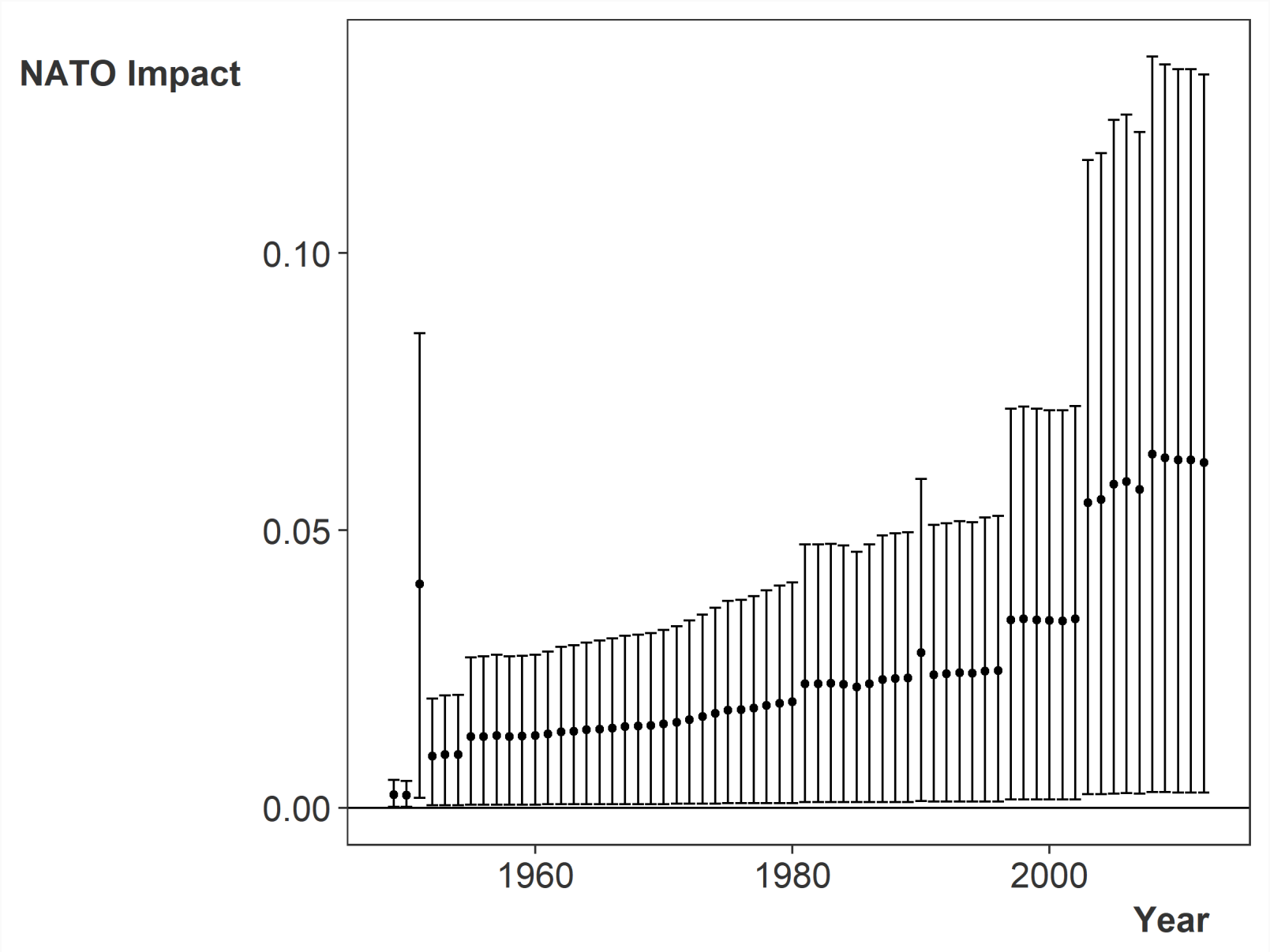
NATO Scope



Impact of NATO on Growth in US Military Spending

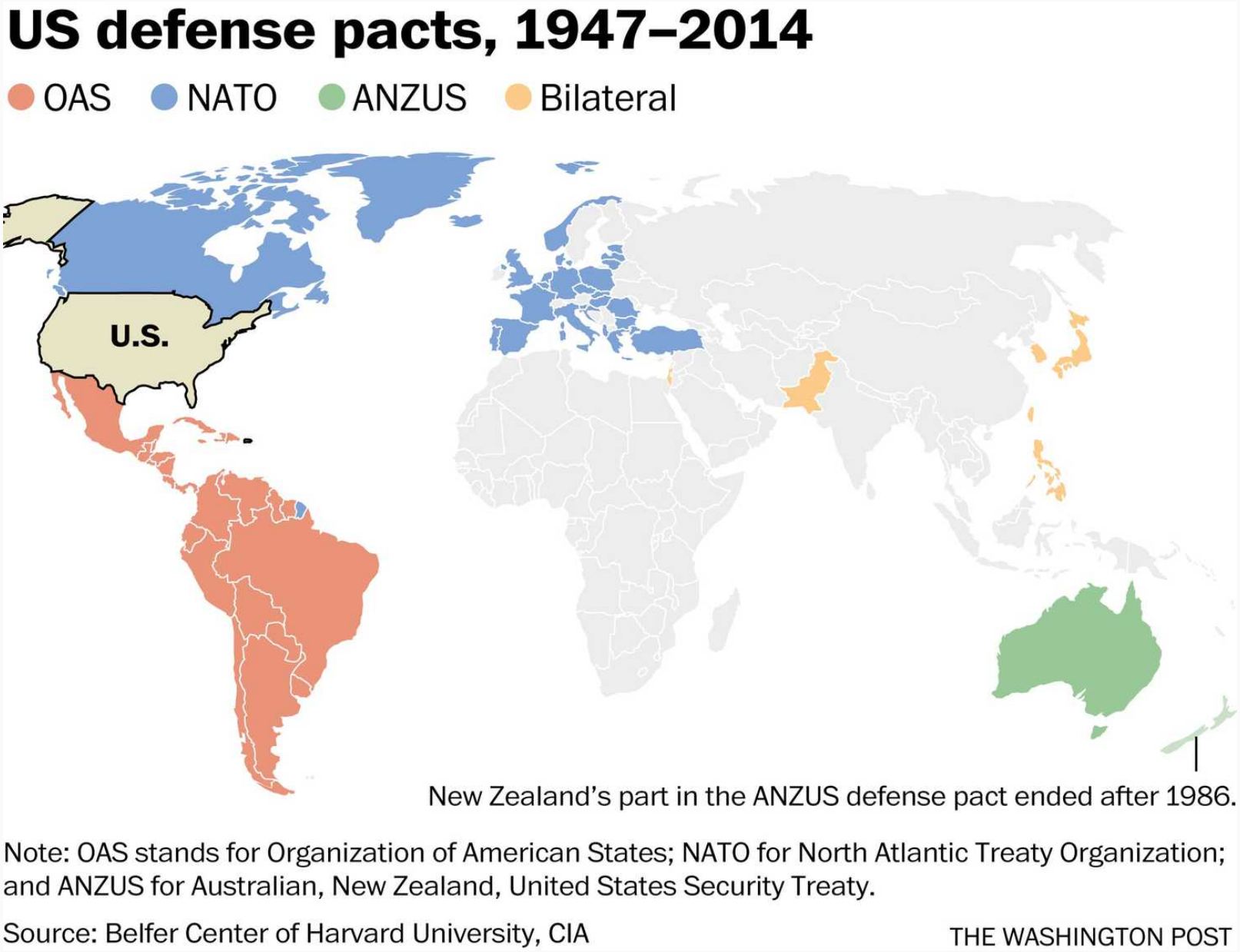


Conclusion

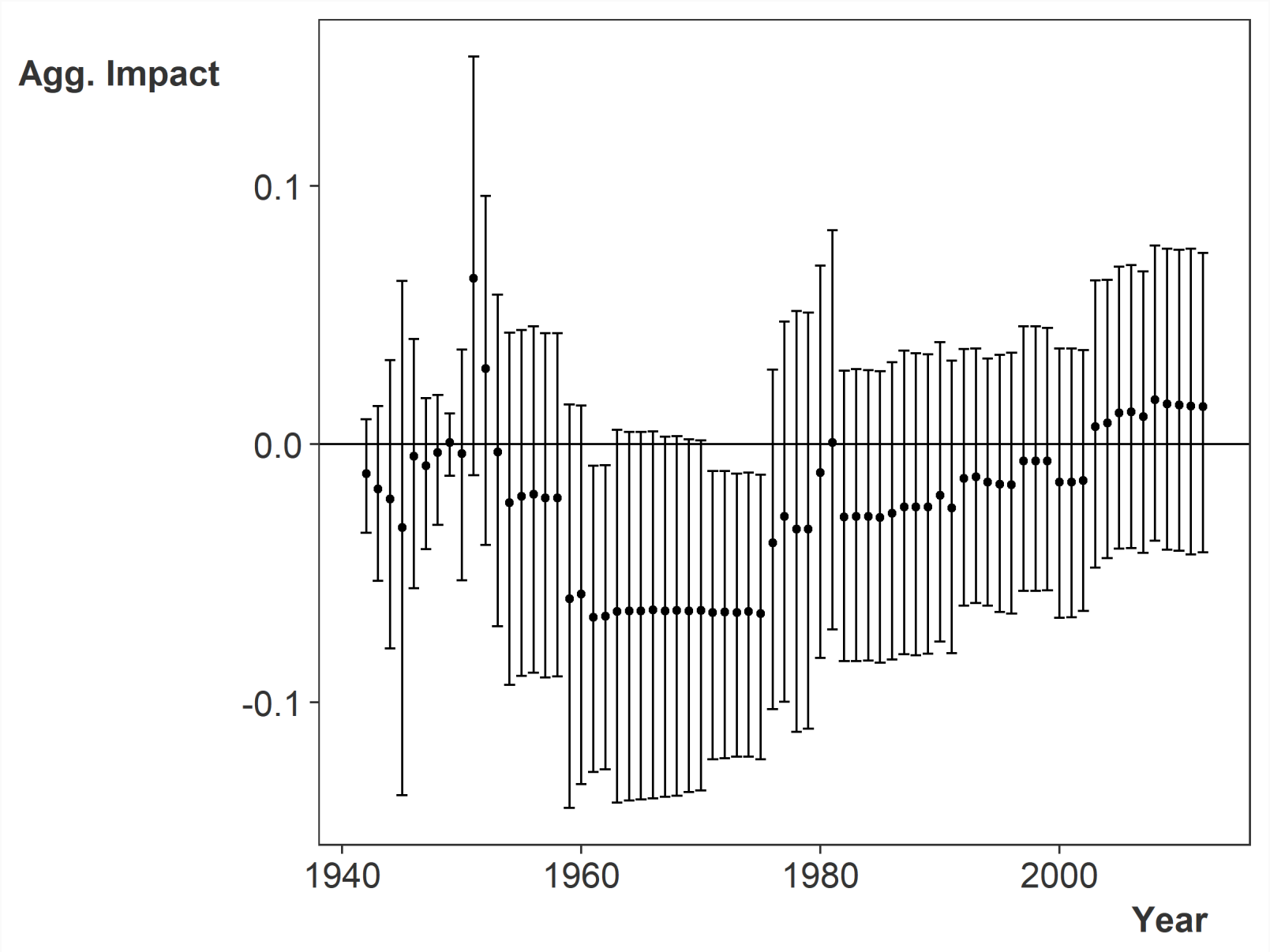
Conclusion

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

Implication: What to do with US alliances?



Alliance Participation and US Military Spending



Looking Ahead

Dissertation

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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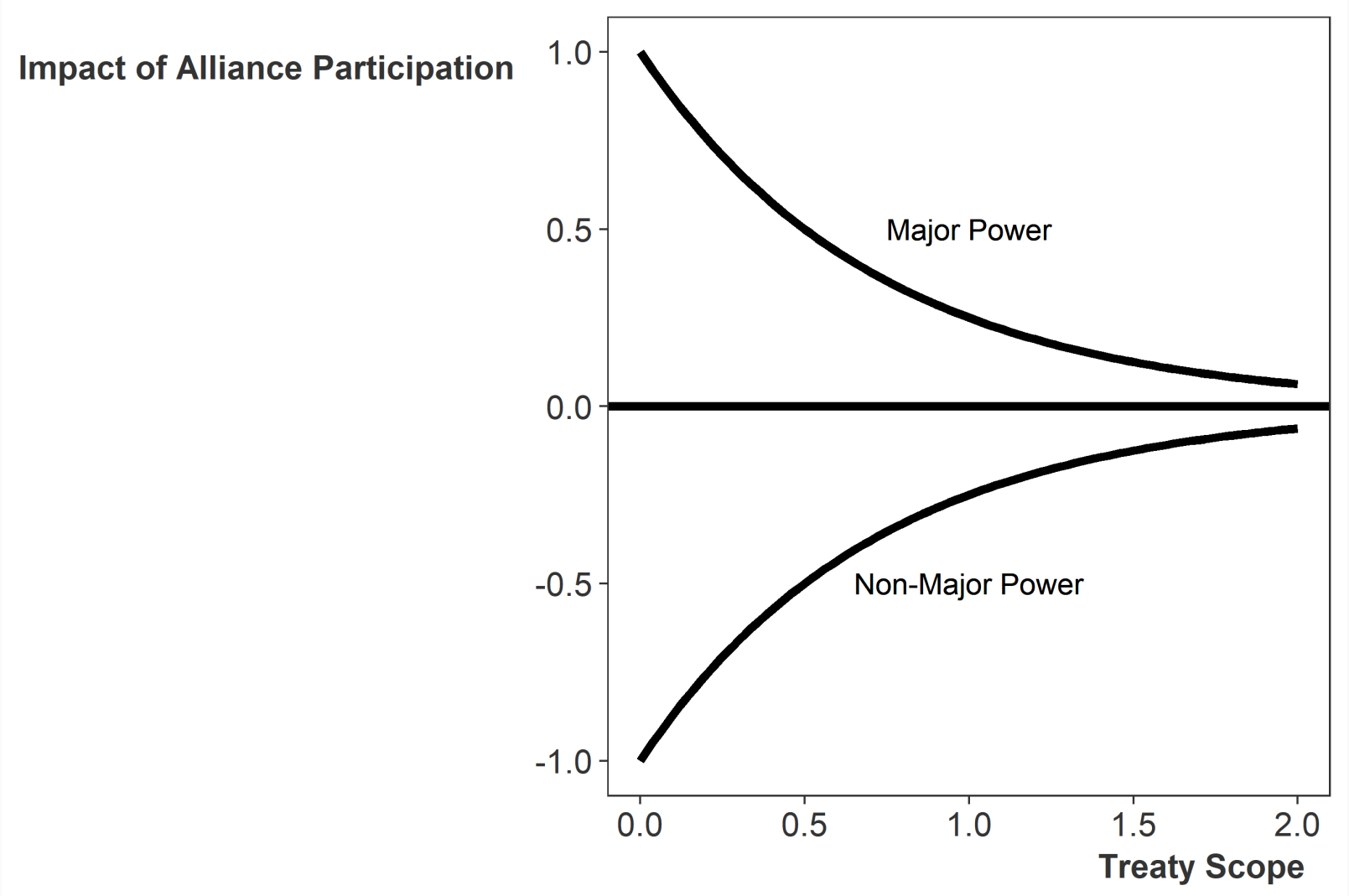
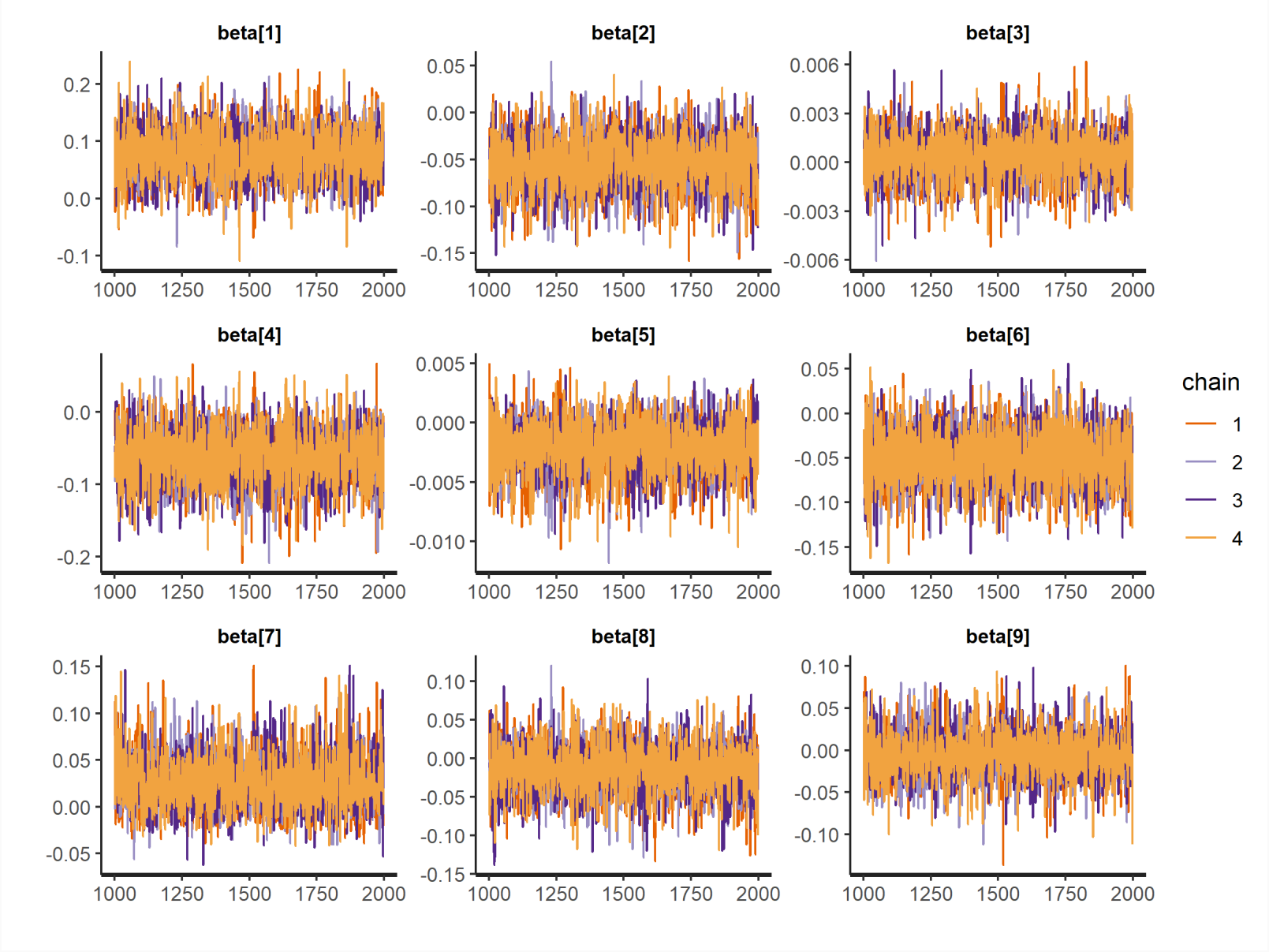
Limitations

1. Domestic political economy of military spending.
2. Measurement error and missing data.
3. Strategic alliance design

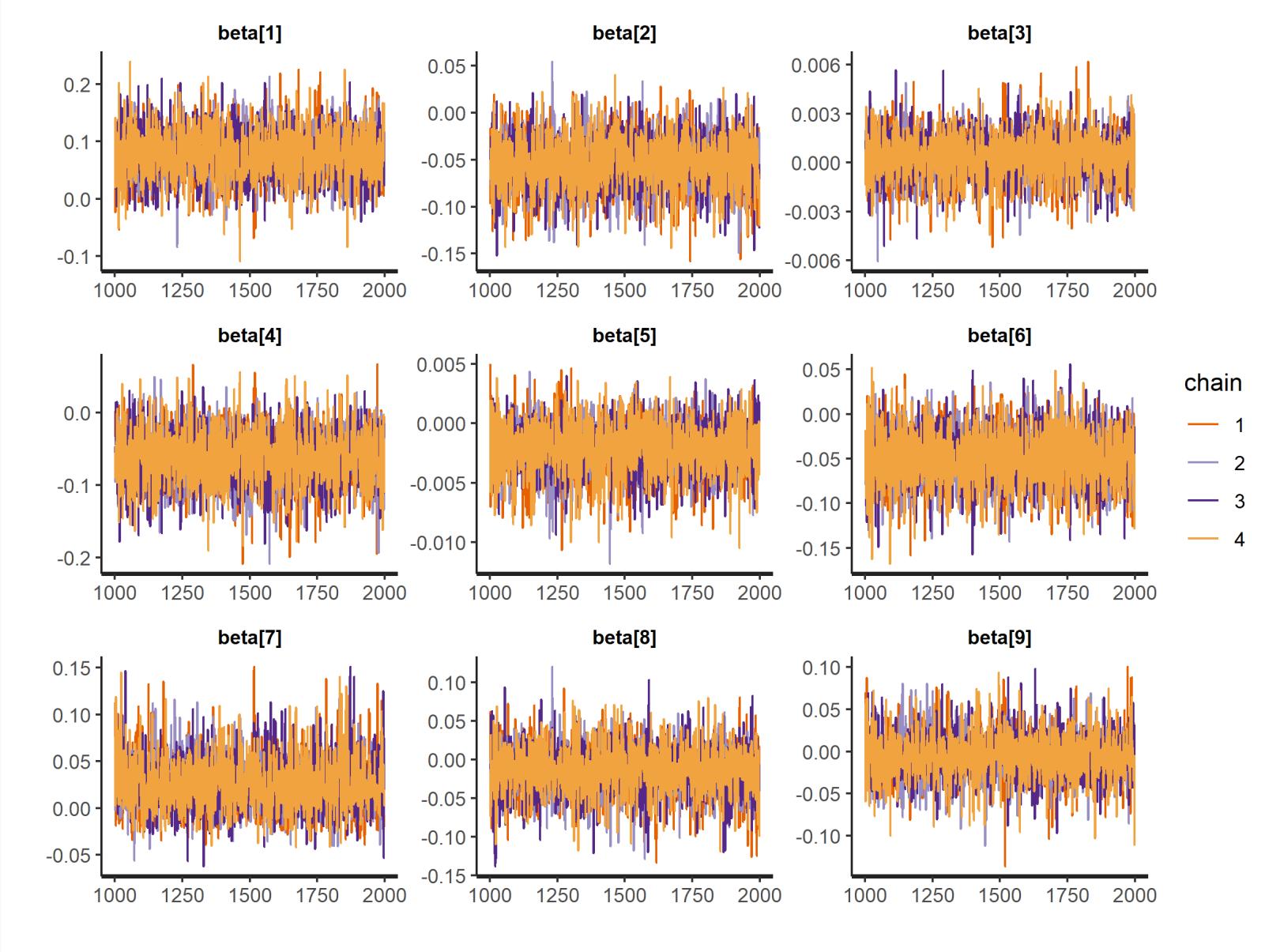
Spending Growth and the Hypotheses



Trace plots: Major



Trace plots: Non-Major



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
σ 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
σ Alliances	0.014	0.009	0.002	0.030	1254.268	1.001

Priors

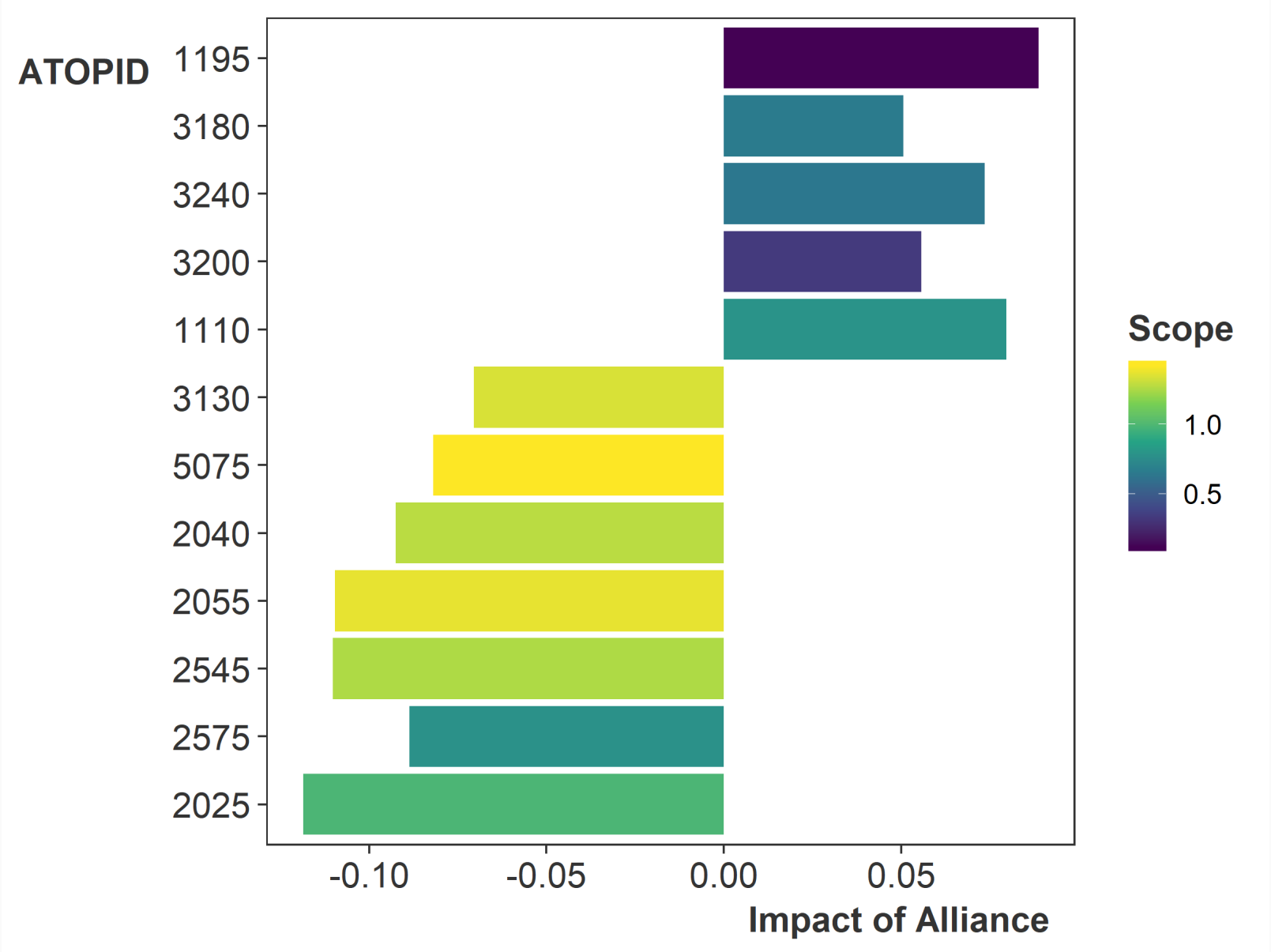
4 Chains with 2,000 samples and 1,000 warmup iterations.

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

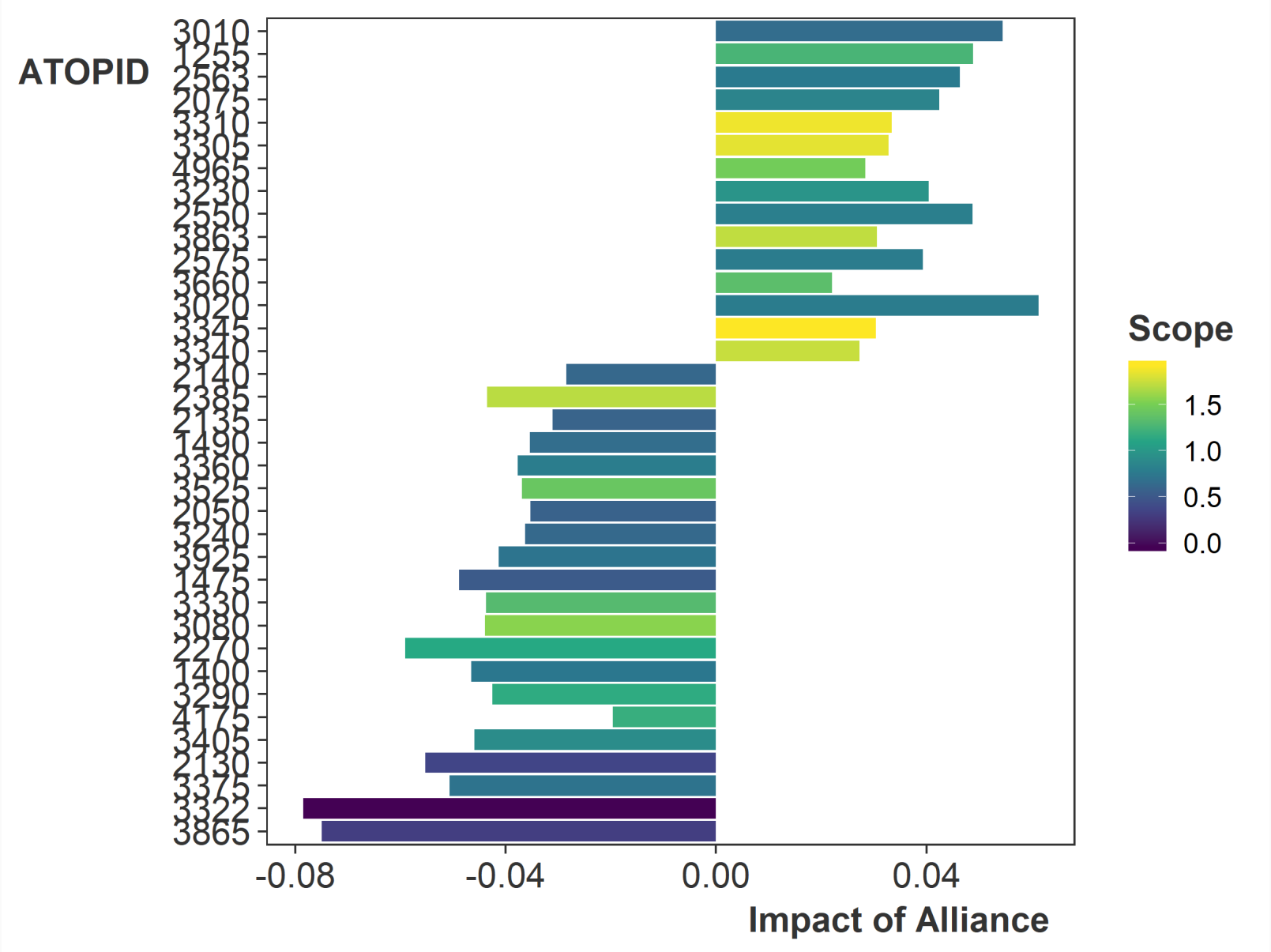
Details of Measurement Model

- 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.

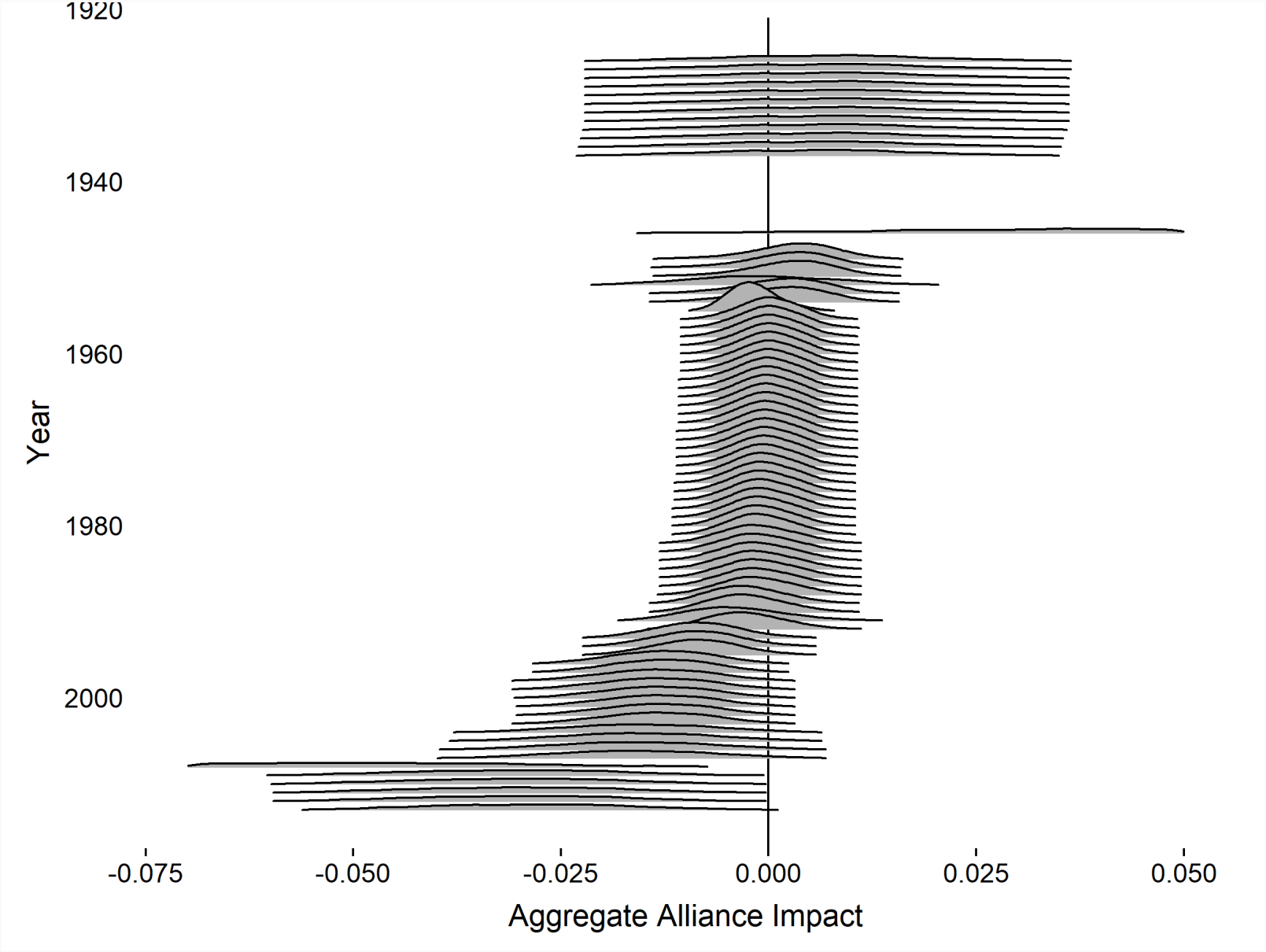
Notable Major Power Alliances



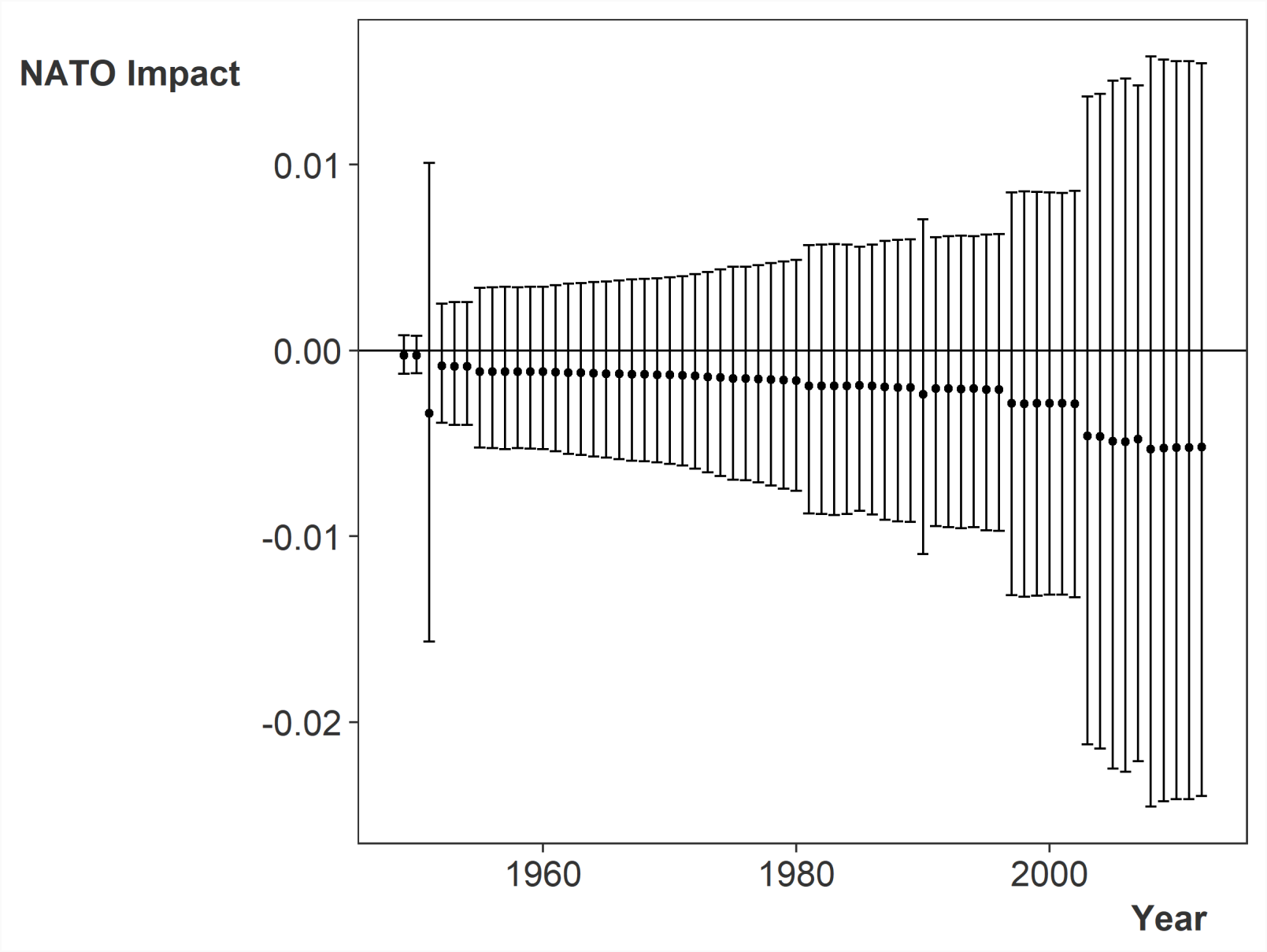
Notable Non-Major Power Alliances



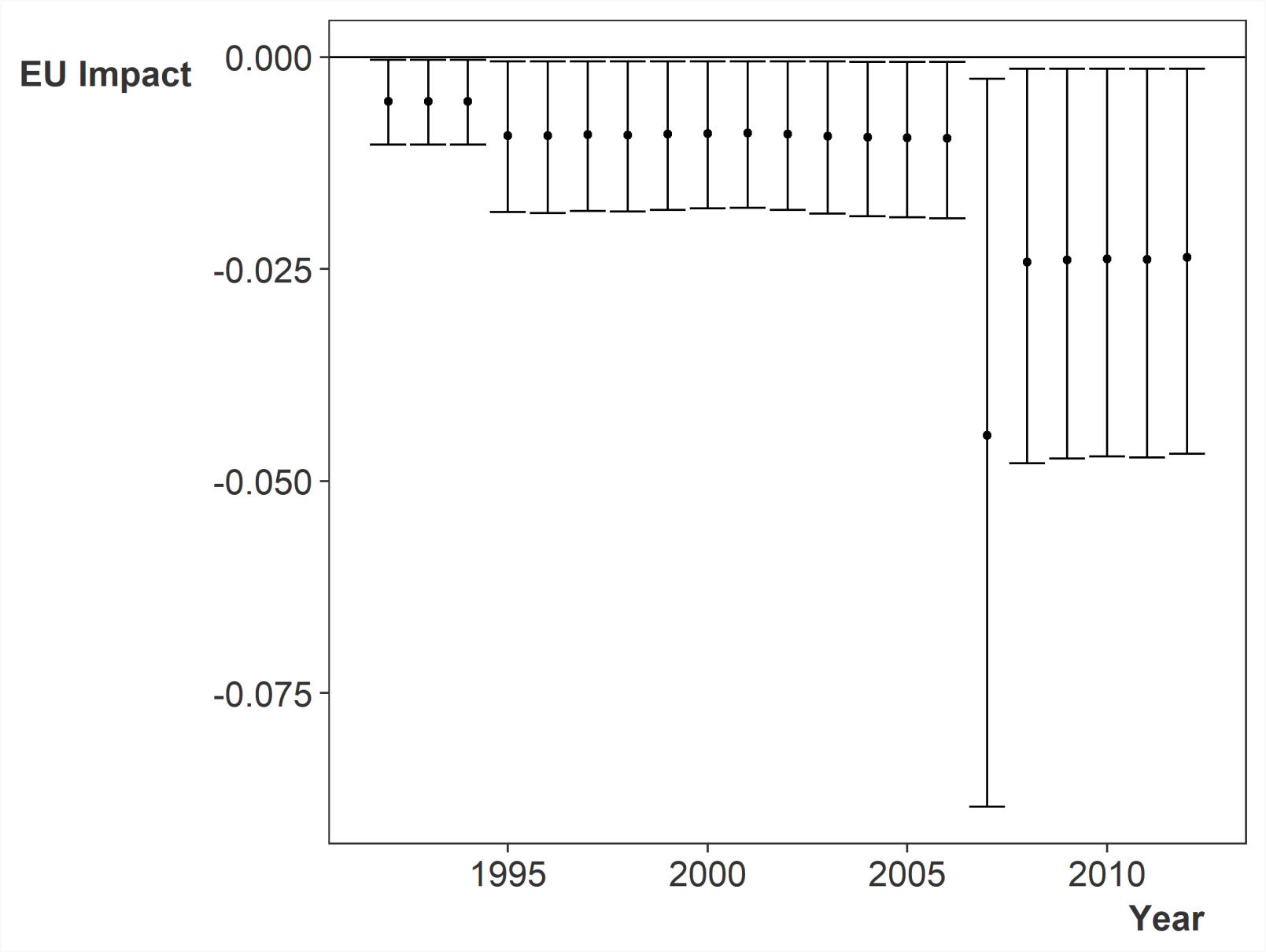
Non-Major Powers in NATO: Belgium



Impact of NATO on Belgium



Impact of EU on Belgium



Varying Slopes Model

Within each of the j groups of state capability, for i in $1...n_j$:

$$y_i \sim \mathit{student}_t(\nu_j, \alpha_j + \alpha^{st} + \alpha^{yr} + \mathbf{W}_i\gamma + \mathbf{Z}_{ji}\lambda_j, \sigma_j) \tag{5}$$

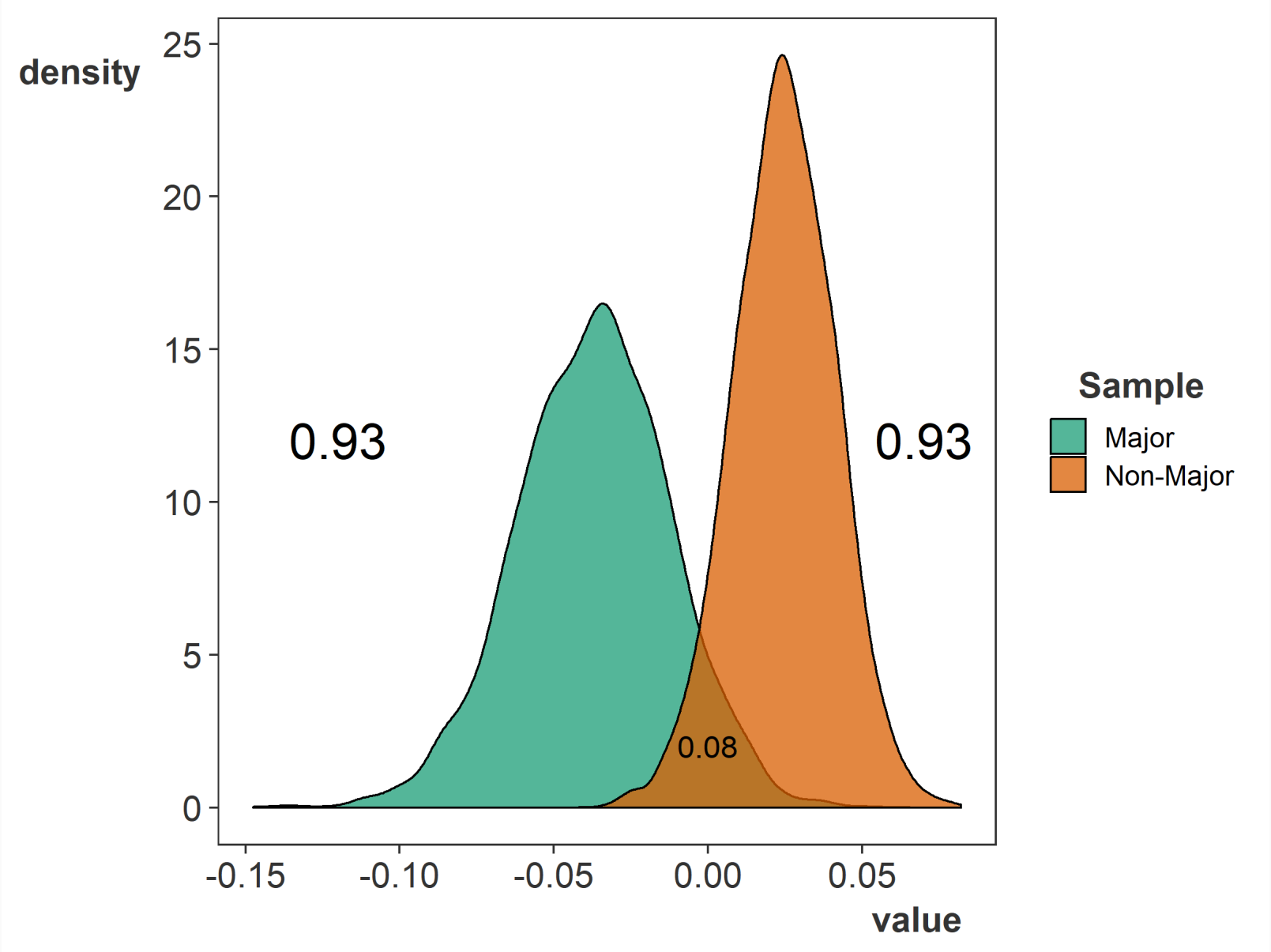
$$\lambda_j \sim N(\theta_j, \sigma_j^{all}) \tag{6}$$

$$\theta_j = \alpha_j^{all} + \mathbf{X}\beta_j \tag{7}$$

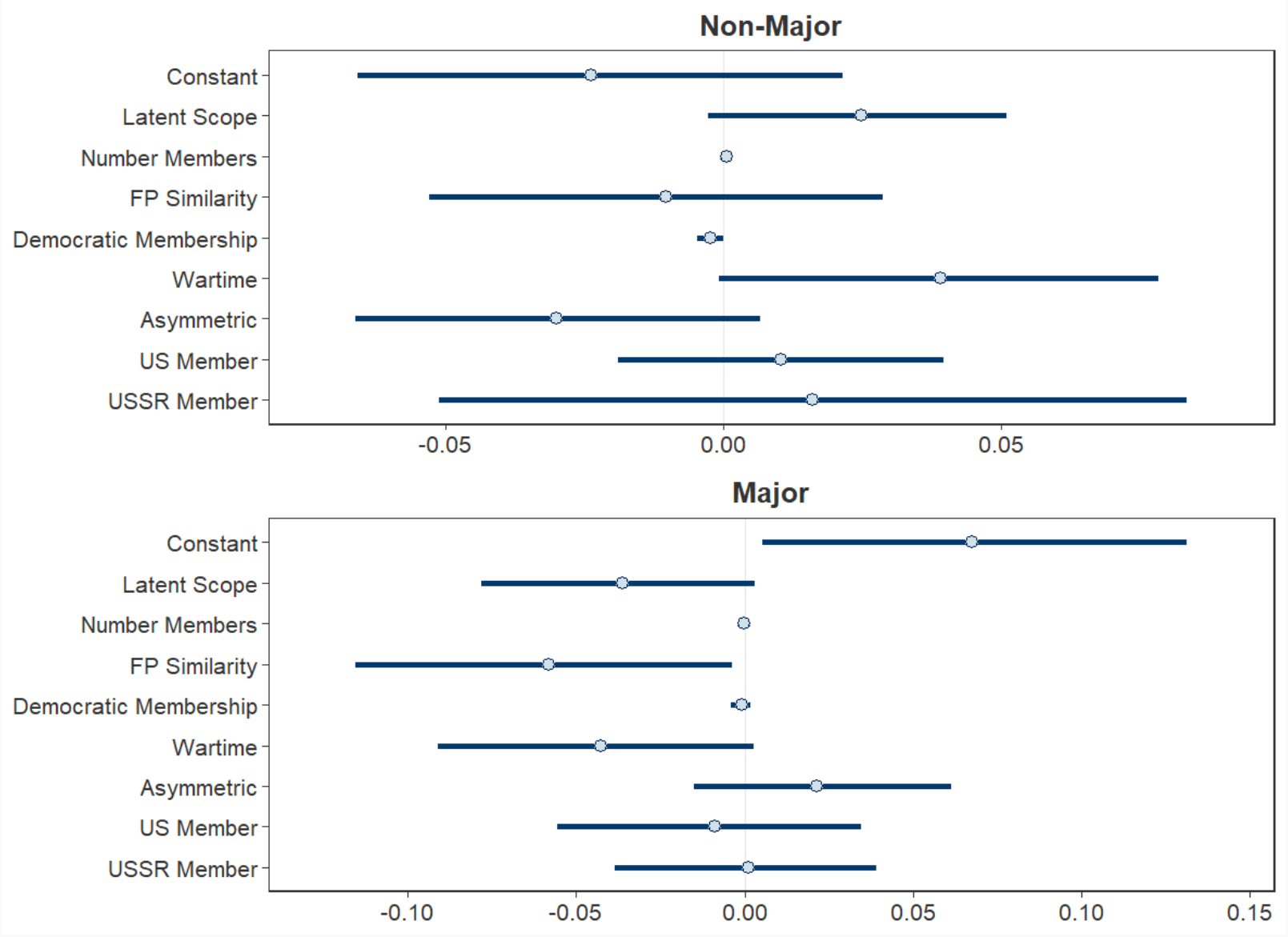
I give β_j a multivariate normal prior with prior scale τ:

$$\beta_j \sim MVN(\mu_{\beta_j}, \Sigma_\beta) \tag{8}$$

Varying Slopes Results: Scope



Full Varying Slopes Results



Single-Level Robust Regression