

Bayesian Hierarchical Modeling of Multi-Level Policy Diffusion: A Spatiotemporal Calibration Framework for Cross-National Governance Transfer

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Abstract. Contemporary governance scholarship increasingly demands methodological precision in tracing how policy instruments migrate across institutional boundaries. This study develops a Bayesian hierarchical calibration framework for modeling spatiotemporal diffusion of regulatory and legislative innovations across multi-level governance architectures. Drawing on panel data spanning 47 democracies (2005–2022), we integrate Markov Chain Monte Carlo (MCMC) estimation with spatial lag decomposition to disentangle vertical intergovernmental transmission from horizontal isomorphic adoption. Our results demonstrate that prior administrative capacity and veto-player configurations serve as primary moderators of diffusion velocity, while supranational conditionality amplifies second-order spillover effects. The framework significantly outperforms conventional event-history and fixed-effects specifications in predictive accuracy. These findings offer actionable calibration benchmarks for comparative governance analysts and international policy transfer practitioners operating under complex institutional interdependence.

Keywords: policy diffusion, Bayesian hierarchical modeling, governance transfer, spatiotemporal calibration, multi-level governance, Markov Chain Monte Carlo estimation, comparative public policy, institutional isomorphism, veto-player configuration

Introduction

The cross-national diffusion of policy innovations constitutes one of the most analytically contested phenomena in contemporary comparative governance scholarship. As of 2024–2026, accelerating supranational integration, digital regulatory harmonization, and post-pandemic institutional restructuring have dramatically intensified the mechanisms by which legislative and administrative instruments traverse state boundaries, cascade through multi-tiered governance architectures, and embed themselves within divergent institutional contexts. Despite decades of theoretical elaboration—ranging from Dolowitz and Marsh's (2000) classic transfer typologies to Simmons, Dobbin, and Garrett's (2006) diffusion mechanism taxonomy—the field continues to lack a unified, methodologically rigorous framework capable of simultaneously capturing vertical intergovernmental transmission, horizontal emulation, and the conditioning role of domestic institutional endowments at scale. Existing approaches suffer from several well-documented limitations. Event-history analysis, while temporally sensitive, systematically underestimates the spatial autocorrelation inherent in geopolitically clustered adoption patterns. Fixed-effects panel estimators, conversely, absorb precisely the institutional variance that theoretically motivates comparative inquiry. Qualitative Comparative Analysis (QCA) offers configurational richness but cannot accommodate probabilistic heterogeneity across large-N samples. These methodological lacunae are not merely technical inconveniences; they generate substantively misleading inferences about the drivers of policy convergence and the efficacy of international epistemic communities as diffusion conduits. This paper addresses these gaps directly by introducing a Bayesian hierarchical calibration framework that integrates spatiotemporal lag decomposition with Markov Chain Monte Carlo (MCMC) posterior sampling. The framework operationalizes diffusion velocity as a latent variable conditioned upon three theoretically grounded moderator clusters: (i) prior administrative capacity as indexed by Kaufmann et al.'s World Governance Indicators; (ii) veto-player configurations derived from Tsebelis's institutional topology; and (iii) supranational conditionality pressure operationalized through EU accession benchmarking, IMF structural adjustment benchmarks, and OECD regulatory peer-review scores. By estimating hierarchical priors across country-dyads nested within regional governance clusters, the model isolates second-order spillover effects that conventional specifications routinely suppress. The empirical base comprises an original panel dataset spanning 47 parliamentary and presidential democracies across five continental regions from 2005 to 2022, encompassing 1,834 discrete policy adoption events across eleven regulatory domains including environmental governance, digital infrastructure regulation, anti-corruption legislation, and social protection reform. Validation proceeds through posterior predictive checks, Widely Applicable Information Criterion (WAIC) model comparison, and out-of-sample forecasting against held-out policy adoption sequences. The remainder of the paper is structured as follows. Section 2 critically reviews the theoretical literature on policy diffusion mechanisms and identifies persistent methodological deficiencies. Section 3 formalizes the Bayesian hierarchical model specification and details the spatiotemporal lag decomposition procedure. Section 4 describes the dataset construction, variable

operationalization, and sampling diagnostics. Section 5 presents and interprets the main empirical findings, including moderator interaction effects. Section 6 discusses implications for governance transfer practitioners and the calibration of multilateral policy conditionality instruments. Section 7 concludes with reflections on the framework's generalizability and directions for future methodological refinement.

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References

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