

Boundless but Bundled: Modelling Quasi-infinite Dimensions in Ideological Space

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Abstract

Ideological summary scales, derived from policy position items, are widely used in research on political psychology and behavior. However, the underlying assumptions of these scales are rarely scrutinized. This study investigates how assumptions about the dimensionality of the latent ideological space can significantly impact empirical estimates, even when using the same data from the same respondents. Through a comprehensive literature review and statistical simulations using data from the ANES, we demonstrate that the optimal number of latent ideological dimensions generally increases without bound as researchers include additional items for analysis. At the same time, nearly all latent ideological factors found within same attitude set are sizably and positively correlated with one another. In light of these findings, we propose an alternative modeling framework that reconciles uni-dimensional and multi-dimensional aspects of mass ideology. Our Bayesian hierarchical latent variable model simultaneously estimates mass ideology as a higher-level, uni-dimensional expression of correlated, lower-level, multi-dimensional building blocks. This approach enables researchers to assess whether particular socio-demographic or psychological predictors, such as income, gender, or egalitarianism, are consistently related to specific sub-dimensions (e.g., economic, socio-cultural, racial ideology) or instead a generalized, uni-dimensional representation thereof. Our results underscore the potential value of this approach, offering insights into the unique characteristics of different ideological factors and their overarching parent dimension.

Literature analysis

A plethora of American public opinion research relies on ideological summary scales to holistically capture respondents' political preferences. Typically constructed from survey items covering a variety of public policy issues, such scales enable researchers to locate respondents in a more parsimonious attitude space. Despite their ubiquity, these scales are themselves rarely the subject of scrutiny and we argue that the measurement of policy ideology warrants more careful and critical attention. Reviewing policy position scales embedded within 74 peer-reviewed publications relying on representative US data, we find that only a minority (22%) of papers assess elementary statistical properties such as internal reliability and valid dimensional structure. Additionally, there is little consensus across studies regarding the appropriate number of policy items to be included in these scales.

Furthermore, there is a lack of agreement on the optimal number of dimensions characterizing Americans' policy attitudes. While a plurality of studies (40%) relies on the classic, uni-dimensional left-right continuum, almost as many (36%) employ bi-dimensional summary scales, typically differentiating between economic and social dimensions of ideology. Additionally, 12% of articles suggest various three-dimensional solutions, while another 13% propose four or more dimensions to adequately capture Americans' policy positions.

Interestingly, we observe that studies which utilize larger pools of issue items are more likely to employ multidimensional summary scales. In other words, authors who select more policy position items tend to construct separate scales capturing different dimensions of mass ideology.

Statistical simulation

Our simulation analysis aims to investigate potential factors contributing to the correlation between the number of policy items and scale construction observed in published research. Using data from the 2012 American National Election Studies (ANES), we conducted approximately 10,000 simulations of latent ideology models with varying item bucket sizes using an iterative process of item selection, dimensionality estimation, and scale construction. As a robustness check, we repeated the process for personality - a construct with a comparatively well-established dimensional structure.

The results in Figure 3 confirm a key pattern identified in published work in political behavior: an increase in the number of distinct policy attitudes necessitates additional ideological dimensions to adequately capture the complexity of the latent attitude space. In other words, ideological dimensionality grows without bound as researchers incorporate more information to measure it. This does not happen for well-established concepts like personality; here, the number of survey items does not lead to a proportional increase in latent complexity beyond 5-6 latent dimensions. However, while personality is constrained by a fixed number of orthogonal factors, we observe that virtually all latent dimensions identified in policy position data are strongly and consistently positively correlated with one another. Although complex enough to warrant separate spatial representation, all latent ideological dimensions seem to be tethered to an overarching, yet somewhat imprecise, uni-dimensional origin.

Figure 1: Number of Items and Scale Dimensionality in Public Opinion Research 1964–2022

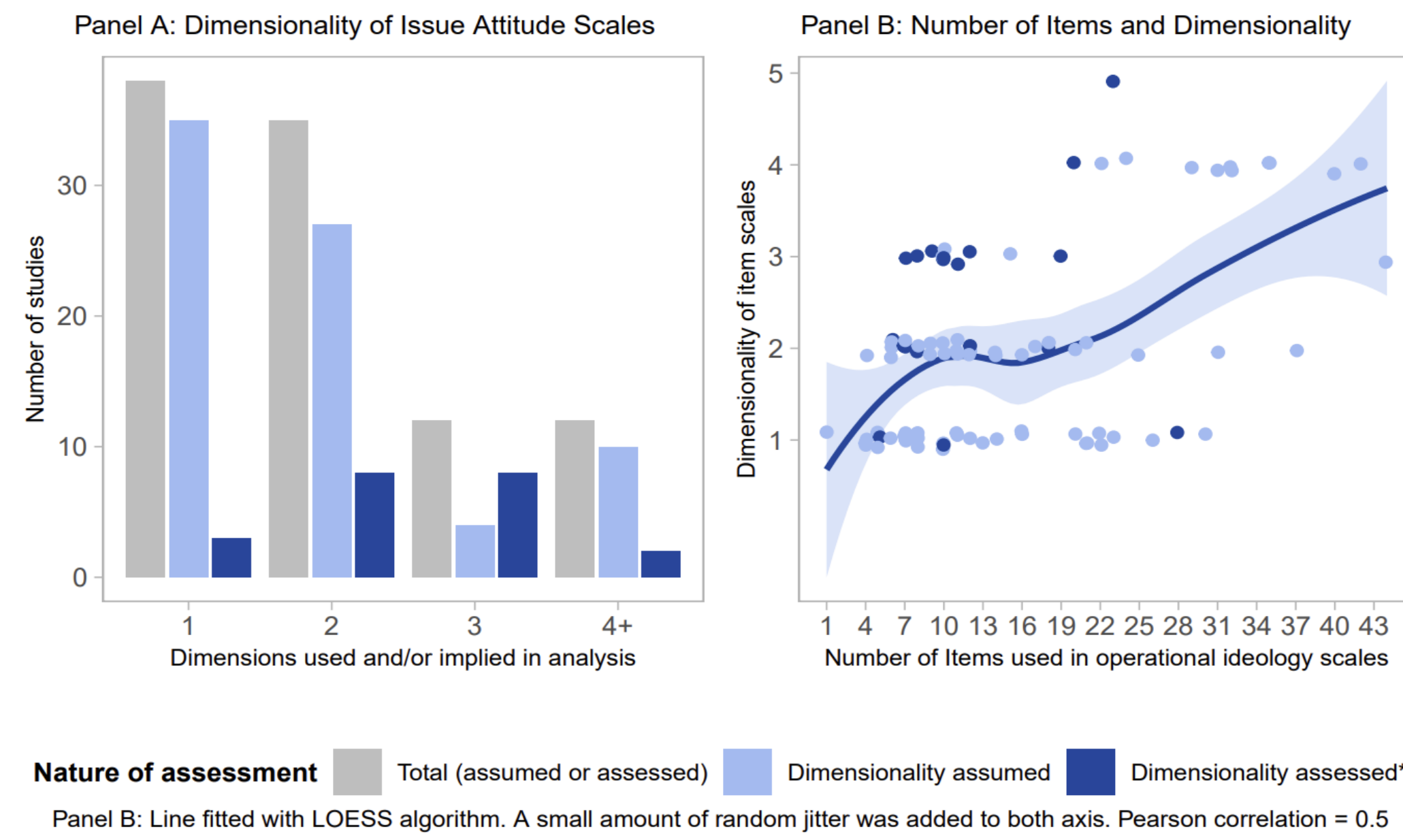


Figure 3: Item Samples and Latent Dimensionality in Policy Ideology and Personality Data

Top: Number of issue items and estimated latent dimensionality. Bottom: Average latent factor correlations within the same model.

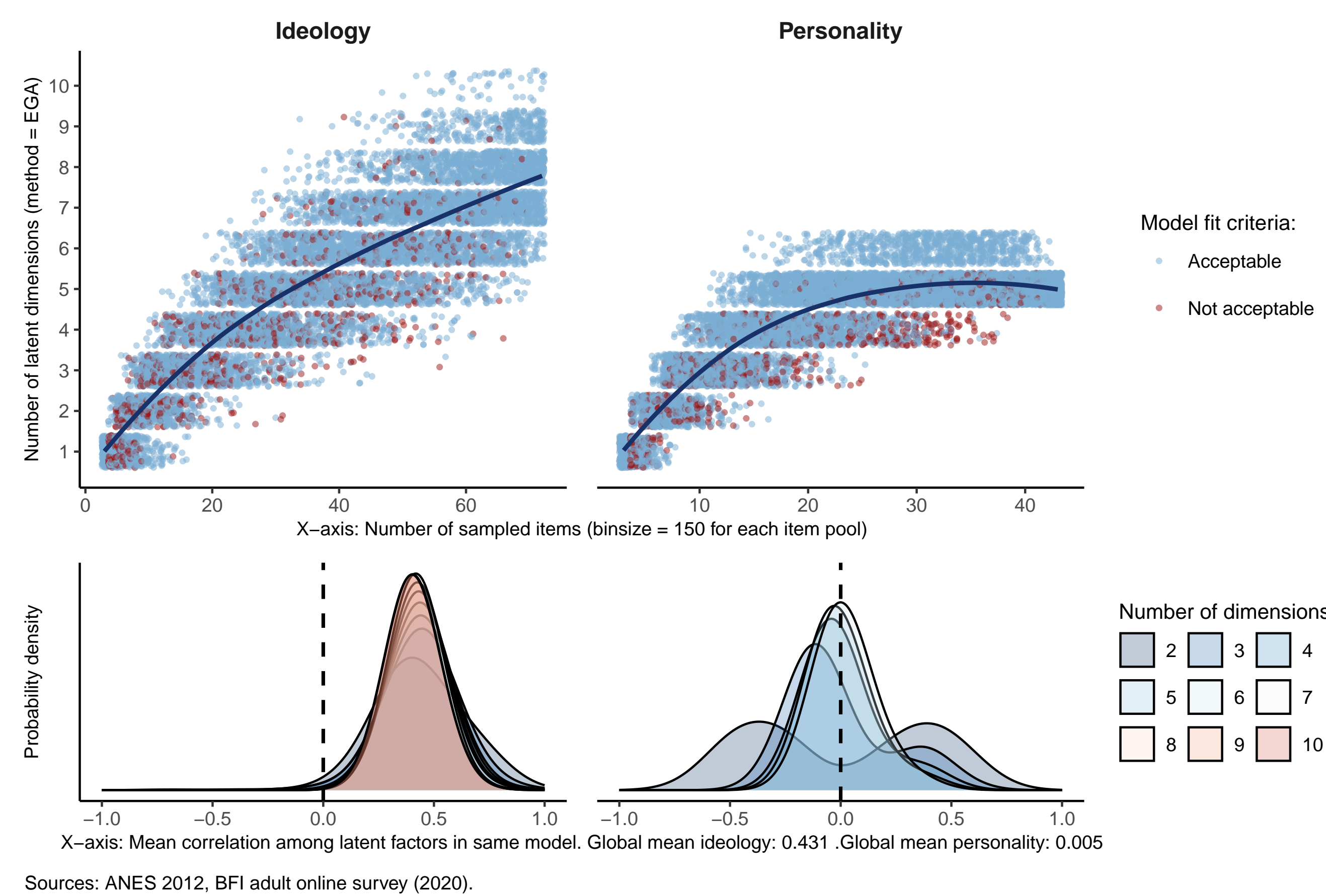
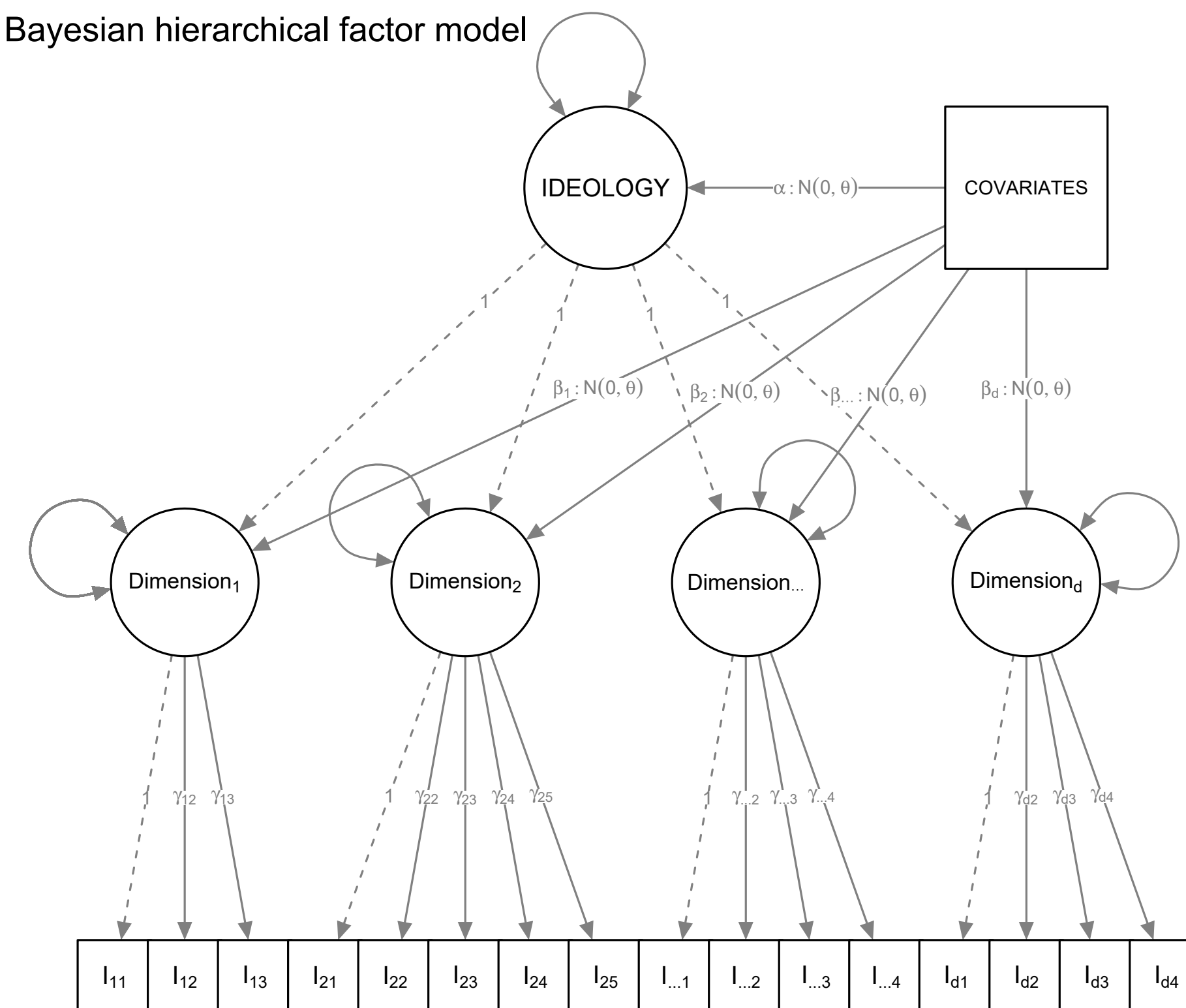


Figure 4: Bayesian hierarchical factor model



Bayesian hierarchical factor models

In light of these findings, we propose an alternative modeling strategy that unifies the multi-dimensional and uni-dimensional characteristics of policy ideology. Figure 4 outlines the blueprint for a Bayesian hierarchical factor model featuring a quasi-infinite number of area-specific sub-dimensions ("Dimension_x") explaining the covariance structure among a given set of policy position items. The model further assumes that all of these sub-dimensions originate from a single, albeit somewhat diffuse hyper-dimension: "IDEOLOGY". While the sub-dimension level features freely estimated loading structures (γ 's), the uni-dimensional hyper-factor is modeled as a pooled average across all sub-dimensions (i.e., higher-level loading coefficients are constrained to unity). Substantially, these constraints treat the super-ordinate ideological factor as a simple average among a heterogeneous pool of cousin concepts - a modeling procedure which treats ideology as a family resemblance concept (Wittgenstein 1956; Cochrane 2015). Finally, informative prior distributions on external predictors allow for the simultaneous estimation of socio-demographic and psychological predictors of uni-dimensional (α) and multi-dimensional (β 's) expressions of mass ideology. Effects of predictors such as income or racial resentment can thus be decomposed into particularities of certain sub-dimensions (such as economic or racial ideology) and effects that generalize across all dimensions.

Figure 5: Predictors of Policy Ideology in Bayesian Hierarchical and Maximum-Likelihood Frameworks

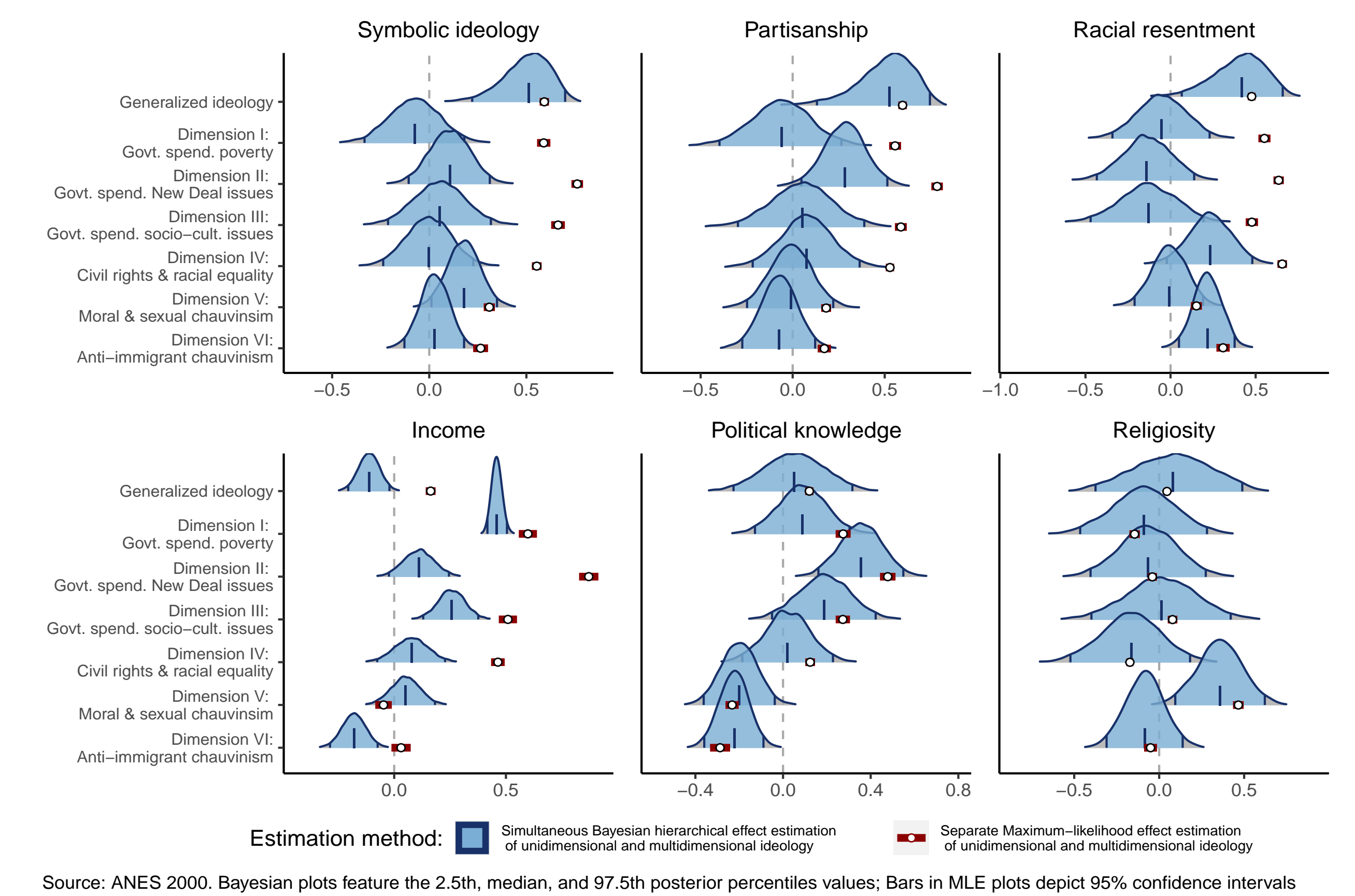


Figure 5 showcases some potential merits of the proposed estimation strategy. For our data foundation, we rely on a pool of issue items ($i = 24$) included across 6 high-quality research papers modeling policy ideology based on the 2000 ANES. Using Exploratory Graph Analysis (EGA) to detect latent dimensionality in this set of attitudes, we find evidence for 6 distinct, yet positively correlated ($\hat{r} = 0.42$) sub-dimensions, which could be labeled as 1) poverty reduction, 2) New Deal issues, 3) socio-cultural issues, 4) racial justice, 5) moral & sexual chauvinism, and 6) anti-immigrant resentment. Employing the same predictors as in Feldman and Johnston's influential Political Psychology paper *Understanding the determinants of political ideology: Implications of structural complexity* (2014), we find that political partisanship, ideological self-identification, racial resentment, and egalitarianism best predict the uni-dimensional hyper-factor. Conversely, controlling for the influence of generalized ideology, we find that respondents' income strongly predicts conservative stances on anti-poverty legislation; anti-immigrant sentiment, meanwhile, moderately decreases with income. Other predictors, such as level of education and political knowledge, are positively related to ideological sub-dimensions related to economic redistribution, yet negatively predict socio-cultural tolerance. Finally, superimposed maximum-likelihood estimates in Figure 5 (colored red) illustrate how conventional estimation strategies generally fail to decompose such effects into common and unique properties across different dimensions of mass political preference.

References

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