The decomposition of true change and response shifts in latent constructs across time

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Many phenomena of interest in the social sciences are not directly observable. Rather, they are conceptualized as latent constructs measured via multiple manifest indicators. Measurement models, such as CFA or IRT models, are utilized to formalize the link between the latent and manifest worlds.

In longitudinal panel studies, valid inferences about the temporal development of a latent construct require that the parameters of the measurement models (e.g., intercepts, factor loadings) are invariant across time. If measurement invariance is not given, cross-time changes in the means and variances of the latent variables are not adequately interpretable because the changes do not only reflect the temporal development of the latent construct (true change) but also systematic changes in the response behavior of the panel population (response shifts).

Nevertheless, it is still possible to learn from the data in such situations. Oort (2005) proposed a threefold linear decomposition of the differences in manifest indicator means into (i) two response shift components and (ii) a true change component, based on the CFA panel data. We propose an extension of the approach, which contains a different identification strategy, estimators for the standard errors of the decomposition components, and possibilities for the graphical visualization of the results.

We demonstrate an empirical application of the extended decomposition procedure using panel data from the CrimoC project.

Reference

Oort, F. (2005). Using structural equation modeling to detect response shifts and true change. Quality of Life Research, 14, 587–598.