Integrating QCA and HLM for Multilevel Research on Organizational Configurations


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QCA PDW, AOM 2018
Chicago, Illinois - Friday, 10 August 2018
Why multilevel research in the social sciences?

- Multilevel research argues that most (if not all) social science phenomena are multilevel

  “Explanations that simply relate macro properties to each other are unsatisfactory.”

  “There are no conceivable causal mechanisms in the social world that operate solely on the macro-level.”
  Abell, Felin & Foss (2008). Building micro-foundations for the routines, capabilities, and performance links. Managerial and decision economics, 29(6), 489-502

- Describing, explaining, and predicting social phenomena requires integrating micro and macro levels of analysis

  Multilevel research analyzes the cross-level dynamics between micro and macro (and meso) levels.
Multi-level models and empirical settings

- Coleman’s bathtub model is one of the most prominent expository vehicles for thinking about multi-level issues in social science research.

Empirical settings

- Macro level (system of action)
- Micro level (actors and resources)

District Country Party
District A School 1 School 2
Class A Class B

- Transformational mechanism
- Action-formation
- Situational mechanism
Two features of empirical multilevel research

**Manifest levels**
- All classes are directly observable
- Strong reliance on forms of formal designation to determine the boundaries of classes (e.g., industry classifications, country)

**Perfectly nested structures**
- All lower level units can be unambiguously categorized to higher-level classes
- Classes at higher-level levels are both collectively exhaustive and mutually exclusive

**Challenge**
What if classes are latent (i.e., by definition not observable)? What if class boundaries are ambiguous?

**Challenge**
What if units can have multiple and/or competing memberships in classes (cross-classification and overlapping levels)?
A more challenging multilevel context

Macro level 2b
Latent classes (e.g., generic strategies, strategic groups, bus. systems)

- Lat.C2
- Lat.C2
- Lat.C3
- Lat.C4

Overlapping-clustering

Macro level 2a
Observable classes (e.g., industry, region)

- Obs.C1
- Obs.C1

Cross-classification

Micro level 1
Observable units (e.g., firm)

- U.1
- U.2
- U.3
- U.4
- U.5
- U.6
Three step approach

Step 1: Run QCA
- Design model and calibrate data
- Conduct truth table analysis

Step 2: Transfer QCA to HLM
- Measure membership score of each unit in each configuration
- Classify cases as members of latent classes

Step 3: Run HLM
- Run HLM with latent class at macro and cases at micro level

Results
- Interpret integrated findings on the structure of configurations and their multilevel forces
Two-level HLM: Estimating two-level Effects

- Recode membership scores into theoretically relevant categories
- Simulation of a *quasi*-perfectly nested structure
- Examine two-level effects between the first level and the latent macro level

**Micro-level equation**

\[ y_{ij} = \beta_0 + \beta_1 x_{ij} + e_{ij} \]

*y_{ij},* for example, denotes performance *y* of company *i* that has adopted organizational type *j*

**Macro-level equations**

\[ \beta_0 = \gamma_0 + r_{o0} \]

\[ \beta_1 = \gamma_1 + r_{1j} \]

Intercept \( \beta_0 \) and slope \( \beta_1 \) vary with organizational type. Intercept \( \beta_0 \) varies around a fixed part \( \gamma_0 \) and a random part \( r_{o0} \). Fixed part is average intercept from the entire sample. Random parts are random draws from a distribution.

**Estimation equation for the HLM**

\[ y_{ij} = \gamma_0 + \gamma_{10} x_{ij} + r_{o0} + r_{1j} x_{ij} + e_{ij} \]

First two components \( \gamma_0 + \gamma_{10} x_{ij} \) denote the fixed effects, and the third and the fourth component \( r_{o0} + r_{1j} x_{ij} \) denote random effects. \( e_{ij} \) is a normally distributed independent and identically distributed error term.
Using QCA for latent class analysis in MLR

- Multilevel research is important in organization science and elsewhere
- Identifying latent classes and modelling complex nested structures challenges the application of multilevel research
- We explain how QCA allows researchers to
  - Identify informed latent classes
  - Measure membership of lower-level units in latent higher-level classes
- We illustrate how researchers may integrate set-theoretic membership scores in a two-level hierarchical linear model
- Possible extension:
  - Alternative fine-grained measures of membership (degrees of membership, classifications of hybrids, etc.), multiple class membership,
  - Additional levels (latent, macro or micro side)
- Requirements/ limitations: preferably large-N sample, trade-offs at integration (# config vs. # of observations), no processual perspective
Thank you!

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