



Multilevel models for cross-national research: strengths, challenges, alternatives

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Outline

- The use of multilevel models in cross-national research
 - (Strengths)
 - Problems
 - Small-N problem & its consequences
 - Possible remediations
 - Within the multilevel framework
 - Outside the multilevel framework
 - Example of multigroup modeling

Problems (1)

- Comparison with educational research (successory of ML modeling)

Some similarity...

| | Educational research | Cross-national research |
|----------------|--|-----------------------------------|
| Data structure | Nested: pupils within classes (within schools) | Nested: citizens within countries |

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Problems (2)

...but also important differences.

| | Educational research | Cross-national research |
|---------------------------|---|---|
| <i>Population</i> | Almost infinite population of interchangeable classes | Very limited population of countries |
| <i>Sampling procedure</i> | Random sampling of classes | No random sampling at the country level |
| <i>Obtained sample</i> | Large number of classes with few pupils each | Small number of countries with large number of citizens |

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Problems (3)

...but also important differences (*continued*).

| | Educational research | Cross-national research |
|---------------------------|--|---|
| <i>Micro-macro</i> | Small theoretical distance between class and pupil Clear definition of class membership | Larger theoretical distance between county and citizen More heterogeneous of membership (spatial variations) |
| <i>Research questions</i> | Focus on pupil characteristics No interest in specific classes | Focus on country characteristics Interest in specific countries |

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Problems (4)

- These differences reveal several problems with multi-level modeling for cross-national research
 - Selection bias
 - Galton problem
 - Black Box problem
 - Small N-problem

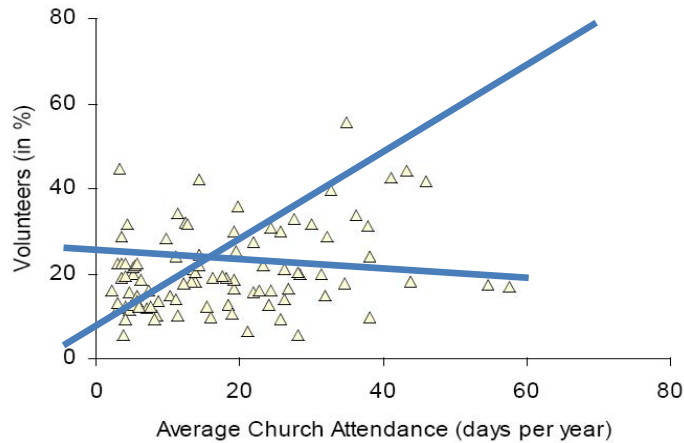
(Goldthorpe 1997 in *Comparative Social Research*)

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Small-N & its consequences (1)

- Influential observations

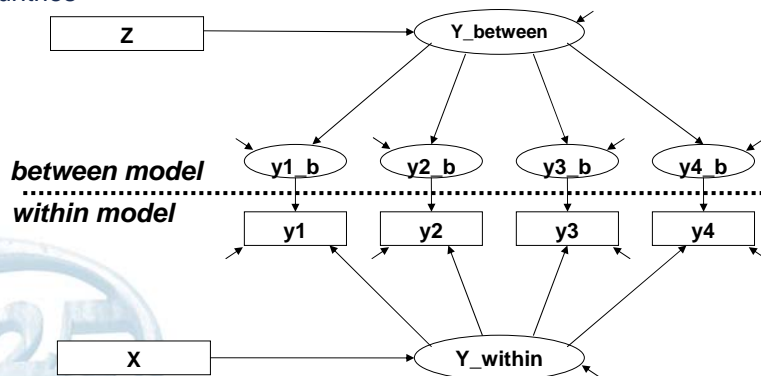
van der Meer, Te Grotenhuis & Pelzer (2010), *ASR*



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Small-N & its consequences (2)

- Consequences of the small-N problem: Monte Carlo studies to assess how accurate multilevel SEM estimates are with small numbers of countries

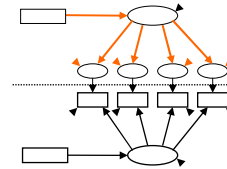


Meuleman, B. & Billiet, J. (2009). A Monte Carlo sample size study: How many countries are needed for accurate multilevel SEM? *Survey Research Methods*, 3(1), 45-58.

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Small-N & its consequences (3)

- Between-group model: problematic in several respects



| | Pop. value (standardized) | Relative parameter bias | Relative standard error bias | Power |
|------------------------|------------------------------|-------------------------------|------------------------------------|--------------|
| Factor loadings | 0.90 – 0.95 | -0.066 | -0.150 | 1 |
| Residual variances | 0.10 – 0.19 | -0.100 | -0.166 | 0.765 |
| Structural path | 0.25 | 0.106 | -0.252 | 0.311 |

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Small-N & its consequences (4)

- How many countries are needed then?
 - Between-level structural path

| # countr. | Rel. Par. bias | Rel. SE bias | Power | | | |
|-----------|----------------|---------------|-------------|-------|-------|-------|
| | | | effect size | | | |
| | | | 0.00 | 0.25 | 0.50 | 0.75 |
| 20 | 0.106 | -0.255 | | | | |
| 40 | 0.050 | -0.132 | | | | |
| 60 | 0.039 | -0.090 | 0.159 | 0.311 | 0.745 | 0.995 |
| 80 | 0.026 | -0.071 | 0.103 | 0.407 | 0.937 | 1.000 |
| 100 | 0.021 | -0.059 | 0.083 | 0.527 | 0.989 | 1.000 |
| | | | 0.077 | 0.632 | 0.999 | 1.000 |
| | | | 0.076 | 0.715 | 1.000 | 1.000 |

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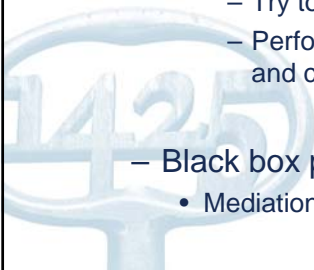
Small-N & its consequences (5)

- To what extent do these result apply to HLM (conventional multi-level modeling)? We do not know. Expectations:
 - Probably somewhat less severe bias
 - Yet, cross-level interactions and random slopes might be more problematic
 - Commonly accepted guideline in sample size literature: 30/30, 50/20 or 100/10 (Kreft, 1996)



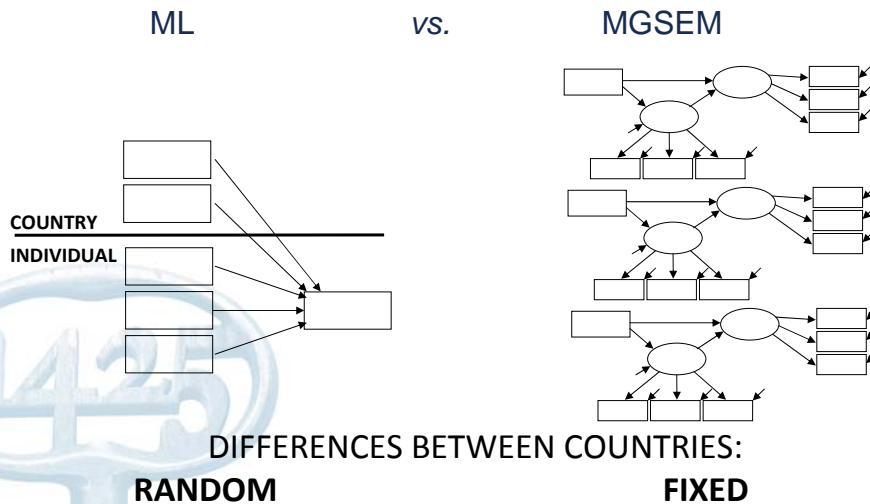
Remediating the problems (1)

- Within the multilevel framework:
 - Small-N problem
 - Check for outlying (groups of) observations
E.g.: [influence.me](http://www.rensenieuwenhuis.nl/r-project/influenceme/)
(<http://www.rensenieuwenhuis.nl/r-project/influenceme/>)
 - Bayesian statistics, MCMC models
 - But even then...
 - Try to reduce the complexity of the between-level models
 - Perform robustness checks by including/excluding variables and countries
 - Black box problem
 - Mediation multilevel analysis



Remediating the problems (2)

- Outside the multilevel framework: multigroup approach



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Remediating the problems (3)

- Advantages of MGSEM:
 - Estimation of indirect effects: further specification of causal chains
 - No sample size requirements at the country level
 - No distributional assumptions at the country-level
 - Latent variable modeling / taking measurement error into account
 - Possibilities to test for measurement equivalence
- Macro-micro relations in MGSEM: two-step method (cfr. Achen 2005 *Political Analysis*)
 - Step 1: model with individual variables only
 - Step 2: link outcomes from step 1 to context variables

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Example (1)

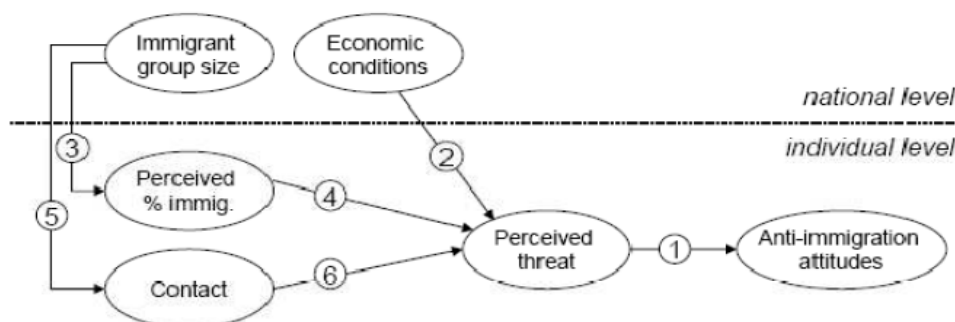
- Example of multigroup analysis (+ two-step approach)

Meuleman, B. (2011). Perceived economic threat and anti-immigration attitudes: Effects of immigrant group size and economic conditions revisited. In E. Davidov, P. Schmidt & J. Billiet (eds.), *Cross-cultural methods and applications*. London: Taylor & Francis.

- Does the presence of immigrant groups in a country stir up anti-immigration attitudes?
- So far: inconsistent findings

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Example (2)

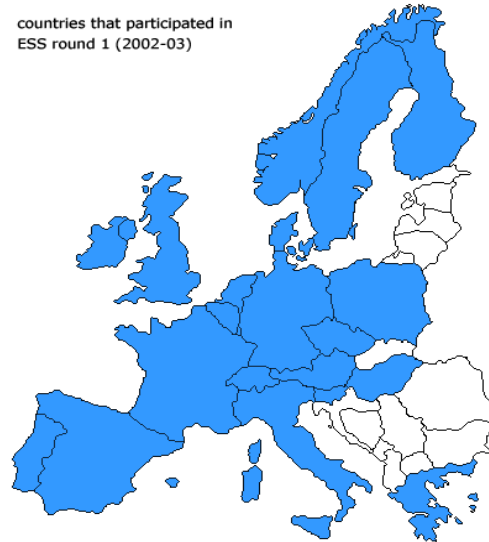


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Example (3)

- ESS Round 1, 21 countries, 35.000 respondents
- Module on attitudes toward immigration

countries that participated in ESS round 1 (2002-03)



Example (4)

| | Question wording | Answer categories |
|-----------|---|---|
| REJECT | To what extent do you think [country] should allow people ... | |
| | D4. ... of the same race or ethnic group from most [country] people to come and live here? | |
| | D5. ... of a different race or ethnic group from most [country] people to come and live here? | 1 (many), 2 (some), 3 (a few), 4 (none) |
| | D7. ... from the poorer countries in Europe to come and live here? | |
| | D8. ... from the richer countries outside Europe to come and live here? | |
| ECOTHREAT | D9. ... from the poorer countries outside Europe to come and live here? | |
| | D19. People who come to live and work here generally harm the economic prospects of the poor more than the rich | 1 (agree strongly) to 5 (disagree strongly) |
| | D21. If people who have come to live and work here are unemployed for a long period, they should be made to leave. | |
| | D25. Would you say that people who come to live here generally take jobs away from workers in [country], or generally help to create new jobs? | 0 (take jobs away) to 10 (create new jobs) |
| | D26. Most people who come to live here work and pay taxes. They also use health and welfare services. On balance, do you think people who come here take out more than they put in or put in more than they take out? | 0 (generally take out more) to 10 (generally put in more) |
| | D27. Would you say that it is generally bad or good for [country] economy that people come to live here from other countries? | 0 (bad for the economy) to 10 (good for the economy) |

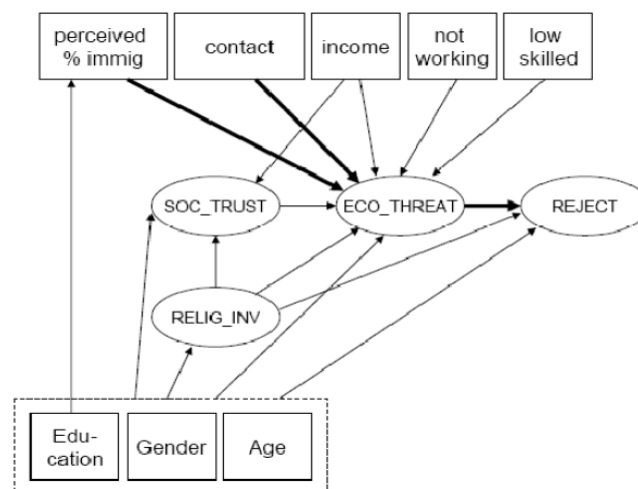
Example (5)

- perceived % immigrants:
"Out of every 100 people living in [country], how many do you think were born outside [country]?"
- Contact: having at least "some" immigrant friends or colleagues
- Immigrant group size: proportion of non-EU foreign born population



Example (7)

- STEP 1: MGSEM, individual level variables



Example (8)

Table 2. Effects of ECOTHREAT on REJECT – Unstandardized parameter estimates and standardized effects

| | <i>Par.Est.</i> | <i>Std.Par.</i> | | | <i>Par.Est.</i> | <i>Std.Par.</i> | | |
|----|-----------------|-----------------|-----|--|-----------------|-----------------|--------|-----|
| CH | 1.25 | (0.71) | *** | | ES | 1.07 | (0.60) | *** |
| IT | 1.23 | (0.73) | *** | | DE | 1.02 | (0.68) | *** |
| LU | 1.23 | (0.59) | *** | | CZ | 1.00 | (0.64) | *** |
| SE | 1.22 | (0.71) | *** | | PT | 1.00 | (0.63) | *** |
| DK | 1.18 | (0.69) | *** | | SI | 0.99 | (0.60) | *** |
| FI | 1.17 | (0.74) | *** | | HU | 0.98 | (0.61) | *** |
| NO | 1.16 | (0.67) | *** | | BE | 0.93 | (0.60) | *** |
| IE | 1.11 | (0.64) | *** | | GR | 0.93 | (0.69) | *** |
| NL | 1.11 | (0.64) | *** | | AT | 0.91 | (0.60) | *** |
| FR | 1.09 | (0.72) | *** | | PL | 0.84 | (0.55) | *** |
| GB | 1.08 | (0.70) | *** | | | | | |

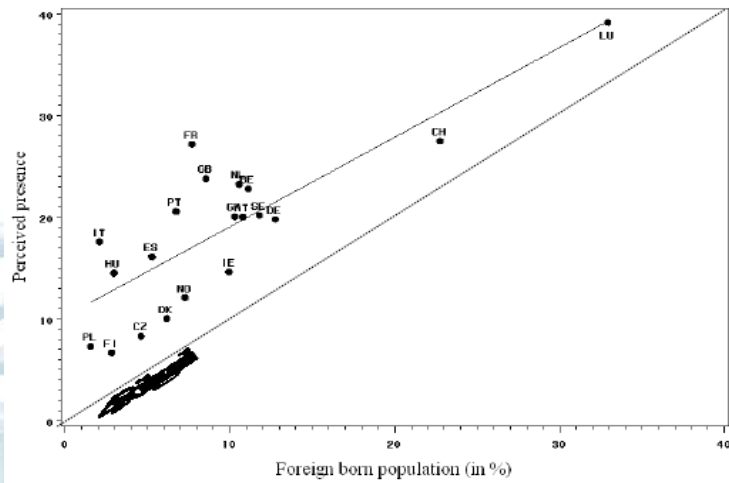
* p<.05; ** p<.01; *** p<.001

| | Contact | | | | Perceived presence | | |
|----|-----------------|-----------------|-----|----|--------------------|-----------------|-----|
| | <i>Par.Est.</i> | <i>Std.Par.</i> | | | <i>Par.Est.</i> | <i>Std.Par.</i> | |
| FR | -0.17 | (-0.28) | *** | GR | 0.15 | (0.21) | *** |
| ES | -0.16 | (-0.29) | *** | GB | 0.13 | (0.21) | *** |
| GR | -0.15 | (-0.21) | *** | NL | 0.13 | (0.23) | *** |
| PT | -0.15 | (-0.23) | *** | NO | 0.12 | (0.22) | *** |
| DE | -0.14 | (-0.23) | *** | DK | 0.11 | (0.20) | *** |
| AT | -0.13 | (-0.20) | *** | IT | 0.11 | (0.20) | *** |
| DK | -0.13 | (-0.24) | *** | CH | 0.10 | (0.19) | *** |
| CH | -0.12 | (-0.22) | *** | LU | 0.10 | (0.21) | *** |
| GB | -0.12 | (-0.19) | *** | CZ | 0.08 | (0.13) | *** |
| BE | -0.10 | (-0.17) | ** | BE | 0.06 | (0.09) | *** |
| CZ | -0.10 | (-0.16) | *** | AT | 0.05 | (0.08) | ** |
| FI | -0.10 | (-0.16) | *** | DE | 0.05 | (0.07) | ** |
| IT | -0.10 | (-0.17) | *** | FR | 0.05 | (0.08) | ** |
| NO | -0.10 | (-0.19) | *** | FI | 0.04 | (0.07) | *** |
| SI | -0.09 | (-0.15) | *** | IE | 0.04 | (0.08) | *** |
| IE | -0.08 | (-0.15) | *** | PT | 0.04 | (0.06) | ** |
| NL | -0.08 | (-0.15) | *** | SI | 0.04 | (0.07) | ** |
| SE | -0.07 | (-0.12) | *** | SE | 0.03 | (0.05) | |
| HU | -0.05 | (-0.09) | ** | ES | -0.02 | (-0.03) | |
| PL | -0.05 | (-0.08) | ** | HU | -0.02 | (-0.03) | |
| LU | -0.03 | (-0.05) | | PL | -0.02 | (-0.04) | * |

.05; ** p<.01; *** p<.001

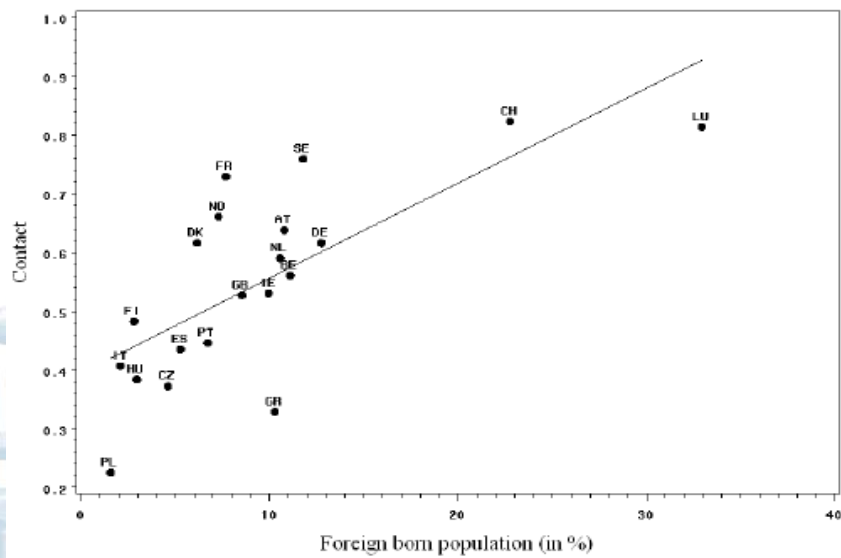
Example (10)

- STEP 2: link between context and MGSEM



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Example (11)



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Example (12)

- Immigrant group size is, via 2 different mechanisms, related perceived threat / anti-immigration attitudes
- Two-step method:
 - Further specification of the causal chain
 - Greater flexibility to use tools at the macro-level that rely on less assumptions
 - More attention for the position of separate countries

