


Universiteit Utrecht


# Reluctant Respondents & Measurement Error



Joop Hox  
Edith de Leeuw  
Utrecht University  
Hsuan-Tzu Chang  
National Taiwan University


Reluctant Respondents and Data Quality

- Question: does drawing in reluctant respondents result in a better or worse data quality?
  - + More representative sample?
  - More measurement error?
- 1. Reluctant respondents more measurement error for extrinsic reasons
  - lower education, more often language problems
- 2. Reluctant respondents more measurement error for intrinsic reasons
  - less motivated, more suspicious




Measurement Error in Subjective Phenomena

- Approach: compare measurement error of eager and reluctant respondents
- Using Multi-Trait Multi-Method (MTMM) design & confirmatory factor analysis
- Data: mail survey data (TDM) from Hox (1986, dissertation), sample of general population
  - Eager: responded to 1<sup>st</sup> round (N=237)
  - Reluctant: responded 2<sup>nd</sup>/3<sup>rd</sup> round (N=239)



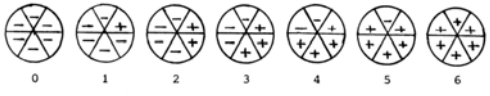
Measurement Error in Subjective Phenomena


- Questions:
  - 3 *traits*: satisfaction with
    - House, Income, Health
  - 5 *methods*:
    - Verbal: Self report, Social comparison
    - Graphical: Faces; Ladder; Circles
    - (question types from Andrews & Withey, 1976)



Measurement Error in Subjective Phenomena



- 5 *methods*:
  - Verbal: Self report, Social comparison
  - Graphical: Faces; Ladder; Circles

0 BESTE DAT IK ZOU KUNNEN VERWACHTEN  

  
 1 SLECHTSTE DAT IK ZOU KUNNEN VERWACHTEN IN MIJN LEVEN



Analysis of MTMM matrix for eager and reluctant respondents

1. Find well-fitting model in entire sample
  - CFA with *trait* and *method* factors + *error*
2. Compare 2 groups of respondents
  1. Equal factor structure
    - Construct validity
  2. Equal factor loadings
    - Equivalence of measure
  3. Equal error variances
    - Equivalence of measure

## CFA models for MTMM matrix

- “standard” MTMM model
- Correlated Uniqueness model

- Identification and convergence problems

Marsh & Grayson (1995). Latent variable models of multitrait-multimethod data.

## Results total sample

Table 1. Goodness of Fit of Alternative MTMM Models

Model	$\chi^2$	df	D	$\chi^2/df$	RMSEA	TLI	RNI
(1)CFA-CT	549.87	87			.016	.94	.93
(2)CFA-CTCU	107.86	72	(1) v.s (2)	$\chi^2_{(15)}=442.01$ (p<.00)	.032	.99	.98
(3)CFA-CTUM	107.86	72			.032	.99	.98
(4)CFA-CTCM	91.42	62	(3) v.s (4)	$\chi^2_{(10)}=16.44$ (p=.09)	.032	.99	.98

- CT (correlated traits, no methods) *no fit*
- CTCU (correlated traits, correlated uniqueness for methods) *fits well*
- CTUM (correlated traits, uncorrelated methods) *fits well*
- CTCM (correlated traits, correlated methods) *fits well*

## Results two groups: fit

Table 2. Goodness of Fit of Alternative MTMM Multiple Group Models

Model	$\chi^2$	df	D	$\chi^2/df$	RMSEA	TLI	RNI
(B)CFA-CTCU	181.12	144			.033	.99	.97
(C)CFA-CTCU	201.23	156	(B) v.s (C)	$\chi^2_{(12)}=20.11$	.035	.99	.97
(D)CFA-CTCU	307.88	186	(C) v.s (D)	$\chi^2_{(30)}=106.65^*$	.053	.98	.96
(E)CFA-CTCU	314.10	192	(D) v.s (E)	$\chi^2_{(6)}=6.22$	.052	.98	.96
(Dv)-C	243.73	171	(C)-1 v.s (C)	$\chi^2_{(15)}=50.26^*$	.042	.99	.97
(Dc)-C	251.49	171	(C)-2 v.s (C)	$\chi^2_{(15)}=42.5^*$	.045	.99	.96

- B. Identical structure *fits well*
- C. Identical factor loadings *fits well*
- D. Identical error (co)variances *fits worse*
- E. Identical trait correlations *fits well*

## Results two groups: fit

Table 2. Goodness of Fit of Alternative MTMM Multiple Group Models

Model	$\chi^2$	df	D	$\chi^2/df$	RMSEA	TLI	RNI
(B)CFA-CTCU	181.12	144			.033	.99	.97
(C)CFA-CTCU	201.23	156	(B) v.s (C)	$\chi^2_{(12)}=20.11$	.035	.99	.97
(D)CFA-CTCU	307.88	186	(C) v.s (D)	$\chi^2_{(30)}=106.65^*$	.053	.98	.96
(E)CFA-CTCU	314.10	192	(D) v.s (E)	$\chi^2_{(6)}=6.22$	.052	.98	.96
(Dv)-C	243.73	171	(C)-1 v.s (C)	$\chi^2_{(15)}=50.26^*$	.042	.99	.97
(Dc)-C	251.49	171	(C)-2 v.s (C)	$\chi^2_{(15)}=42.5^*$	.045	.99	.96

- F. (Dv) Identical error variances *fits worse*
- G. (Dv) Identical error covariances *fits worse*

## Results two groups: factor loadings

Method	Uniqueness eager			Uniqueness reluctant		
	T1	T2	T3	T1	T2	T3
Method 1						
T1M1				0.6		
T2M1	0.97*					
T3M1		0.93*				
Method 2						
T1M2				0.79		
T2M2	1				0.74	
T3M2		0.62*				0.67
Method 3						
T1M3				0.91		
T2M3	0.97*					
T3M3		1				
Method 4						
T1M4				0.82		
T2M4	0.97*					
T3M4		0.97*				
Method 5						
T1M5				0.82		
T2M5	0.97*					
T3M5		0.97*				

- Common factor structure
- All traits measured well
  - Trait correlations low
- Method 2 (comparison) weakest
- Methods 3-5 (graphical) best


## Results two groups: uniquenesses

Method	Uniqueness eager			Uniqueness reluctant		
	T1	T2	T3	T1	T2	T3
Method 1						
T1M1	0.48*			0.72*		
T2M1	0.59*				0.57*	
T3M1		0.37*				0.59*
Method 2						
T1M2	0.77*			0.96*		
T2M2	0.55*				0.77*	
T3M2		0.82*				0.93*
Method 3						
T1M3	0.23*			0.35*		
T2M3	0.26*				0.32*	
T3M3		0.19*				0.31*
Method 4						
T1M4	0.25*			0.14*		
T2M4	0.16*				0.16*	
T3M4		0.19*				0.14*
Method 5						
T1M5	0.18*			0.22*		
T2M5	0.27*				0.26*	
T3M5		0.27*				0.26*

- Unique variances generally higher in reluctant group
- Specifically with verbal questions
- Graphical question formats better, especially M4 (ladder)
- ... designed originally by Cantril for its intercultural generalizability...

### Why have reluctant respondents larger error variance?

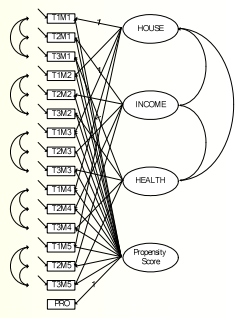

1. Reluctant respondents more measurement error for intrinsic reasons
  - less motivated, more suspicious
2. Reluctant respondents more measurement error for extrinsic reasons
  - lower education, more often language problems



ITSEW 2008 13

### Why have reluctant respondents larger error variance?


- Calculate propensity for being in reluctant group, based on background characteristics
  - age, gender, marriage, job status, housing (logistic regression)
- Add propensity score as covariate to the CFA model
- Result: same as before, groups still differ
  - Intrinsic reasons apply here

ITSEW 2008 14

### Conclusion

- Reluctant respondents tend to produce more error variance, but measurement structure remains the same
  - Construct validity
  - Measurement equivalence
- The reason is not socio-demographic differences (although these exist)
- Some question types more robust



ITSEW 2008 15