The Validity and Reliability of Detailed and Crude Measures of Occupation in ISSP 2009-2019

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Earlier presentations

- ISSP Research Session, Santiago, April 2013
- RC28, Tilburg, May 28 2015
- Social Weather Station, Manilla (PH), October 2017
- (…more…)

Additions to earlier version

- Added analysis of 2019 ISSP data (8 countries, provisional file).
- (Paper is intended for special volume on ISSP 2019)

Main conclusions

- Measurement of occupational status using a crude (showcard) format is **equally (and almost perfectly) valid** and (slightly) **more reliable** than measurement using a detailed (open question) format (such as commonly used).
- However, using both a crude and a detailed format in a latent variable model has perfect validity and no (i.e. fully disattenuated) reliability – and this changes results substantially.

Subsidiary conclusions

- Validity and reliability of measurement can be expressed in coefficients using the Saris-Andrews MTMM (Multi-Trait Multi-Method) model.
- For 2019, results are slightly more in favour of detailed occupations – this may be due to improved coding (introduction of ISCO-08).

The measurement of occupational status: standard procedures

- Step 1: Open question, answers recorded by interviewers / data entry typist.
- Step 2: Coding the answers into a standard occupational classification, such as ISCO.
- Step 3: Scale or categorize the detailed codes into a measure such as ISEI or EGP.
- Altogether this constitutes an error-prone multi-step process, in which errors tend to magnify and to not even out during the process: ***sequential error.***
- Available estimates of measurement quality (reliability) vary between 0.75 and 0.85.

Quality of measurement

- A common way to redress measurement error is by **multiple indicator measurement**. Multiple indicator measurement allows one to estimate measurement quality, but also to reduce or remove it, by averaging or latent variable models.
- [This is sometimes applied in the coding stage of occupational measurement, by using multiple (=2) coders and an adjudication procedure (=3rd coder).]
- But the principal problem with occupations remains that multiple indicator measurement at the level of informants appears hard to achieve.

Double indicator measurement

- ISSP 1987 introduced a procedure to ask for occupations twice:
  - via the usual open question, leading to ***detailed*** information.
  - via a pre-coded format, leading to ***crude*** information.
- Moreover, the double indicator measurement was repeated over multiple occupations, in particular father's and offspring's occupation.
- Note: the procedure of combining crude and detailed measurement of multiple occupations in one questionnaire was invented ***unintentionally***.

Results ISSP 1987

- Data of ISSP 1987 were analyzed by Ganzeboom (2005).
- Crude measurement of father's and first and current occupation was a compulsory item in 1987. In five countries (AT, AU, CH, DE, US) there was double measurement for father and respondent, because they included detailed occupations anyway.
- Some results:
  - Detailed and crude measure have about the same quality (0.835 vs 0.829).
  - Controlling measurement quality brings important changes to status attainment results. (Education has no direct effect on earnings if occupation is properly measured, i.e. with double indicators.)

Random error = unreliability

- If measurement errors occur randomly, the resulting measure is called **unreliable.**
- Notice that the scientific use of the word ‘reliability’ is different from common understanding.
- Unreliability causes weaker (never: stronger) correlations.
- Unreliability can be countered by repeating (and averaging) the measurement.

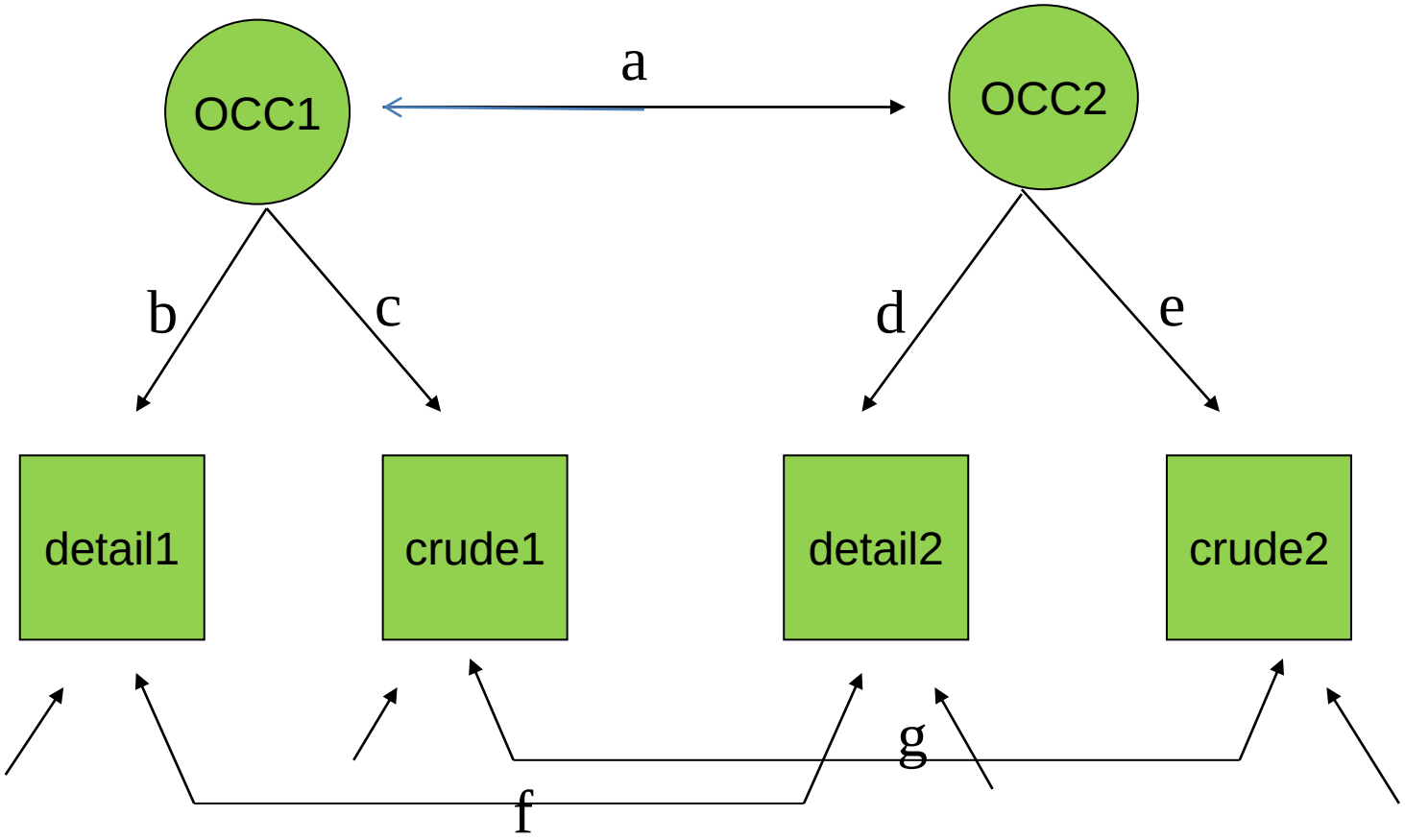
Systematic error = invalidity

- If the measurement error occurs over and over again, this causes **invalidity** (or **bias**).
- Examples: underreporting of income, response sets, social desirability.
- Systematic error may cause correlations to become stronger (or: do not affect correlations).
- Systematic error can be traced by repeating the measurement error (NOT: repeating the measurement).

Random and systematic measurement error in repeated measurement

- With double indicator measurement on one construct we can only identify random measurement error (unreliability).
- When double indicator measurement is repeated over similar (correlated) concepts, we can also identify systematic measurement error (invalidity), i.e. error that arises every time we ask the question.
- If combined, we have a MTMM (multiple traits, multiple methods) design.

Elementary MTMM model



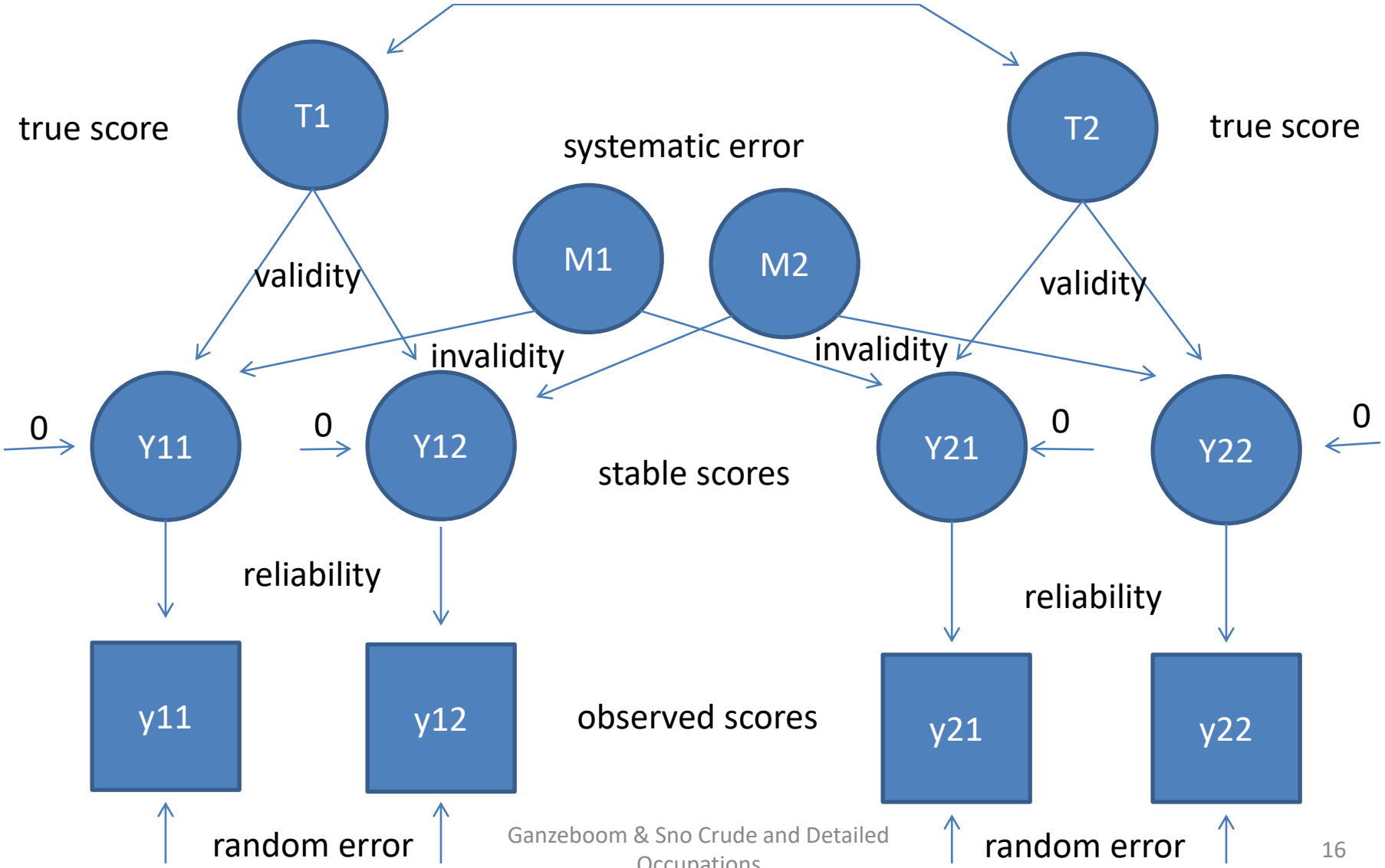
Elementary MTMM model

- Model is NOT identified in this format, not even with the constraints **b=d** and **c=e**.
- However, the model becomes identified if we expand it to more (four) occupations.
- It also helps to expand the model with ‘auxiliary variables’, such as education and income.

Saris-Andrews reformulation

- Saris, Willem E., and Frank M. Andrews. 1991. “Evaluation of Measurement Instruments Using a Structural Modeling Approach.” Pp. 575–97 in *Measurement Errors in Surveys*, edited by Paul Biemer.
- Observed, stable and true scores.
- Validity and reliability coefficients are multiplied, such that:
  - You can have reliable measurement without validity, BUT
  - you cannot have valid measurement without reliability.
- Validity * reliability = total measurement quality.
- Like the elementary classic MTMM, the Saris-Andrews model is not identified for two concepts with double measurement; we need more concepts, more indicators, and / or auxiliary variables.

Saris-Andrews reformulation



Occupation measures in ISSP 2009

- ISSP 2009 (Social Inequality IV) specifications required detailed measurement of father's and mother's occupations, and respondent's first and current / last occupation, as well as spouse's current occupation. All of these to be coded in 4-digit ISCO-88.
- ISSP 2009 also contained optional questions for the crude measurement of four occupations (father, mother, first, current/last), using a showcard adapted from the format used in ISSP 1987.

Here is a list of different types of jobs. Which type of job did you have in your first job – after leaving full-time education – and which type of job do you have now in your current job? If you are not working now, please tell us about your last job. (please tick one box for your first job and one box for your current/last job)

	Your first job	Your current/last job
Professional and technical (for example: doctor, teacher, engineer, artist, accountant, nurse)	☐1	☐1
Higher administrative (for example: banker, executive in big business, high government official, union official)	☐2	☐2
Clerical (for example: secretary, clerk, office manager, civil servant, bookkeeper)	☐3	☐3
Sales (for example: sales manager, shop owner, shop assistant, insurance agent, buyer)	☐4	☐4
Service (for example: restaurant owner, police officer, waitress, barber, caretaker)	☐5	☐5
Skilled worker (for example: foreman, motor mechanic, printer, seamstress, tool and die maker, electrician)	☐6	☐6
Semi-skilled worker (for example: bricklayer, bus driver, cannery worker, carpenter, sheet metal worker, baker)	☐7	☐7
Unskilled worker (for example: labourer, porter, unskilled factory worker, cleaner)	☐8	☐8
Farm worker (for example: farm labourer, tractor driver)	☐9	☐9
Farm proprietor, farm manager	☐10	☐10
First job is same as current job.	☐96	☐96
I have never had a job	☐97	☐97

Data: compliance in ISSP 2009

- The full design with double occupation measurement was implemented by 11 countries: BE, CH, CZ, HU, IT, LT, LV, NL, RU, TR, UA.
- Partial implementation in 4 countries: DE, FR, SR (double indicators for two occupations) and AR (double indicators for a single occupation).
- Two countries replaced detailed measurement by crude questions altogether: NZ and UK. Both also have detailed occupations of respondents.
- (Three countries cheated by recoding the crude measures from the detailed measures in stead of asking the respondent: AT, JP, KR.)
- The remaining 21 countries asked only the detailed measures, but with omissions:
  - ES and PH omitted first occupation.
  - ZA coded only one digit.
  - AT coded only three digits.
  - In PH there was no correlation whatsoever between parental occupations and respondent occupation in the first release of the data. This was corrected in version 4 of the GESIS dataset.

Double indicator measurement of occupations in ISSP 2019

- Only a first incomplete release available now (Sep 2022).
- Design was a near repeat of the 2009 design
  - Same question format for crude question
  - Compulsory: detailed measurement of occupations of father, mother, respondent and spouse. To be coded in ISCO-2008.
  - Optional: crude measurement of these four occupations

Compliance in ISSP 2019

- Data for 22 countries are now available.
- Only 8 included the optional (crude) questions.
- CH IS PH RU SR TH implemented the full design. BG and UK implemented it partially.

Research Questions

- What is the measurement quality of crude versus detailed measurement of occupation, with respect to:
  - Reliability: do we the same answer on repeat?
  - Validity: do we get the right answer?
  - How much does measurement error correction changes results of the SAT model?

Design: scaling the occupations

- Detailed occupation measures are scaled with ISEI-08: new ISEI scale that was developed using ISSP 2000-2008. These indicators are labeled **fasei, masei, asei1, asei.**
- Crude occupation measures are scaled using their ISEI-08 means. These indicators are labeled **fusei, musei, usei1, usei**.
- (The crude measures could be expanded by taking into account self-employment.)

Design: estimation

- Data are completely standardized, i.e. standardized ***within*** countries. This allows for pooled estimation.
- Estimation with Stata 13 & MLMV and LISREL 8.8 FIML. This is like “pairwise deletion of missing values”, assuming MAR (Missings At Random).
- We analyse both pooled estimates and country-specific estimates.

MTMM correlations (11 countries)

	FASEI	FUSEI	MASEI	MUSEI	ASEI1	USEI1	ASEI	USEI
FASEI	1	.755	.508	.514	.339	.311	.329	.308
	11531	11350	7441	7640	9988	9570	9758	8473
FUSEI	.755	1	.514	.581	.352	.350	.328	.338
	11350	11852	7522	7934	10193	9865	9966	8721
MASEI	.508	.514	1	.802	.340	.310	.324	.298
	7441	7522	8472	8209	7642	7341	7517	6823
MUSEI	.514	.581	.802	1	.347	.347	.333	.335
	7640	7934	8209	8866	7905	7706	7792	7174
ASEI1	.339	.352	.340	.347	1	.784	.704	.614
	9988	10193	7642	7905	11421	10707	10928	9504
USEI1	.311	.350	.310	.347	.784	1	.612	.710
	9570	9865	7341	7706	10707	11075	10440	9579
ASEI	.329	.328	.324	.333	.704	.612	1	.754
	9758	9966	7517	7792	10928	10440	11185	9418
USEI	.308	.338	.298	.335	.614	.710	.754	1
	8473	8721	6823	7174	9504	9579	9418	9853

PARAMETER ESTIMATES				
	XNAT	XNAT	XNAT	XNAT
FASEI	0.842	0.811	0.819	0.850
FUSEI	0.903	0.936	0.954	0.919
MASEI	0.865	0.835	0.819	0.850
MUSEI	0.914	0.946	0.954	0.919
ASEI1	0.902	0.867	0.819	0.850
USEI1	0.884	0.920	0.954	0.919
ASEI	0.882	0.847	0.819	0.850
USEI	0.891	0.927	0.954	0.919
ASEI1-ASEI	0.092	0.039	-0.012	0.045
USEI1-USEI	0.066	0.117	0.157	0.112
ASEI-xxx		-0.017	-0.034	0
USEI-xxx		0.047	0.059	0.033
L2	280.4	52.2	83.2	92.5
NDF	12	10	16	17

PARAMETER ESTIMATES

	XNAT	XNAT	XNAT	XNAT		BE	CH	CZ	HU	IT	LV	NL	RU	TR	UA
FASEI	0.842	0.811	0.819	0.850		0.840	0.868	0.851	0.869	0.852	0.882	0.727	0.857		0.868
FUSEI	0.903	0.936	0.954	0.919		0.942	0.919	0.891	0.939	0.925	0.943	0.944	0.889		0.900
MASEI	0.865	0.835	0.819	0.850		0.840	0.868	0.851	0.869	0.852	0.882	0.727	0.857		0.868
MUSEI	0.914	0.946	0.954	0.919		0.942	0.919	0.891	0.939	0.925	0.943	0.944	0.889		0.900
ASEI1	0.902	0.867	0.819	0.850		0.840	0.868	0.851	0.869	0.852	0.882	0.727	0.857		0.868
USEI1	0.884	0.920	0.954	0.919		0.942	0.919	0.891	0.939	0.925	0.943	0.944	0.889		0.900
ASEI	0.882	0.847	0.819	0.850		0.840	0.868	0.851	0.869	0.852	0.882	0.727	0.857		0.868
USEI	0.891	0.927	0.954	0.919		0.942	0.919	0.891	0.939	0.925	0.943	0.944	0.889		0.900
ASEI1-ASEI	0.066	0.117	0.157	0.112		0.094	0.076	0.131	0.180	0.103	0.057	0.134	0.110		0.068
USEI1-USEI	0.092	0.039	-0.012	0.045		0.016	0.107	0.054	0.029	0	0.014	0	0.118		0.107
ASEI-xxx		0.047	0.059	0.033		0.035	0.017	0.024	0.020	0.038	0.013	0.047	0.025		0.021
USEI-xxx		-0.017	-0.034	0		0	0	0	0	0	0	0	0.012		0
L2	280.4	52.2	83.2	92.5		22.6	24.6	21.4	19.3	33.2	30.4	49.2	20.5		29.2
NDF	12	10	16	17		17	17	17	17	18	17	18	16		17

PARAMETER ESTIMATES										
	XNAT	XNAT	XNAT	XNAT		DE	FR	SR	AR	NZ	UK
FASEI	0.842	0.811	0.819	0.850		0.899	0.909	0.893	0.947	0	0
FUSEI	0.903	0.936	0.954	0.919		0	0	0	0	0.915	0.889
MASEI	0.865	0.835	0.819	0.850		0.899	0.909	0.893	0.947	0	0
MUSEI	0.914	0.946	0.954	0.919		0	0	0	0	0.915	0.889
ASEI1	0.902	0.867	0.819	0.850		0.899	0.909	0.893	0.947	0	0
USEI1	0.884	0.920	0.954	0.919		0.826	0.863	0.865	0	0.915	0.889
ASEI	0.882	0.847	0.819	0.850		0.899	0.909	0.893	0.947	0	0
USEI	0.891	0.927	0.954	0.919		0.826	0.863	0.865	0.863	0.915	0.889
ASEI1-ASEI	0.066	0.117	0.157	0.112		0.043	0.043	0.049	0	0	0
USEI1-USEI	0.092	0.039	-0.012	0.045		0.140	0.078	0.152	0	0	0
ASEI-xxx		0.047	0.059	0.033		0	0	0	0	0	0
USEI-xxx		-0.017	-0.034	0		0	0	0	0	0	0
L2	280.4	52.2	83.2	92.5		4.3	4.3	12.7	15.3	7.7	2.5
NDF	12	10	16	17		18	18	18	26	26	26

Saris-Andrews estimates 2009

- (Model includes additional correlated residuals between first-current and father-mother.)
- Pooled estimates:

Validity

– Detailed **0.994** Crude **0.984**

Reliability

– Detailed **0.874** Crude **0.900**

Table 4b: Estimates of measurement relationships in five SEM models,. ISSP 2019

	6 countries with completely implemented design, N=12601					8 countries, with completely and incompletely implemented designs, N=15476				
	1	2	3	4	5	1	2	3	4	5
FISQO						0.872	0.878	0.889	0.866	0.875
FCRUDE						0.910	0.890	0.880	0.905	0.893
MISQO						0.908	0.878	0.889	0.866	0.875
MCRUDE						0.897	0.890	0.880	0.905	0.893
RISQO						0.868	0.878	0.889	0.866	0.875
RCRUDE						0.874	0.890	0.880	0.905	0.893
SISQO						0.868	0.878	0.889	0.866	0.875
SCRUDE						0.884	0.890	0.880	0.905	0.893
RISQO-SISQO						0.028	0.028		0.048	
RCRUDE-SCRUDE						0.032	0.032	0.049		
FISQO-MISQO						0.028	0.028		0.048	
FCRUDE-MCRUDE						0.032	0.032	0.049		
DF						20	26	27	27	28
L2						66.4	91.6	142.1	158.4	397.8
RMSEA						0.012	0.013	0.017	0.018	0.029

Results on ISSP2019

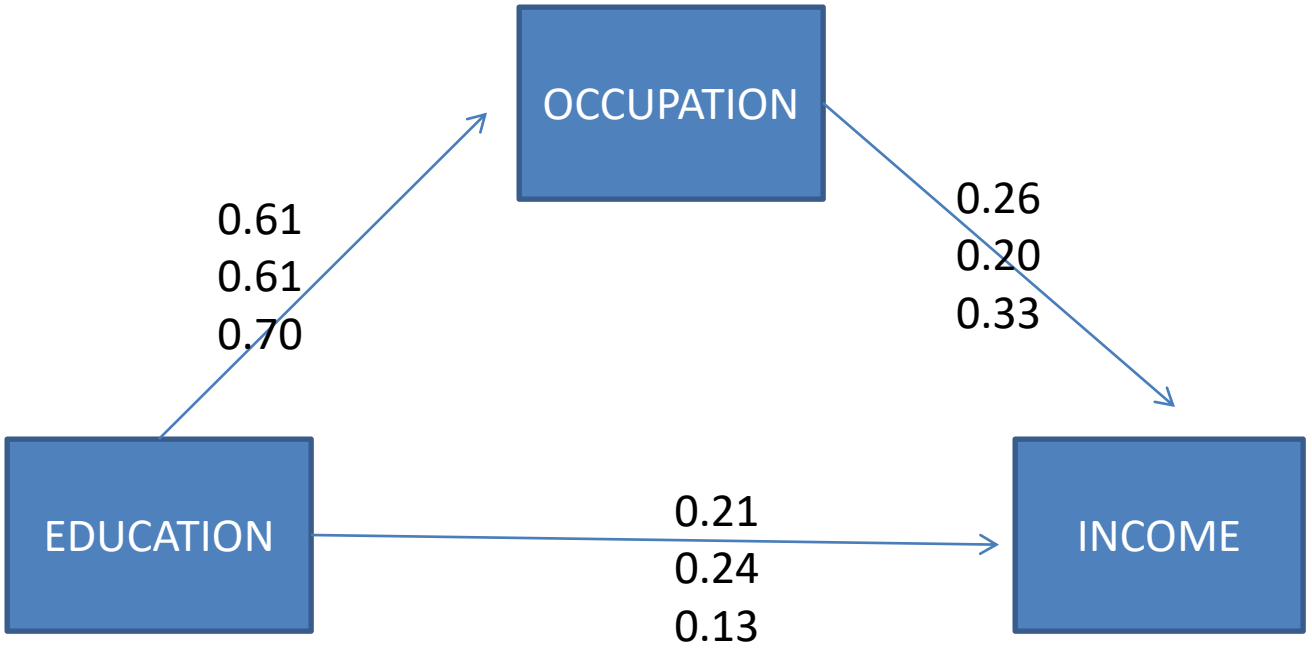
- Crude occupations are slightly (significantly) more reliable than detailed occupations.
- Crude occupations invoke some (significantly) more systematic measurement error.
- Correcting for systematic measurement error does not change the first conclusions.
- These conclusions also hold for all countries separately!

Results - general

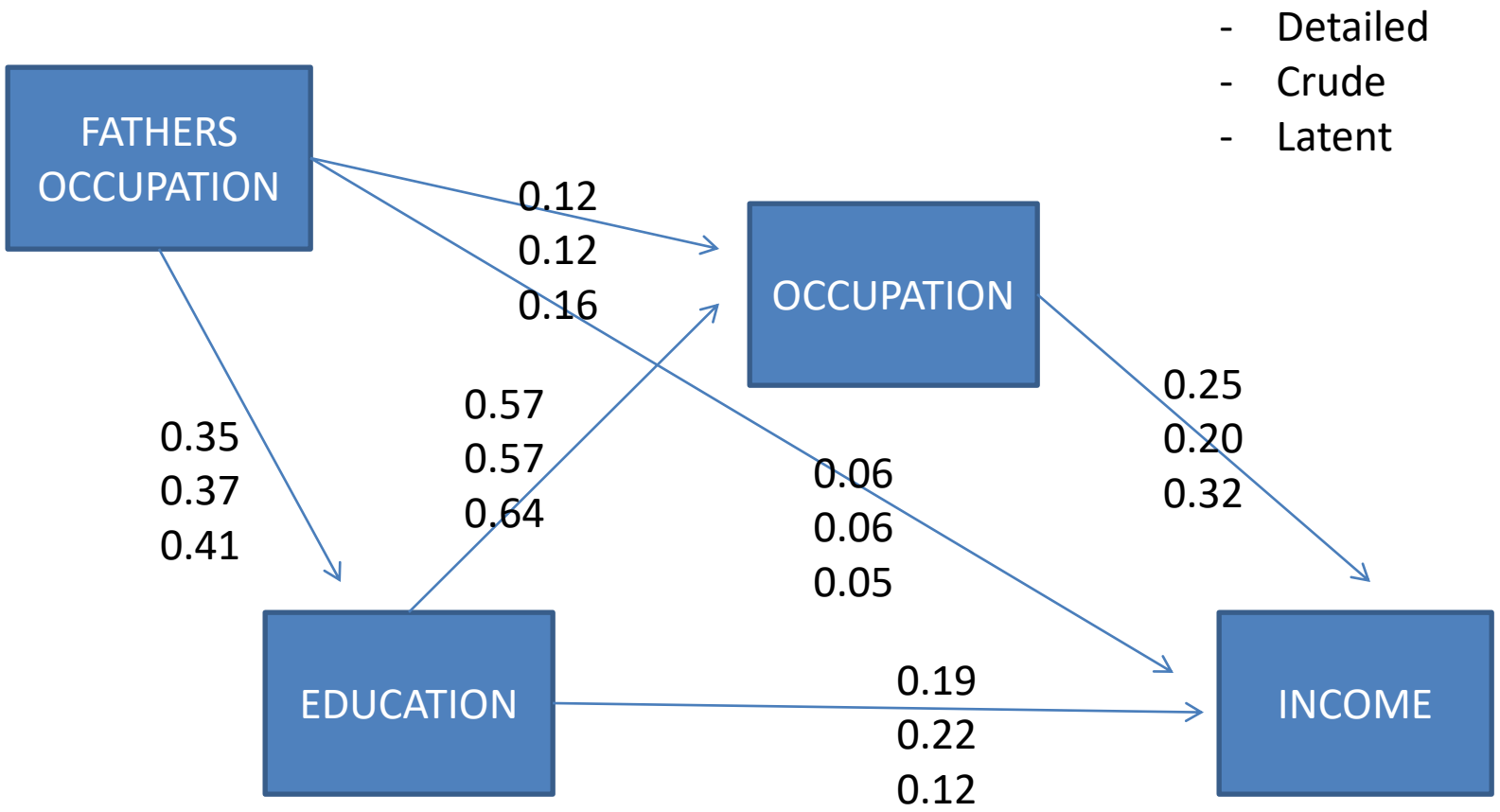
- Crude and detailed measurement are equally (and almost perfectly) valid.
- Crude measurement is more reliable (0.90) than detailed measurement (0.87).[Test-retest reliability is equal to the square of these coefficients.]
- Note that these high reliability coefficients still imply a loss of measurement quality of 10% and 13%.
- Systematic measurement error is fairly limited and does hardly apply across all occupations; however, it arises between father's and mother's occupations, and between first and current occupations. This may be 'response-set' caused by proximity of the questions in the questionnaire.

Consequences for SAT model

- Detailed
- Crude
- Latent



Consequences for SAT model



CAN WE DISCARD ISCO?

- If you need to choose between crude and detailed measurement, choose crude measurement:
  - Easier, quicker and cheaper
  - Better reliability
  - No problems with validity.
- If you can afford to include both crude and detailed measurement, and know how to do latent variable modeling, you do better.

But..

- Analysis is cast in continuous variables modeling.
- Crude measurement would allow discrete variable modeling (‘class analysis’) too.
- Current ISSP instrument is male-oriented. Interesting to see whether female occupation title would change results (for mothers / women).