

Qualifications and Duration as Measures of Level of Education

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Duration measurement

- Amount (of time spent in) education.
Complexities:
 - When to begin counting?
 - Part-time education / school hours
 - Repeating classes
 - Incomplete education
- Age of completing.
 - Complexities: all of the above
 - Interrupted educational careers

Advantages duration measures

- Measures the amount of education – which is most relevant from a human capital perspective.
- Accumulates over the educational career.
- Easy to ask, easy to process.
- Glosses easily over cross-national and historical variation.
- Ratio measurement → log transformation, gini, CV (coefficient of variation)
- Fine grained, detailed measurement.

Disadvantages of duration measurement

- Hard to answer: complex calculations → extreme values, unreliable answers.
- Invalid in tracked systems as a measure of level of education → in parts level and duration may be inversely related.
- Linear or curvilinear effect? (Is duration in early careers the same as in later careers?)

Qualification measurement

- Highest completed or last completed education.
- Can be measured in terms intrinsic to the education system. Respondents may remember this, register measurement may be available.
- Can be very detailed

Disadvantages of qualification measurement

- Information can be very complex and very indigenous, between countries, but also within countries.
- Hard to process, in particular for the comparative researcher.
- Not trivial how qualifications are to be transferred into a (single) hierarchical measure.

RQs: Duration

- How to handle extreme values (outliers): topcoding, remove?
- Linear or curvilinear effects?
- Accumulation measurement vs leaving age-measurement: how big is the difference? Which one has better quality?

RQs: Qualifications

- How to transfer into a single hierarchical measure?
- How to be measured: pre-harmonized vs post-harmonized?
- How to avoid harmonized measurement?

RQs: Duration and Qualifications

- How (strong) are the two related?
- Quality of measurement:
 - Random measurement error
 - Systematic measurement error
- Can and should we combine them?

Answers: Duration

- Remove extreme values (duration > 25 years) and declare them missing. Use MI or ML.
- Effect is only slightly curvilinear. Can be disregarded.
- Accumulation measurement is better than leaving-age measurement. But by how much?

Answers: qualifications

- Avoid pre-harmonized measurement.
- Post-harmonize detailed country-specific qualification using three-digit ISCED-2011.
- Scale qualifications using ISLED: International Standard Level of Education (Schroder & Ganzeboom, 2014).

Answers: qualifications and duration

- Qualifications and duration are correlated around 0.79, if qualifications are crudely measured.
- This correlation rises to 0.8x if qualification are detailedly measured and scaled by ISLED.
- This correlation is lower in highly stratified education systems; in highly stratified education systems, duration is a more important repair of crude measurement than in comprehensive systems.

Answers: qualifications and duration

- Crude (post-harmonized) qualifications and duration have about the same level of random measurement error (15% attenuation).
- Crude measurement (recoding to a short common metric) increases random measurement error.
- Averaging (scaled) qualifications and duration is an improvement of single indicator measurement ($r=0.78$ → cronbach's alpha: $0.88 = 6\%$ loss), but not the correct solution.
- Correct solution: combine scaled qualifications and duration on a latent variable measurement model.

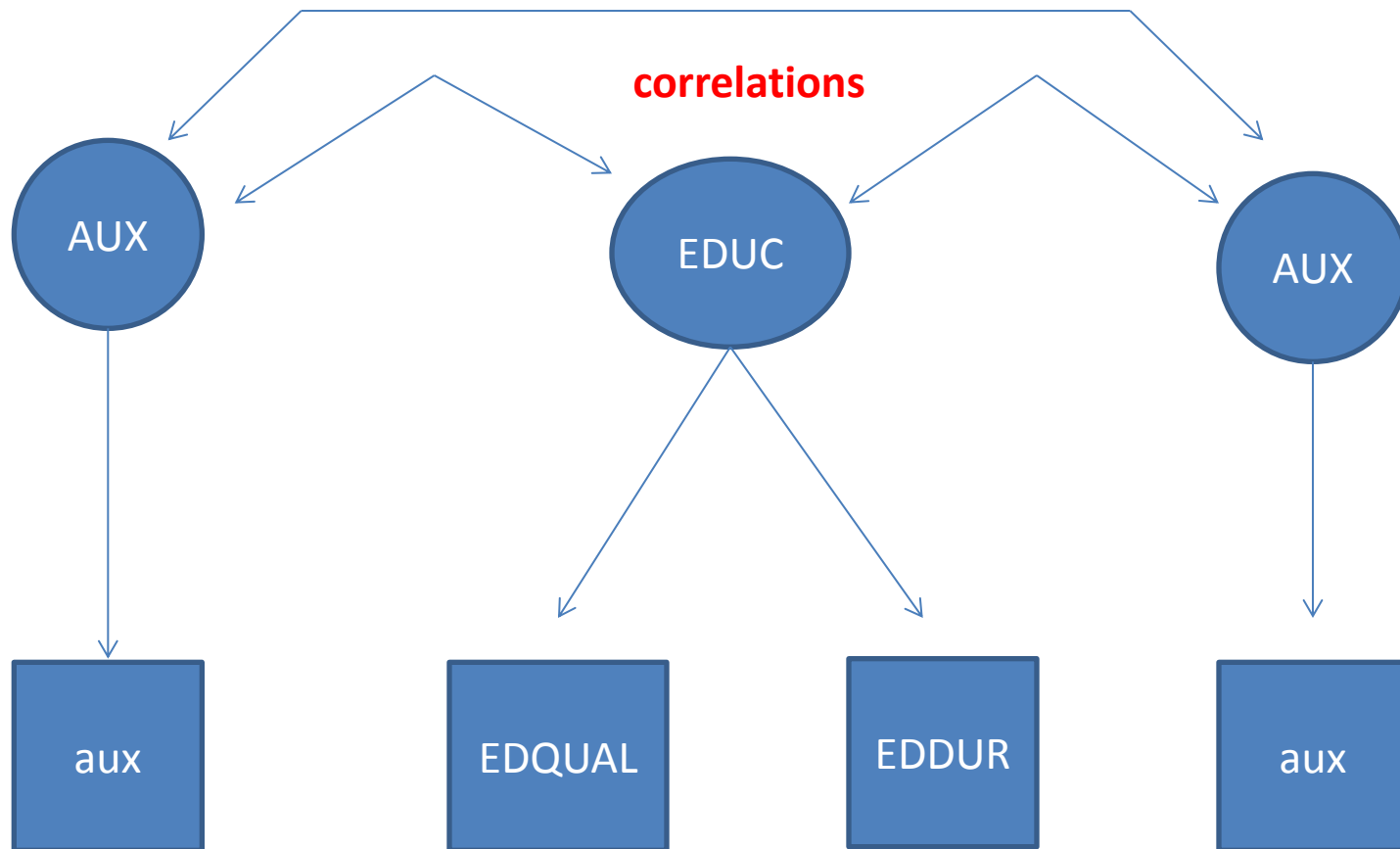
Validation model

- In order to evaluate the quality of education measures, it is useful to analyze them in relationship to validation criteria ('nomological network').
- Most obvious:
 - Educations of different persons such as spouses, or parents – offspring → MTMM models
 - Input: parental status (not only parental education, but also occupational status)
 - Output: labor market success, in particular occupational status (not earnings!!).

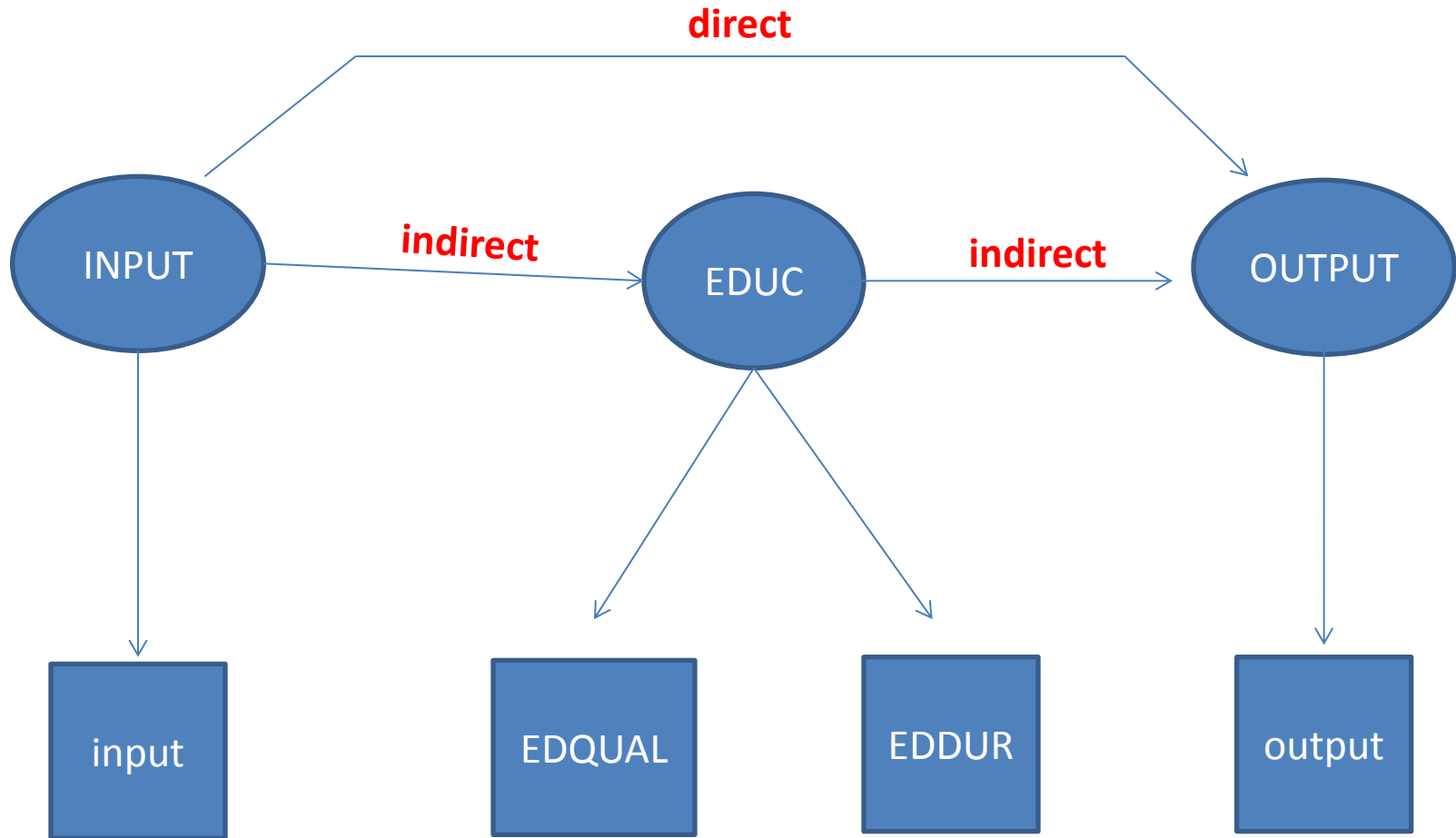
Two types of validation models

- MTMM validation model: factor analytic framework with unconstrained latent factor correlations.
- Indirect effects model: how does education transfer input into output.
- These models work (best) if education is measured with multiple indicators (such as duration and (scaled) qualifications, two different measures of duration or two different measures of qualifications).

Factor analytic



Mediation



Data

- ESS R1-R8: duration and country specific qualifications.
- ISSP-NL, 2004-2015: duration and NL qualification for respondents and partner (proxy information)
- EU-SILC, 2005, 2011: school-leaving age and ISCED 1-digit qualifications.

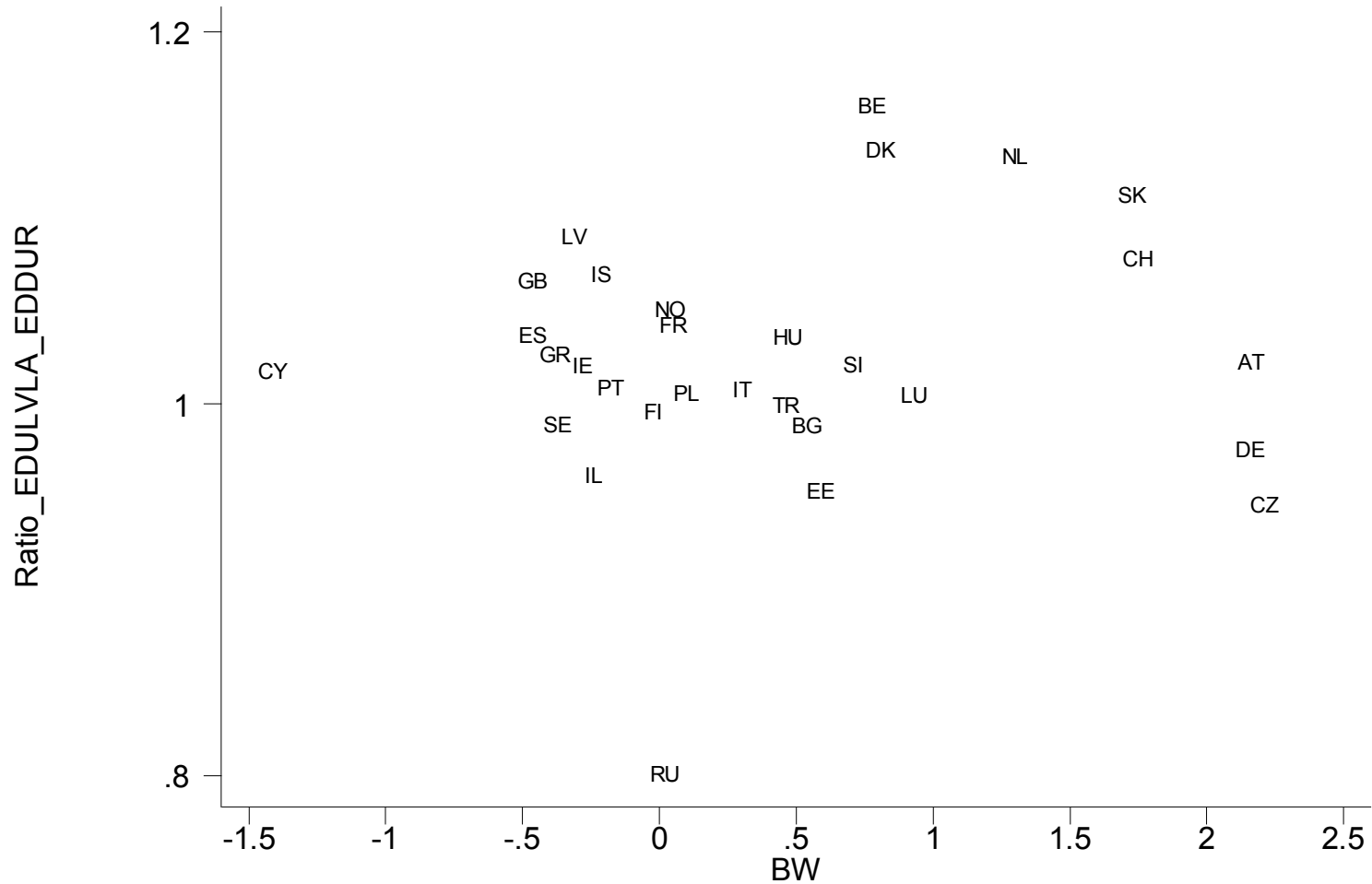
ESS R1-R8

- Cross-national (25-30 countries)
- Country specific measures, but with changes within countries.
- Good measures of inputs (parental education and occupation) and outputs (occupational status).
- Fine grained measure of duration (only for respondent).
- Disadvantage: only European.

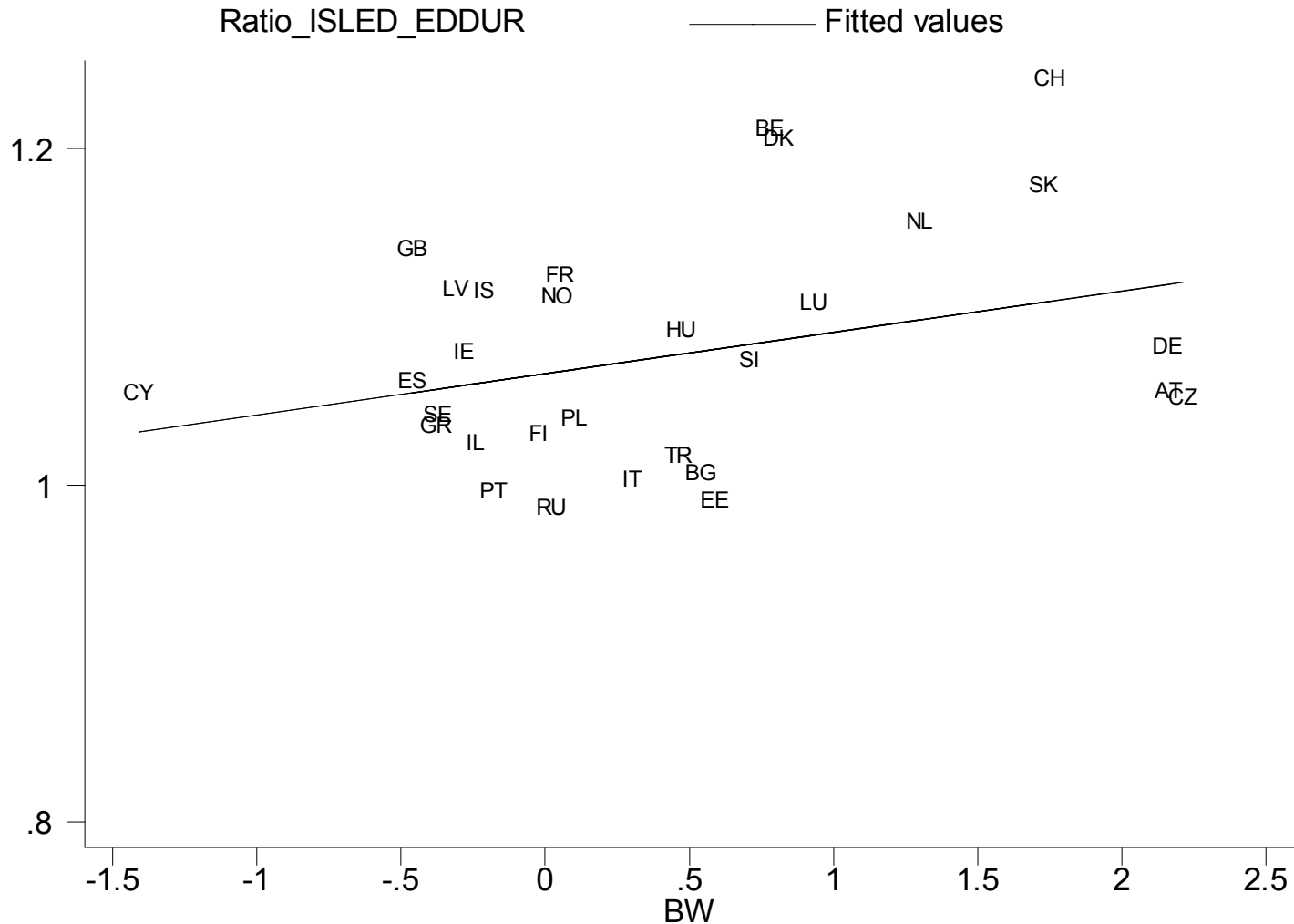
Table 1: Random error in qualification and duration measurement of education, Model A: qualifications scaled by ISCED five main levels (EDULVLa). Model B: country specific qualifications scaled by International Standard Level of Education [ISLED]. Source: ESS R1-R8, 36 countries, N=393,415.

	Model A		Model B	
	EDULVLa	EDDUR	ISLED	EDDUR
All data	0.892	0.883	0.945	0.858
ESSROUND = 1	0.884	0.873	0.941	0.858
ESSROUND = 2	0.882	0.887	0.947	0.859
ESSROUND = 3	0.899	0.874	0.949	0.845
ESSROUND = 4	0.891	0.893	0.954	0.868
ESSROUND = 5	0.898	0.889	0.943	0.862
ESSROUND = 6	0.901	0.886	0.947	0.861
ESSROUND = 7	0.891	0.874	0.935	0.854
ESSROUND = 8	0.885	0.879	0.940	0.854

Ratio EDULVLa / Duration by BW Educational Stratification



Ratio ISLED / Duration by BW Educational Stratification



ISSP 2009 (2019??)

- Cross-national (25-30 countries)
- Country specific measures, but with changes within countries.
- Good measures of inputs (only parental occupation) and outputs (occupational status, not spouses education).
- Fine grained measure of duration (only for respondent).
- World wide coverage.

ISCED

- International Standard Classification of Education. Maintained by Unesco.
- ISCED is the most often used cross-national harmonization framework.
- ESS follows is rather stric, ISSP only loosely.
- Fundamental change between ISCED-97 and ISCED-2011: from one to tree (nested) digits.
- ISCED-2011 offers 28 categories to code education; most countries use around 10-15 categories; there is a one-to-one match.

ISLED

- International Standard Level of Education.
- Schröder (2014); Schröder & Ganzeboom (2014).
- Optimal scaling of country-specific categories in a indirect effects validation model.
- Optimal scaling of ISCED-2011 harmonized categories in an indirect effects validation model.

ISSP-NL 2009-2014

- In order to examine systematic measurement error, we need data that repeat the measurement error.
- ISSP-NL offers proxy data for this: respondents reporting both highest qualification and total duration for themselves and their spouse.
- With auxiliary variables, this design allows use to estimate systematic measurement error.

MTMM model

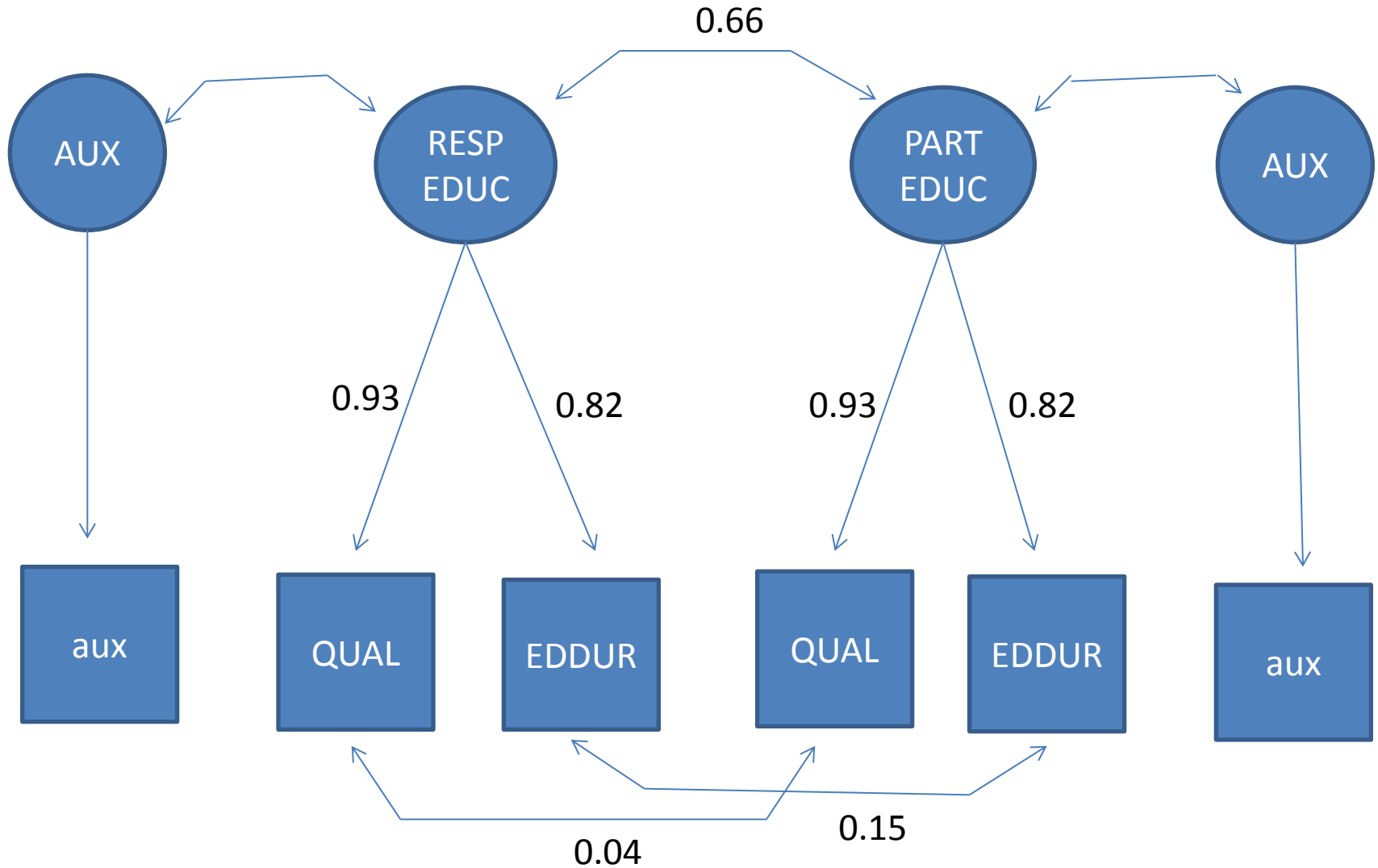


Table 2: Random and systematic measurement error in respondent and partner education: MTMM model on qualification and duration measurement. Source: ISSP-NL 2011-2014 (three waves, N=4414)

	0.659			
Latent correlation between partners				
	EDQUAL	EDDUR		
Measurement	0.932	0.819		
Residual correlation between measures	0.037	0.152		
Observed correlation between partners	0.608	0.580		

Auxiliary variables: fathers and mother education, fathers, mothers and first occupation. Coefficients constraint to be equal between respondent and partner. Fit of the model: $\chi^2(12) = 13.7$.

Table 3: Elementary OED (indirect effects) models, with various treatment of measurement error.
Source: ISSP-NL 2011-2014 (three waves, N=4414)

	EdQual	Duration	Index	Correction for random error	+ Correction systematic error
OCCUPATION					
Parental Occupation	0.329	0.329	0.329	0.320	na
Parental Occupation	0.133	0.196	0.142	0.106	na
Education	0.530	0.430	0.520	0.574	na
HOMOLOGY					
Parental Education	0.497	0.460	0.472	0.507	0.459
Parental Education	0.218	0.221	0.201	0.163	0.201
Education	0.500	0.493	0.519	0.625	0.553

sem (pared RED -> PED) (pared -> RED) (PED -> zpeddur zpedqual) (RED -> zreddur zredqual),
 method(mlmv) standardized covar(e.zpeddur*e.zreddur) covar(e.zpedqual*e.zredqual) iterate(50)

EU-SILC

- Cross-national, but European.
- Qualifications: only ISCED one-digit (post harmonized).
- Duration: school leaving age.
- However, measured for all members in household → MTMM model with independent sources.