**Investigating the relative impact of different sources of measurement non-equivalence in comparative surveys: An illustration with scale format, data collection mode and cross-national variations**

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**Replication Materials**

**Part A: Steps involved in preparing the data for the analysis of measurement invariance**

Data analysed for this article came from multiple sources:

1. European Social Survey 2006 (Switzerland, France and Germany)
2. European Social Survey 2006, supplementary questionnaire, country-specific experiment (Joye et al., 2010 and Ernst Staehli et al., 2019, available at FORSbase)
3. ESS CATI experiment 2006, (Roberts et al., 2010 ; ESS ERIC reserves the right to make the relevant data sets available upon request)

Several steps were involved in preparing the data in order to conduct the analyses of measurement invariance.

**Step 1:** Selecting the countries from the main ESS3 2006 data file. Merging data from the Swiss country-specific data from the supplementary questionnaire with the main ESS 2006 data. Selecting only those participants in the face-to-face survey who reported in the survey having a fixed-line telephone in the household. Selecting only those Swiss participants living in French or German speaking regions.

**Step 2:** Preparing and merging data from the Swiss and German CATI experiment with the main ESS face-to-face data. This included a) preparing sociodemographic variables for analysis of the sample composition in face-to-face and telephone modes; and b) calculating selection probability weights to correct for differential selection probabilities for people living in households with more than one member.

**Step 3:** Assessing relative differences across categories of socio-demographic characteristics of the achieved (selection-probability weighted) samples in each mode. Estimating response propensity scores based on a logistic regression model predicting the probability of participating by telephone compared to by face-to-face interview.

**Step 4:** Computing weights based on the response propensity scores to correct for differential selection effects between modes when assessing measurement invariance and computing final weights combining the selection probability and propensity-score weights.

The data files and all related analyses were conducted in IBM SPSS Statistics, versions 24 and 25. We only provide syntax for steps 3 onwards.

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**Step 1:** Selecting the countries from the main ESS3 2006 data file. Merging data from the Swiss country-specific data from the supplementary questionnaire with the main ESS3 2006 data. Selecting only those participants in the face-to-face survey who reported in the survey having a fixed-line telephone in the household. Selecting only those Swiss participants living in French or German speaking regions.

GET FILE = '/ESS3 with test questions.sav'

/KEEP ALL.

EXE.

FRE I7.

RECODE cntry ('CH' = 1) INTO country.

VAR LAB country 'country'.

VAL LAB country 1 'Switzerland ESS3' 2 'German ESS3' 3 'France ESS3'.

\*\*Select if living in French or German Switzerland, and has fixed line phone.

fre regioach.

select if regioach <7.

\*\*\*fre fxltph.

select if fxltph = 1.\*\*\*

\*\*identify suisse romands.

do if regioach = 1 or regioach = 2 and lnghoma NE 'GER'.

compute lingreg = 1.

else.

compute lingreg = 0.

end if.

var lab lingreg 'linguistic region Switzerland'.

val lab lingreg 1 'French' 0 'German'.

**Step 2:** Preparing and merging data from the Swiss and German CATI experiment with the main ESS face-to-face data. This included a) preparing sociodemographic variables for analysis of the sample composition in face-to-face and telephone modes; and b) calculating selection probability weights to correct for differential selection probabilities for people living in households with more than one member.

1. ***Preparing sociodemographic variables for analysis of the sample composition in face-to-face and telephone modes***

The following socio-demographic variables were prepared for the sample composition analysis: sex (male; male = 1); age (agecats; 1= 15-30; 2 = 31-44; 3= 45-64; 4= 65 and older); marital status (maritals; 1 'single' 2 'married' 3 'widowed' 4 'divorced or separated'); lives with a partner (partnerr; 1 'Lives with husband/wife/partner at F4' 0 'Does not live with partner'); urbanicity (domicil recoded into ‘urban’; 1 ‘big city, suburbs or town’, 0 ‘country’); main activity (mainacti, 1 'Paid work' 2 'Education' 3 'Unemployed' 4 'Retired' 5 'Housework, looking after children' 6 'Permanently sick or disabled' 7 'other and community or military service', recoded into ‘paidwork’ 1 'R is in paid work' 0 'R is in education, unemployed, retired, housework, sick or other'); educational level (edulvla, recoded into ‘highschool’; 1 'R completed up to upper secondary education' 0 'R completed post-secondary or tertiary education').

recode gndr (1=1) (2=0) (else=copy) into male.

miss val male (9).

miss val yrbrn ().

do if yrbrn = 7777.

compute age = 7777.

else if yrbrn = 8888.

compute age = 8888.

else if yrbrn = 9999.

compute age = 9999.

else.

compute age = 2007-yrbrn.

end if.

miss val age (7777, 8888, 9999).

fre age.

compute agesqd = age \* age \* .01.

recode age (15 thru 30 = 1) (31 thru 44 = 2) (45 thru 64 = 3) (65 thru 107 = 4) (else = copy) into agecats.

val lab agecats 1 '15-30' 2 '31-44' 3 '45-64' 4 '65+'.

miss val agecats (7777, 8888, 9999).

fre agecats.

recode agecats (1=1) (else=0) into agecat1.

recode agecats (2=1) (else =0) into agecat2.

recode agecats (3=1) (else=0) into agecat3.

recode agecats (4=1) (else=0) into agecat4.

exe.

fre maritala.

recode maritala (1=2) (2=2) (3=4) (4=4) (5 =4) (6=3) (7=4) (8=3)(9=1) (else =copy) into maritals.

val lab maritals 1 'single' 2 'married' 3 'widowed' 4 'divorced or separated'.

fre maritals.

miss val maritals (77,88,99).

recode maritals (1=1) (else=0) into maritals1.

recode maritals (2=1) (else =0) into maritals2.

recode maritals (3=1) (else=0) into maritals3.

recode maritals (4=1) (else=0) into maritals4.

exe.

compute married = maritals2.

fre married.

var lab married 'R is married'.

val lab married 1 'R is married' 0 'R is single, divorced or widowed'.

fre married.

recode partner (1=1) (2=0) (else=copy) into partnerr.

val lab partnerr 1 'Lives with husband/wife/partner at F4' 0 'Does not live with partner' 9 'Not available'.

miss val partnerr (9).

fre partnerr.

fre domicil.

recode domicil (1=1) (else=0) into domicil1.

recode domicil (2=1) (else =0) into domicil2.

recode domicil (3=1) (else=0) into domicil3.

recode domicil (4=1) (else=0) into domicil4.

recode domicil (5=1) (else=0) into domicil5.

exe.

recode domicil (1=1) (2=1) (3=1) (4=0) (5=0) (else=copy) into urban.

val lab urban 1 'big city, suburbs or town' 0 'country' 7 'Refusal' 9 'No answer'.

var lab urban 'R lives in urban setting'.

miss val urban (7,9).

fre urban.

fre mnactic.

recode mnactic (1 =1) (2=2) (3=3) (4=3) (5=6) (6=4) (7=7) (8=5) (9=7) (else=copy) into mainacti.

val lab mainacti 1 'Paid work' 2 'Education' 3 'Unemployed' 4 'Retired' 5 'Housework, looking after children'

 6 'Permanently sick or disabled' 7 'other and community or military service' 77 'Refusal' 88 'Dont Know' 99 'No answer'.

miss val mainacti (77,88,99).

fre mainacti.

recode mainacti (1=1) (else=0) into mainacti1.

recode mainacti (2=1) (else =0) into mainacti2.

recode mainacti (3=1) (else=0) into mainacti3.

recode mainacti (4=1) (else=0) into mainacti4.

recode mainacti (5=1) (else=0) into mainacti5.

recode mainacti (6=1) (else=0) into mainacti6.

recode mainacti (7=1) (else=0) into mainacti7.

exe.

compute paidwork = mainacti1.

var lab paidwork 'R is in paid work'.

val lab paidwork 1 'R is in paid work' 0 'R is in education, unemployed, retired, housework, sick or other'.

fre paidwork.

fre edulvla .

recode edulvla (1=1) (else=0) into edulvla1.

recode edulvla (2=1) (else=0) into edulvla2.

recode edulvla (3=1) (else=0) into edulvla3.

recode edulvla (4=1) (else=0) into edulvla4.

recode edulvla (5=1) (else=0) into edulvla5.

recode edulvla (1=1) (2=1) (3=1) (4=0) (5=0) (else=copy) into highschool.

var lab highschool 'R completed up to upper secondary education and not beyond'.

val lab highschool 1 'R completed up to upper secondary education' 0 'R completed post-secondary or tertiary education'

 77 'Refusal' 88 'Dont know' 99 'No answer'.

miss val highschool (77,88,99).

fre highschool.

\*\*Note some errors were encountered in the coding of main activity variable and the education level variables across modes/countries, which were resolved prior to analysis. Additional syntax is available on request.

\*\* fixed line telephone at home.

fre fxltph.

recode fxltph (1=1) (2=0) (else=copy) into hastel.

val lab hastel 1 'Has fixed line telephone in accommodation' 0 'No fixed line telephone' 7 'Refusal' 9 'No answer'.

miss val hastel (7,9).

fre hastel.

\*\*The variable ‘sample’ used below indicates which country, linguistic region and mode respondents belong to.

\*\*respondent interviewed by telephone.

recode sample (1=0) (2=0) (3=0) (4=1) (5=1) into telint.

var lab telint 'R interviewed by telephone'.

val lab telint 1 'R interviewed by telephone' 0 'R interviewed by F2F'.

fre telint.

do if sample <4.

do if hastel NE 1.

compute group = 99.

else if hastel = 1.

do if sample = 1 and sysmis(I7).

compute group = 98.

else if sample = 1 and I7 = 3.

compute group = 98.

else if sample = 1 and I7 = 1.

compute group = 2.

else if sample = 1 and I7 = 2.

compute group = 4.

else if sample = 2.

compute group = 5.

else if sample = 3.

compute group = 1.

end if.

end if.

else if sample = 4.

compute group = 3.

else if sample = 5.

compute group = 6.

end if.

fre group.

var lab group 'comparison groups'.

val lab group 1 'France F2F (not at all)'

2 'CH FR F2F (very - main)'

3 'CH FR CATI (very)'

4 'CH DE F2F standard wording (extremely)'

5 'DE F2F (extremely)'

6 'DE CATI (extremely)'

98 'ESSCH Ticino sample'

99 'no telephone'.

miss val group (98,99).

miss val hastel (7,8,9).

fre group.

\*\*experiment groups.

fre sample group.

miss val group testb24va testb24vb testb24vc ().

fre group testb24va testb24vb testb24vc.

do if group = 2 or group = 4.

do if sysmis (testb24vb) and sysmis (testb24vc).

compute expgroup = 1.

else if sysmis (testb24va) and sysmis (testb24vc).

compute expgroup = 2.

else if sysmis (testb24va) and sysmis (testb24vb).

compute expgroup = 3.

end if.

else if group = 98 or group = 99.

compute expgroup = 98.

else if group = 1 or group = 3 or group = 5 or group = 6.

compute expgroup = 99.

end if.

val lab expgroup 1 'Very' 2 'Extremely' 3 'not at all' 98 'ticino or no phone' 99 'not in expt'.

miss val expgroup (98,99).

fre expgroup.

\*lifesat var.

\*groups for lifesat var in wording comparison.

1 'France F2F (not at all)'

2a 'CH FR F2F (very - main)'

2b 'CH FR F2F test wording 1 (very)'

3 'CH FR F2F test wording 2 (extremely)'

4 'CH FR F2F test wording 3 (not at all)'

5 'CH FR CATI (very)'

6a 'CH DE F2F standard wording (extremely)'

6b 'CH DE F2F test wording 2 (extremely)'

7 'CH DE F2F test wording 1 (very)'

8 'CH DE F2F test wording 3 (not at all)'

9 'DE F2F (extremely)'

10 'DE CATI (extremely)'.

\*\*Preparation of the life satisfaction variable, as varies by main sample and test sample:

do if group = 1.

compute lifesat = stflife.

else if (group = 2 or group = 4) and expgroup = 1.

compute lifesat = testb24va.

else if (group = 2 or group = 4) and expgroup = 2.

compute lifesat = testb24vb.

else if (group = 2 or group = 4) and expgroup = 3.

compute lifesat = testb24vc.

else if group = 3.

compute lifesat = stflife.

else if group = 5.

compute lifesat = stflife.

else if group = 6.

compute lifesat = stflife.

else.

compute lifesat = 99.

end if .

fre lifesat.

miss val lifesat (77 thru 99).

fre lifesat.

***b) Calculating selection probability weights to correct for differential selection probabilities for people living in households with more than one member***

\*\*weights.

\*design weights for telephone are the inverse of the number of people in the household.

fre group.

temp.

select if group = 3.

fre hhmmb.

do if group = 3 or group = 6.

compute newdweight = 1/ hhmmb.

else.

compute newdweight = dweight.

end if.

fre newdweight.

re sample group.

\*for the CATI respondents dweight is 1/ selection probability - so 1/ 1/ number of people in household (newdweight).

do if sample = 4 or sample = 5.

compute dw1 = 1/newdweight.

else.

compute dw1 = dweight.

end if.

exe.

fre dw1.

\*\*This creates some slightly larger weights, which were trimmed so the maximum weight was 4. This affected 13 cases in sample=4 and 5 cases in sample = 5.

do if sample = 4.

recode dw1 (5=4) (6=4) (else=copy).

else if sample = 5.

recode dw1 (5=4) (7=4) (else = copy).

end if.

\*\*Then the weights were normalised so that the sum corresponds to the exact number of units involved in the analysis. CH = 237. DE = 199. How to normalize weights : divide the survey weight of each unit used by the (unweighted) average of the survey weights of all the analyzed units – e.g. Step 1 - what is the sum of the survey weights? 10

Step 2 - how many observations are there? 237 or 199

Step 3 - the average is the sum/ observations: 2.4515 or 2.3869

Step 4 - divide each weight by this amount.\*\*

temp.

select if sample = 5.

DESCRIPTIVES VARIABLES=dw1

 /STATISTICS=MEAN STDDEV MIN MAX.

do if sample = 4.

compute dw2 = dw1/2.4515.

else if sample = 5.

compute dw2 = dw1/2.3869.

else.

compute dw2 = dweight.

end if.

exe.

\*\*use dw2 for all analyses.

**Step 3:** Assessing relative differences across categories of socio-demographic characteristics of the achieved (selection-probability weighted) samples in each mode. Estimating response propensity scores based on a logistic regression model predicting the probability of participating by telephone compared to by face-to-face interview.

\*\*Comparisons of sample composition were conducted as in following example after applying the weight dw2:

\*CH f2f french = group = 2.

temp.

select if group = 2.

fre male agecats maritals partnerr domicil mainacti edulvla .

temp.

select if group = 2.

DESCRIPTIVES VARIABLES=male age agecat1 agecat2 agecat3 agecat4 maritals1 maritals2 maritals3 maritals4

 partnerr domicil1 domicil2 domicil3 domicil4 domicil5 mainacti1 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7

 edulvla1 edulvla2 edulvla3 edulvla4 edulvla5 eduyrs hhmmb

 /STATISTICS=MEAN STDDEV MIN MAX SEMEAN.

\*\* Estimating response propensity scores based on a logistic regression model predicting the probability of participating by telephone compared to by face-to-face interview.

\*\*Estimating response propensities in Switzerland.

\*\*Missing values on the selected sociodemographics were imputed for the purpose of estimating the parameters of the logistic regression equation.

temp.

select if group = 2.

fre male age agesqd maritals2 maritals3 maritals4 domicil2 domicil3 domicil4 domicil5

 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7 edulvla2 edulvla3 edulvla4 edulvla5 eduyrs hhmmb.

\*eduyrs.

miss val eduyrs ().

do if group = 2 and eduyrs = 88.

recode eduyrs (88=14).

end if.

temp.

select if group = 3.

fre male age agesqd maritals2 maritals3 maritals4 domicil2 domicil3 domicil4 domicil5

 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7 edulvla2 edulvla3 edulvla4 edulvla5 eduyrs hhmmb.

\*eduyrs.

miss val eduyrs ().

do if group = 3 and eduyrs = 88.

recode eduyrs (88=14).

end if.

miss val eduyrs (77,88,99).

fre eduyrs.

weight by dw2.

temp.

select if group = 2 or group =3.

LOGISTIC REGRESSION VARIABLES telint

 /METHOD=ENTER male agecat2 agecat3 agecat4 citizen maritals1 maritals3 maritals4

domicil2 domicil3 domicil4 domicil5 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7

 hh2 hh3 hh4 edu1 edu3 hampered mobile

 /SAVE=PRED

 /PRINT=GOODFIT

 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).

weight off.

\*\*Estimating response propensities in Germany.

\*\*Missing values on the selected sociodemographics were imputed for the purpose of estimating the parameters of the logistic regression equation.

temp.

select if group = 5.

fre male age agesqd maritals2 maritals3 maritals4 domicil2 domicil3 domicil4 domicil5

 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7 eduyrs hhmmb.

temp.

select if group = 6.

fre male age agesqd maritals2 maritals3 maritals4 domicil2 domicil3 domicil4 domicil5

 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7 eduyrs hhmmb.

\*age.

miss val age ().

fre age.

do if group = 5.

recode age (7777=49) (8888=49) (else = copy).

end if.

temp.

select if group = 5.

fre age.

do if group = 6.

recode age (107=91) (else=copy).

end if.

temp.

select if group = 6.

fre age.

do if group = 5 or group = 6.

compute agesqd = age\*age\*.01.

end if.

temp.

select if group = 5 or group = 6.

fre agesqd.

miss val eduyrs ().

temp.

select if group = 5.

fre eduyrs.

temp.

select if group = 6.

fre eduyrs.

do if group = 5.

recode eduyrs (77=13) (88=13).

else if group = 6.

recode eduyrs (77= 15) (88=15).

end if.

temp.

select if group = 5 or group = 6.

fre eduyrs.

miss val hhmmb ().

temp.

select if group = 5.

fre hhmmb.

do if group=5.

recode hhmmb (77=3) (12=2) (22=2).

end if.

temp.

select if group = 5 or group = 6.

fre hhmmb.

weight by dw2.

\*\*Logistic regression to estimate response propensities.

temp.

select if group = 5 or group =6.

LOGISTIC REGRESSION VARIABLES telint

 /METHOD=ENTER male agecat2 agecat3 agecat4 citizen native maritals1 maritals3 maritals4

domicil2 domicil3 domicil4 domicil5 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7

 hh2 hh3 hh4 edu1 edu3 hampered mobile

 /SAVE=PRED

 /PRINT=GOODFIT

 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).

weight off.

**Step 4:** Computing weights based on the response propensity scores to correct for differential selection effects between modes when assessing measurement invariance and computing final weights combining the selection probability and propensity-score weights.

\*\*Switzerland.

\*\*1) Compute propensity scores based on predicted probabilities of the logistic regression model.

weight off.

do if group = 3.

compute m1ps = 1.

else if group = 2.

compute m1ps = PRE\_3/(1-PRE\_3).

end if.

exe.

temp.

select if group = 2 or group = 3.

fre m1ps.

\*\*2) Combine with design weight.

do if group = 3 or group = 2.

compute comweight1 = dw2 \* m1ps.

end if.

\*\*3) Trim weights before normalising.

weight off.

temp.

select if group =2 .

fre comweight1.

\*group 2: max weight = 3.41. 99th percentile = 5 cases with weights greater than 3, 98th percentile = 9 cases with weights greater than 2.53

97th percentile = 12 cases with weights greater than 2.33.

\*group 3: max weight = 1.63. Leave.

\*\*trim to 97th.

do if group = 2.

do if comweight1 > 2.33.

recode comweight1 (else = 2.33) into comweight1t.

else.

recode comweight1 (else = copy) into comweight1t.

end if.

end if.

temp.

select if group = 2.

fre comweight1t.

\*\*4) Normalise trimmed weights using the same procedure as for the design weights.

temp.

select if group = 2.

DESCRIPTIVES VARIABLES=comweight1t

 /STATISTICS=MEAN SUM STDDEV MIN MAX.

temp.

select if group = 3.

DESCRIPTIVES VARIABLES=comweight1

 /STATISTICS=MEAN SUM STDDEV MIN MAX.

do if group =2.

compute comweight1tn = comweight1t/ .5735.

else if group =3.

compute comweight1tn = comweight1/ 1.0000.

end if.

temp.

select if group = 2.

fre comweight1tn.

weight by comweight1tn.

temp.

select if group = 3.

DESCRIPTIVES VARIABLES=male agecat1 agecat2 agecat3 agecat4 citizen native maritals1 maritals2 maritals3 maritals4

domicil1 domicil2 domicil3 domicil4 domicil5 mainacti1 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7 paid

 hh1 hh2 hh3 hh4 edu1 edu2 edu3 hampered mobile

 /STATISTICS=MEAN STDDEV MIN MAX SEMEAN.

\*\*Germany.

\*\*1) Compute propensity scores based on predicted probabilities of the logistic regression model.

weight off.

temp.

select if group = 5.

fre PRE\_4.

do if group = 6.

compute m1psg = 1.

else if group = 5.

compute m1psg = PRE\_4/(1-PRE\_4).

end if.

exe.

temp.

select if group = 5 .

fre m1psg.

temp.

select if group = 2.

fre m1ps.

\*\*2) Combine with design weight.

fre group.

temp.

select if group = 5.

fre dw2.

do if group = 5 or group = 6.

compute comweight1g = dw2 \* m1psg.

end if.

temp.

select if group = 5 or group = 6.

fre comweight1g.

\*\*3) Trim weights before normalising.

weight off.

temp.

select if group =5 .

fre comweight1g.

\*group 5: max weight = 1.23. 99th percentile = 28 cases with weights greater than .37.. probably ok. try trimming to 99th.

\*group 3: max weight = 1.68. Leave.

\*trim to 99th.

weight off.

do if group = 5.

do if comweight1g > 0.37.

recode comweight1g (else = 0.37) into comweight1gt.

else.

recode comweight1g (else = copy) into comweight1gt.

end if.

end if.

temp.

select if group = 5.

fre comweight1gt.

\*\*4) Normalise trimmed weights using same procedure as for the design weight.

temp.

select if group = 5.

DESCRIPTIVES VARIABLES=comweight1gt

 /STATISTICS=MEAN SUM STDDEV MIN MAX.

temp.

select if group = 6.

DESCRIPTIVES VARIABLES=comweight1g

 /STATISTICS=MEAN SUM STDDEV MIN MAX.

do if group =5.

compute comweight1gtn = comweight1gt/ .073251.

else if group =6.

compute comweight1gtn = comweight1g/ 1.0000.

end if.

temp.

select if group = 5.

fre comweight1gtn.

weight by comweight1gtn.

temp.

select if group = 6.

DESCRIPTIVES VARIABLES=male agecat1 agecat2 agecat3 agecat4 citizen native maritals1 maritals2 maritals3 maritals4

domicil1 domicil2 domicil3 domicil4 domicil5 mainacti1 mainacti2 mainacti3 mainacti4 mainacti5 mainacti6 mainacti7 paid

 hh1 hh2 hh3 hh4 edu1 edu2 edu3 hampered mobile

 /STATISTICS=MEAN STDDEV MIN MAX SEMEAN.

\*\*Combine normalised weights for all countries.

do if group = 2 or group = 3.

compute fincomweight = comweight1n.

else if group = 5 or group =6.

compute fincomweight = comweight1gn.

end if.

temp.

select if group = 2 or group = 3 or group = 5 or group = 6.

fre fincomweight.

\*\*Combine normalised trimmed weights for all countries (using 97th percentile for ch and 99th for de).

do if group = 2 or group = 3.

compute fincomweightt = comweight1tn.

else if group = 5 or group =6.

compute fincomweightt = comweight1gtn.

end if.

temp.

select if group = 2 or group = 3 or group = 5 or group = 6.

fre fincomweightt.

VAR LAB fincomweight 'PS weight combined with design weight, normalised not trimmed'.

var lab fincomweightt 'PS weight combined with design weight, trimmed to 99th percentile for de and to 97th for ch, normalised'.

exe.

\*\*Note the weight fincomweight was used in the final analysis.

**Part B: Analysis of Measurement Invariance**

**Mplus input files for estimating models presented in Table 3**

|  |
| --- |
| **Step 1: Scale format** |
| *1.1. Within French-speaking Switzerland (Groups 1,2, and 3)* |

*Configural*

 useobservations ARE (group\_all EQ 21 OR group\_all EQ 22 OR group\_all EQ 23);

 grouping is group\_all (21=CHF\_VERY 22=CHF\_EXTR 23=CHF\_NOT);

 weight ARE dw2;

 usevariables ARE B24\_exp stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy B24\_exp;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_EXTR:

SATLIF3 BY happy B24\_exp;

[happy B24\_exp];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

Model CHF\_NOT:

SATLIF3 BY happy B24\_exp;

[happy B24\_exp];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full metric*

 useobservations ARE (group\_all EQ 21 OR group\_all EQ 22 OR group\_all EQ 23);

 grouping is group\_all (21=CHF\_VERY 22=CHF\_EXTR 23=CHF\_NOT);

 weight ARE dw2;

 usevariables ARE B24\_exp stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy B24\_exp;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_EXTR:

!SATLIF3 BY happy B24\_exp;

[happy B24\_exp];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

Model CHF\_NOT:

!SATLIF3 BY happy B24\_exp;

[happy B24\_exp];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full scalar*

 useobservations ARE (group\_all EQ 21 OR group\_all EQ 22 OR group\_all EQ 23);

 grouping is group\_all (21=CHF\_VERY 22=CHF\_EXTR 23=CHF\_NOT);

 weight ARE dw2;

 usevariables ARE B24\_exp stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy B24\_exp;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_EXTR:

!SATLIF3 BY happy B24\_exp;

![happy B24\_exp];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

Model CHF\_NOT:

!SATLIF3 BY happy B24\_exp;

![happy B24\_exp];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

|  |
| --- |
| *1.2. Within German-speaking Switzerland (Groups 4,5, and 6)* |

*Configural*

 useobservations ARE (group\_all EQ 41 OR group\_all EQ 42 OR group\_all EQ 43);

 grouping is group\_all (41=CHDE\_VERY 42=CHDE\_EXTR 43=CHDE\_NOT);

 weight ARE dw2;

 usevariables ARE B24\_exp stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy B24\_exp;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHDE\_EXTR:

SATLIF3 BY happy B24\_exp;

[happy B24\_exp];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

Model CHDE\_NOT:

SATLIF3 BY happy B24\_exp;

[happy B24\_exp];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full metric*

 useobservations ARE (group\_all EQ 41 OR group\_all EQ 42 OR group\_all EQ 43);

 grouping is group\_all (41=CHDE\_VERY 42=CHDE\_EXTR 43=CHDE\_NOT);

 weight ARE dw2;

 usevariables ARE B24\_exp stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy B24\_exp;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHDE\_EXTR:

!SATLIF3 BY happy B24\_exp;

[happy B24\_exp];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

Model CHDE\_NOT:

!SATLIF3 BY happy B24\_exp;

[happy B24\_exp];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full scalar*

 useobservations ARE (group\_all EQ 41 OR group\_all EQ 42 OR group\_all EQ 43);

 grouping is group\_all (41=CHDE\_VERY 42=CHDE\_EXTR 43=CHDE\_NOT);

 weight ARE dw2;

 usevariables ARE B24\_exp stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy B24\_exp;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHDE\_EXTR:

!SATLIF3 BY happy B24\_exp;

![happy B24\_exp];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

Model CHDE\_NOT:

!SATLIF3 BY happy B24\_exp;

![happy B24\_exp];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

|  |
| --- |
| **Step 2: Mode** |
| *2.1. Switzerland (Groups 7 and 8)* |

*Configural*

 Missing are all (-9999) ;

 useobservations ARE (group EQ 2 OR group EQ 3);

 grouping is group (2=CHF\_2F2 3=CHF\_CATI);

 weight ARE fincomweight;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_CATI:

SATLIF3 BY happy stflife;

[happy stflife];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full metric*

 Missing are all (-9999) ;

 useobservations ARE (group EQ 2 OR group EQ 3);

 grouping is group (2=CHF\_2F2 3=CHF\_CATI);

 weight ARE fincomweight;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_CATI:

!SATLIF3 BY happy stflife;

[happy stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Partial metric*

 Missing are all (-9999) ;

 useobservations ARE (group EQ 2 OR group EQ 3);

 grouping is group (2=CHF\_2F2 3=CHF\_CATI);

 weight ARE fincomweight;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY happy stflife stflfsf;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_CATI:

SATLIF3 BY stflfsf;!happy stflife;

[stflife stflfsf];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Partial scalar*

 Missing are all (-9999) ;

 useobservations ARE (group EQ 2 OR group EQ 3);

 grouping is group (2=CHF\_2F2 3=CHF\_CATI);

 weight ARE fincomweight;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY happy stflife stflfsf;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_CATI:

SATLIF3 BY stflfsf;!happy stflife;

[stflfsf];!stflife

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

|  |
| --- |
| *2.2. Germany (Groups 9 and 10)* |

*Configural*

 Missing are all (-9999) ;

 useobservations ARE (group EQ 5 OR group EQ 6);

 grouping is group (5=DE\_2F2 6=DE\_CATI);

 weight ARE fincomweight;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model DE\_CATI:

SATLIF3 BY happy stflife;

[happy stflife];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full metric*

 Missing are all (-9999) ;

 useobservations ARE (group EQ 5 OR group EQ 6);

 grouping is group (5=DE\_2F2 6=DE\_CATI);

 weight ARE fincomweight;

 usevariables ARE stflife stflfsf

 fltdpr fltlnl fltsd fltanx

 happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model DE\_CATI:

!SATLIF3 BY happy stflife;

[happy stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full scalar*

 Missing are all (-9999) ;

 useobservations ARE (group EQ 5 OR group EQ 6);

 grouping is group (5=DE\_2F2 6=DE\_CATI);

 weight ARE fincomweight;

 usevariables ARE stflife stflfsf

 fltdpr fltlnl fltsd fltanx

 happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model DE\_CATI:

!SATLIF3 BY happy stflife;

![happy stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

|  |
| --- |
| **Step 3: Impact of language within countries** |
| *3.1. Within Switzerland (Groups 11 and 12)* |

 Missing are all (-9999) ;

 useobservations ARE (group EQ 2 OR group EQ 4);

 grouping is group (2=CHF\_2F2 4=CHDE\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHDE\_2F2:

SATLIF3 BY happy stflife;

[happy stflife];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full metric*

 useobservations ARE (group EQ 2 OR group EQ 4);

 grouping is group (2=CHF\_2F2 4=CHDE\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHDE\_2F2:

!SATLIF3 BY happy stflife;

[happy stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full scalar*

 Missing are all (-9999) ;

 useobservations ARE (group EQ 2 OR group EQ 4);

 grouping is group (2=CHF\_2F2 4=CHDE\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf

 fltdpr fltlnl fltsd fltanx

 happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHDE\_2F2:

!SATLIF3 BY happy stflife;

![happy stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

*Partial scalar I*

 useobservations ARE (group EQ 2 OR group EQ 4);

 grouping is group (2=CHF\_2F2 4=CHDE\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHDE\_2F2:

!SATLIF3 BY happy stflife;

[happy];! stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

*Partial scalar II*

 useobservations ARE (group EQ 2 OR group EQ 4);

 grouping is group (2=CHF\_2F2 4=CHDE\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHDE\_2F2:

!SATLIF3 BY happy stflife;

[happy];! stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl];! fltsd fltanx];

|  |
| --- |
| **Step 4: Impact of country within languages** |
| *4.1. Across French-speaking regions and countries (Groups 13 and 14)* |

*Configural*

 useobservations ARE (group EQ 1 OR group EQ 2);

 grouping is group (1=F\_2F2 2=CHF\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_2F2:

SATLIF3 BY happy stflife;

[happy stflife];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full metric*

 useobservations ARE (group EQ 1 OR group EQ 2);

 grouping is group (1=F\_2F2 2=CHF\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf

 fltdpr fltlnl fltsd fltanx

 happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_2F2:

!SATLIF3 BY happy stflife;

[happy stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Partial metric*

 useobservations ARE (group EQ 1 OR group EQ 2);

 grouping is group (1=F\_2F2 2=CHF\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_2F2:

!SATLIF3 BY happy stflife;

![happy stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

*Partial scalar*

 useobservations ARE (group EQ 1 OR group EQ 2);

 grouping is group (1=F\_2F2 2=CHF\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY happy stflife stflfsf ;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_2F2:

SATLIF3 BY stflfsf ;!happy stflife;

[stflfsf ];

!NEGEM4 BY fltlnl fltsd fltanx;

![fltlnl fltsd fltanx];

|  |
| --- |
| *4.2. Across German-speaking regions and countries (Groups 15 and 16)* |

*Configural*

 useobservations ARE (group EQ 4 OR group EQ 5);

 grouping is group (4=CHDE\_2F2 5=DE\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model DE\_2F2:

SATLIF3 BY happy stflife;

[happy stflife];

NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Full metric*

 useobservations ARE (group EQ 1 OR group EQ 2);

 grouping is group (1=F\_2F2 2=CHF\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model CHF\_2F2:

!SATLIF3 BY happy stflife;

[happy stflife];

!NEGEM4 BY fltlnl fltsd fltanx;

[fltlnl fltsd fltanx];

*Partial metric I*

 useobservations ARE (group EQ 4 OR group EQ 5);

 grouping is group (4=CHDE\_2F2 5=DE\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model DE\_2F2:

!SATLIF3 BY happy stflife;

[happy stflife];

!NEGEM4 BY fltlnl fltsd ;

NEGEM4 BY fltanx;

[fltlnl fltsd fltanx];

*Partial metric II*

 useobservations ARE (group EQ 4 OR group EQ 5);

 grouping is group (4=CHDE\_2F2 5=DE\_2F2);

 weight ARE dw2;

 usevariables ARE stflife stflfsf fltdpr fltlnl fltsd fltanx happy;

Analysis:

 Type = general;

 Estimator = MLR;

Model:

SATLIF3 BY stflfsf happy stflife;

NEGEM4 BY fltdpr fltlnl fltsd fltanx;

Model DE\_2F2:

SATLIF3 BY happy;! stflife;

[happy stflife];

!NEGEM4 BY fltlnl fltsd ;

NEGEM4 BY fltanx;

[fltlnl fltsd fltanx];