MPLUS Analysis Examples Replication Chapter 13

Mplus includes all input code and output in the *.out file. This document contains all code and selected output from the weighted multilevel models presented in Chapter 13. Because the SEM model output is discussed in detail in the book, we omit that example here. See Chapter 13 and the Mplus documentation for details on multilevel models and SEM methods.

All data preparation and management was done using SAS and then read into Mplus v7.4 using a text file format produced by SAS.

```
Mplus VERSION 7.4
MUTHEN & MUTHEN
08/15/2017   5:13 PM
INPUT INSTRUCTIONS
  TITLE: ASDA 2 EXAMPLE 13.3.3 MULTILEVEL MODEL EXAMPLE NO WGTS PISA 2000 DATA
    Data:
    FILE IS "P:\ASDA 2\Data sets\Additional Example Data Sets\pisa_mplus.txt";
    Variable:
     NAMES ARE
       both_for college female high_school id_school isei one_for pass_read test_lang
        w_fstuwt wnrschbw;
     missing are . ;
    usevar = isei id_school college ;
    within =  college ;
    cluster = id_school ;
    Analysis:
    type is twolevel random ;
    estimator=mlr ;
    Model:
    %within%
     randoms1 | isei on college ;
    %between%
     isei  ;




INPUT READING TERMINATED NORMALLY
ASDA 2 EXAMPLE 13.3.3 MULTILEVEL MODEL EXAMPLE NO WGTS PISA 2000 DATA
SUMMARY OF ANALYSIS
Number of groups                                          1
Number of observations                                 2069
Number of dependent variables                             1
Number of independent variables                           1
Number of continuous latent variables                     1
Observed dependent variables
  Continuous
    ISEI
Observed independent variables
    COLLEGE
Continuous latent variables
    RANDOMS1
Variables with special functions
  Cluster variable      ID_SCHOO
  Within variables
    COLLEGE
Estimator                                               MLR
Information matrix                                  OBSERVED
Maximum number of iterations                            100
Convergence criterion                             0.100D-05
Maximum number of EM iterations                         500
Convergence criteria for the EM algorithm
  Loglikelihood change                            0.100D-02
  Relative loglikelihood change                   0.100D-05
  Derivative                                      0.100D-03
Minimum variance                                  0.100D-03
Maximum number of steepest descent iterations            20
Maximum number of iterations for H1                    2000
Convergence criterion for H1                      0.100D-03
Optimization algorithm                                  EMA
Input data file(s)
  P:\ASDA 2\Data sets\Additional Example Data Sets\pisa_mplus.txt
Input data format  FREE
SUMMARY OF DATA
    Number of missing data patterns               1
    Number of clusters                          148




COVARIANCE COVERAGE OF DATA
Minimum covariance coverage value   0.100
```

```
        PROPORTION OF DATA PRESENT
              Covariance Coverage
                 ISEI        COLLEGE

               _____      _____
   ISEI          1.000
   COLLEGE        1.000        1.000
```

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION
Number of Free Parameters   **5**
Loglikelihood
        H0 Value   -8611.880
        H0 Scaling Correction Factor   0.9058
          for MLR
Information Criteria
        Akaike (AIC)   17233.760
        Bayesian (BIC)   17261.934
        Sample-Size Adjusted BIC   17246.048
          (n* = (n + 2) / 24)

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Within Level				
Residual Variances				
ISEI	219.309	7.522	29.156	0.000
Between Level				
Means				
ISEI	38.793	0.598	64.842	0.000
RANDOMS1	12.639	0.890	14.197	0.000
Variances				
ISEI	16.506	5.243	3.148	0.002
RANDOMS1	42.482	8.855	4.797	0.000

QUALITY OF NUMERICAL RESULTS
     Condition Number for the Information Matrix   0.112E-02
        (ratio of smallest to largest eigenvalue)

```
Mplus VERSION 7.4
MUTHEN & MUTHEN
08/16/2017   7:56 AM
INPUT INSTRUCTIONS
  TITLE: ASDA 2 EXAMPLE 13.3.3 MULTILEVEL MODEL WITH WGT AS COVARIATE PISA 2000 DATA
  Data:
  FILE IS "P:\ASDA 2\Data sets\Additional Example Data Sets\pisa_mplus.txt";
  Variable:
   NAMES ARE
    both_for college female high_school id_school isei one_for pass_read test_lang
     w_fstuwt wnrschbw;
   missing are . ;
  usevar = isei id_school college w_fstuwt ;
  within =  college w_fstuwt ;
  cluster = id_school ;
  Analysis:
  type is twolevel random ; ! DEFINE A TWOLEVEL MODEL WITH RANDOM EFFECTS
  estimator=mlr ; ! ESTIMATOR IS MLR ;
  Model:
  %within%
   randoms1 | isei on college ;
   isei on w_fstuwt ;
  %between%
   isei  ;


 INPUT READING TERMINATED NORMALLY


ASDA 2 EXAMPLE 13.3.3 MULTILEVEL MODEL WITH WGT AS COVARIATE PISA 2000 DATA
SUMMARY OF ANALYSIS
Number of groups                                         1
Number of observations                                2069
Number of dependent variables                            1
Number of independent variables                          2
Number of continuous latent variables                    1
Observed dependent variables
  Continuous
   ISEI
Observed independent variables
   COLLEGE     W_FSTUWT
Continuous latent variables
   RANDOMS1
Variables with special functions
  Cluster variable      ID_SCHOO
  Within variables
   COLLEGE     W_FSTUWT
Estimator                                              MLR
Information matrix                                 OBSERVED
Maximum number of iterations                           100
Convergence criterion                          0.100D-05
Maximum number of EM iterations                        500
Convergence criteria for the EM algorithm
  Loglikelihood change                         0.100D-02
  Relative loglikelihood change                0.100D-05
  Derivative                                   0.100D-03
Minimum variance                               0.100D-03
Maximum number of steepest descent iterations           20
Maximum number of iterations for H1                   2000
Convergence criterion for H1                   0.100D-03
Optimization algorithm                                 EMA
Input data file(s)
  P:\ASDA 2\Data sets\Additional Example Data Sets\pisa_mplus.txt
```

```
Input data format  FREE
SUMMARY OF DATA
     Number of missing data patterns            1
     Number of clusters                       148


COVARIANCE COVERAGE OF DATA
Minimum covariance coverage value   0.100
        PROPORTION OF DATA PRESENT
             Covariance Coverage
             ISEI          COLLEGE       W_FSTUWT


            _____      _____      _____
 ISEI        1.000
 COLLEGE     1.000         1.000
 W_FSTUWT    1.000         1.000         1.000


THE MODEL ESTIMATION TERMINATED NORMALLY
```

MODEL FIT INFORMATION

Number of Free Parameters   **6**
Loglikelihood
        H0 Value   **-8609.914**
        H0 Scaling Correction Factor   0.9061
         for MLR
Information Criteria
        Akaike (AIC)   17231.827
        Bayesian (BIC)   17265.636
        Sample-Size Adjusted BIC   17246.574
         (n* = (n + 2) / 24)
MODEL RESULTS

				Two-Tailed
	Estimate	S.E.	Est./S.E.	P-Value
Within Level				
ISEI **ON**				
W_FSTUWT	0.002	0.001	2.110	0.035
Residual Variances				
ISEI	219.917	7.530	29.205	0.000
Between Level				
Means				
ISEI	36.819	1.050	35.067	0.000
RANDOMS1	12.597	0.893	14.106	0.000
Variances				
ISEI	13.937	4.969	2.805	0.005
RANDOMS1	42.259	8.562	4.936	0.000

```
QUALITY OF NUMERICAL RESULTS
     Condition Number for the Information Matrix             0.142E-03
        (ratio of smallest to largest eigenvalue)
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```

Mplus VERSION 7.4
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INPUT INSTRUCTIONS

  TITLE: ASDA 2 EXAMPLE 13.3.3 MULTILEVEL MODEL WITH WGT/EFFECTIVE SCALING PISA 2000 DATA

    Data:
    FILE IS "P:\ASDA 2\Data sets\Additional Example Data Sets\pisa_mplus.txt";

    Variable:
     NAMES ARE
      both_for college female high_school id_school isei one_for pass_read test_lang
       w_fstuwt wnrschbw;
     missing are . ;
     weight = conwt ;
     wtscale=ecluster ;
     bweight = wnrschbw ;
     usevar = isei id_school college wnrschbw w_fstuwt conwt ;
     within = college w_fstuwt ;
     cluster = id_school ;

    Define:
     conwt= w_fstuwt / wnrschbw ;
    Analysis:
    type is twolevel random ; !TWOLEVEL MODEL WITH RANDOM EFFECTS ;

    Model:
    %within%
     randoms1 | isei on college ;
    %between%
     isei ;

*** WARNING in MODEL command
  Variable is uncorrelated with all other variables: W_FSTUWT
*** WARNING in MODEL command
  At least one variable is uncorrelated with all other variables in the model.
  Check that this is what is intended.
   2 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS

ASDA 2 EXAMPLE 13.3.3 MULTILEVEL MODEL WITH WGT/EFFECTIVE SCALING PISA 2000 DATA

SUMMARY OF ANALYSIS

Number of groups   1
Number of observations   2069

Number of dependent variables   2
Number of independent variables   1
Number of continuous latent variables   1

Observed dependent variables

  Continuous
   ISEI   W_FSTUWT

```
Observed independent variables
   COLLEGE


Continuous latent variables
   RANDOMS1


Variables with special functions

  Cluster variable       ID_SCHOO
  Weight variable (effective cluster-size scaling)
    CONWT
  Between weight variable (sample-size scaling)
    WNRSCHBW

  Within variables
   COLLEGE    W_FSTUWT



Estimator                                          MLR
Information matrix                             OBSERVED
Maximum number of iterations                       100
Convergence criterion                        0.100D-05
Maximum number of EM iterations                    500
Convergence criteria for the EM algorithm
  Loglikelihood change                       0.100D-02
  Relative loglikelihood change              0.100D-05
  Derivative                                 0.100D-03
Minimum variance                             0.100D-03
Maximum number of steepest descent iterations       20
Maximum number of iterations for H1               2000
Convergence criterion for H1                 0.100D-03
Optimization algorithm                             EMA

Input data file(s)
  P:\ASDA 2\Data sets\Additional Example Data Sets\pisa_mplus.txt
Input data format  FREE



SUMMARY OF DATA

     Number of missing data patterns          1
     Number of clusters                     148


COVARIANCE COVERAGE OF DATA
Minimum covariance coverage value   0.100
     PROPORTION OF DATA PRESENT
          Covariance Coverage
            ISEI        W_FSTUWT      COLLEGE

          _____     _____     _____
 ISEI       1.000
 W_FSTUWT   1.000        1.000
 COLLEGE    1.000        1.000        1.000
```

```
THE MODEL ESTIMATION TERMINATED NORMALLY
```
MODEL FIT INFORMATION

Number of Free Parameters   7

Loglikelihood

          HO Value   -25186.756
          HO Scaling Correction Factor   31.4769
            for MLR

Information Criteria

          Akaike (AIC)   50387.513
          Bayesian (BIC)   50426.956
          Sample-Size Adjusted BIC 50404.717
            (n* = (n + 2) / 24)

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value

Within Level

  Means
    W_FSTUWT   1114.235   99.190   11.233   0.000

  Variances
    W_FSTUWT   ********* *********   2.466   0.014

  Residual Variances
    ISEI   214.914   13.086   16.424   0.000

Between Level

  Means
    ISEI   35.863   0.903   39.734   0.000
    RANDOMS1   14.309   1.461   9.791   0.000

  Variances
    ISEI   17.881   6.496   2.753   0.006
    RANDOMS1   41.253   13.321   3.097   0.002


```
QUALITY OF NUMERICAL RESULTS

    Condition Number for the Information Matrix          0.234E-04
       (ratio of smallest to largest eigenvalue)
```

```
Mplus VERSION 7.4
MUTHEN & MUTHEN
08/16/2017   8:11 AM

INPUT INSTRUCTIONS

  TITLE: ASDA 2 EXAMPLE 13.3.3 MULTILEVEL MODEL WITH WGT/SIZE SCALING PISA 2000 DATA

  Data:
  FILE IS "P:\ASDA 2\Data sets\Additional Example Data Sets\pisa_mplus.txt";

  Variable:
   NAMES ARE
    both_for college female high_school id_school isei one_for pass_read test_lang
     w_fstuwt wnrschbw;
   missing are . ;
   weight = conwt ;
   !wtscale=sample ;
   bweight = wnrschbw ;
   bwtscale = sample ;

   usevar = isei id_school college wnrschbw w_fstuwt conwt ;
  !between= college ;
   within =  college w_fstuwt ;
   cluster = id_school ;

  Define:
   conwt= w_fstuwt / wnrschbw ;
  Analysis:
  type is twolevel random ; !TWOLEVEL MODEL WITH RANDOM EFFECTS ;

  Model:
  %within%
   randoms1 | isei on college ;
  %between%
   isei ;



*** WARNING in MODEL command
  Variable is uncorrelated with all other variables: W_FSTUWT
*** WARNING in MODEL command
  At least one variable is uncorrelated with all other variables in the model.
  Check that this is what is intended.
   2 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS


ASDA 2 EXAMPLE 13.3.3 MULTILEVEL MODEL WITH WGT/SIZE SCALING PISA 2000 DATA

SUMMARY OF ANALYSIS

Number of groups                                         1
Number of observations                                2069

Number of dependent variables                            2
Number of independent variables                          1
Number of continuous latent variables                    1

Observed dependent variables

  Continuous
   ISEI        W_FSTUWT

Observed independent variables
   COLLEGE

Continuous latent variables
   RANDOMS1

Variables with special functions
```

```
  Cluster variable       ID_SCHOO
  Weight variable (cluster-size scaling)
    CONWT
  Between weight variable (sample-size scaling)
    WNRSCHBW

  Within variables
   COLLEGE     W_FSTUWT


Estimator                                   MLR
Information matrix                      OBSERVED
Maximum number of iterations                100
Convergence criterion                 0.100D-05
Maximum number of EM iterations             500
Convergence criteria for the EM algorithm
  Loglikelihood change                0.100D-02
  Relative loglikelihood change       0.100D-05
  Derivative                          0.100D-03
Minimum variance                      0.100D-03
Maximum number of steepest descent iterations   20
Maximum number of iterations for H1        2000
Convergence criterion for H1          0.100D-03
Optimization algorithm                      EMA

Input data file(s)
  P:\ASDA 2\Data sets\Additional Example Data Sets\pisa_mplus.txt
Input data format  FREE


SUMMARY OF DATA

    Number of missing data patterns          1
    Number of clusters                     148


COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100


      PROPORTION OF DATA PRESENT


          Covariance Coverage
            ISEI        W_FSTUWT     COLLEGE


            _____    _____    _____
 ISEI         1.000
 W_FSTUWT     1.000       1.000
 COLLEGE      1.000       1.000       1.000
```

MODEL FIT INFORMATION

Number of Free Parameters   7

Loglikelihood

        H0 Value   -25184.307
        H0 Scaling Correction Factor   31.4583
          for MLR

Information Criteria

        Akaike (AIC)   50382.614
        Bayesian (BIC)   50422.058
        Sample-Size Adjusted BIC   50399.818
          (n* = (n + 2) / 24)

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Within Level				
Means				
W_FSTUWT	1113.968	98.962	11.257	0.000
Variances				
W_FSTUWT	********	********	2.466	0.014
Residual Variances				
ISEI	214.877	13.109	16.392	0.000
Between Level				
Means				
ISEI	35.861	0.902	39.745	0.000
RANDOMS1	14.309	1.461	9.797	0.000
Variances				
ISEI	17.933	6.498	2.760	0.006
RANDOMS1	41.292	13.320	3.100	0.002

QUALITY OF NUMERICAL RESULTS

    Condition Number for the Information Matrix   0.235E-04
      (ratio of smallest to largest eigenvalue)