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. Though the SEM model code and output is discussed in detail in the book, we still include the details in this document. Other approaches included in C13 are not available in this version of Mplus therefore they are included in the text using R software.

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 .txt format produced by SAS.

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Mplus VERSION 7.4
MUTHEN & MUTHEN
04/10/2025   5:42 AM

INPUT INSTRUCTIONS

   TITLE: ASDA 3 EXAMPLE 13.3.2 MULTILEVEL MODEL EXAMPLE NO WGTS PISA 2000 DATA
   Data:
   FILE IS "P:\ASDA3\Replication Mplus\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 3 EXAMPLE 13.3.2 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:\ASDA3\Replication Mplus\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

                                                    Two-Tailed
                    Estimate       S.E.  Est./S.E.    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)


DIAGRAM INFORMATION

  Mplus diagrams are currently not available for multilevel analysis.
  No diagram output was produced.


     Beginning Time:  05:42:30
        Ending Time:  05:42:30
       Elapsed Time:  00:00:00
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```
Mplus VERSION 7.4
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04/10/2025   5:45 AM

INPUT INSTRUCTIONS

   TITLE: ASDA 3 EXAMPLE 13.3.2 MULTILEVEL MODEL WITH WGT AS
    COVARIATE PISA 2000 DATA;
   Data:
   FILE IS "P:\ASDA3\Replication Mplus\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 3 EXAMPLE 13.3.2 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:\ASDA3\Replication Mplus\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

	Estimate	S.E.	Est./S.E.	Two-Tailed 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)

DIAGRAM INFORMATION

Mplus diagrams are currently not available for multilevel analysis.
No diagram output was produced.

Beginning Time: 05:45:21
Ending Time: 05:45:21
Elapsed Time: 00:00:00

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```
Mplus VERSION 7.4
MUTHEN & MUTHEN
04/10/2025   5:47 AM

INPUT INSTRUCTIONS

  TITLE: ASDA 3 EXAMPLE 13.2.3 MULTILEVEL MODEL WITH
  WGT/EFFECTIVE SCALING PISA 2000 DATA;
   Data:
   FILE IS "P:\ASDA3\Replication Mplus\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 3 EXAMPLE 13.2.3 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:\ASDA3\Replication Mplus\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

          H0 Value                      -25186.756
          H0 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
                                                    Two-Tailed
                    Estimate       S.E.  Est./S.E.    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)


DIAGRAM INFORMATION

  Mplus diagrams are currently not available for multilevel analysis.
  No diagram output was produced.


     Beginning Time:  05:47:50
        Ending Time:  05:47:50
       Elapsed Time:  00:00:00
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```
Mplus VERSION 7.4
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04/10/2025   5:49 AM

INPUT INSTRUCTIONS

  TITLE: ASDA 3 EXAMPLE 13.2.3 MULTILEVEL MODEL WITH WGT/SIZE
  SCALING PISA 2000 DATA;

   Data:
   FILE IS "P:\ASDA3\Replication Mplus\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 3 EXAMPLE 13.2.3 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:\ASDA3\Replication Mplus\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

          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
                                                    Two-Tailed
                    Estimate       S.E.  Est./S.E.    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)


DIAGRAM INFORMATION

  Mplus diagrams are currently not available for multilevel analysis.
  No diagram output was produced.


     Beginning Time:  05:49:43
        Ending Time:  05:49:43
       Elapsed Time:  00:00:00
```

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```
Mplus VERSION 7.4
MUTHEN & MUTHEN
04/10/2025   5:56 AM

INPUT INSTRUCTIONS

  TITLE: ASDA3 C13 WEIGHTED ESTIMATION OF IMMIGRATION ALPHA;
  DATA:        FILE = P:\asda3\Replication Mplus\immig.dat;
  VARIABLE:    NAMES = psu trstplt trstprt imsmetn imdfetn impcntr weight;
          USEV = psu imsmetn imdfetn impcntr weight;
          MISSING = ALL(8);
          WEIGHT = weight;
          CLUSTER = psu;
  ANALYSIS:    TYPE = COMPLEX;
          ESTIMATOR = MLR;
  MODEL:
          F1 BY imsmetn@1;
          F2 BY imdfetn@1;
          F3 BY impcntr@1;
          imsmetn@0;
          imdfetn@0;
          impcntr@0;
          F1-F3 (P1-P3);
          F1 WITH F2-F3 (P12-P13);
          F2 WITH F3 (P23);
  MODEL CONSTRAINT:
          NEW(ALPHA);
          ALPHA = 1.5*2*(P12+P13+P23)/(P1+P2+P3+2*(P12+P13+P23));
  OUTPUT:     CINTERVAL;



*** WARNING
  Data set contains cases with missing on all variables.
  These cases were not included in the analysis.
  Number of cases with missing on all variables:  6
   1 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS



ASDA3 C13 WEIGHTED ESTIMATION OF IMMIGRATION ALPHA;

SUMMARY OF ANALYSIS

Number of groups                                                 1
Number of observations                                        1697

Number of dependent variables                                    3
Number of independent variables                                  0
Number of continuous latent variables                            3

Observed dependent variables

  Continuous
   IMSMETN     IMDFETN     IMPCNTR

Continuous latent variables
   F1          F2          F3
```

```
Variables with special functions

  Cluster variable      PSU
  Weight variable       WEIGHT

Estimator                                                      MLR
Information matrix                                        OBSERVED
Maximum number of iterations                                  1000
Convergence criterion                                    0.500D-04
Maximum number of steepest descent iterations                   20
Maximum number of iterations for H1                           2000
Convergence criterion for H1                             0.100D-03

Input data file(s)
  P:\asda3\Replication Mplus\immig.dat

Input data format  FREE


SUMMARY OF DATA

     Number of missing data patterns             5
     Number of clusters         125



COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100


     PROPORTION OF DATA PRESENT


           Covariance Coverage
              IMSMETN       IMDFETN       IMPCNTR
              ________      ________      ________
 IMSMETN        0.999
 IMDFETN        0.997         0.998
 IMPCNTR        0.995         0.994         0.996



THE MODEL ESTIMATION TERMINATED NORMALLY



MODEL FIT INFORMATION

Number of Free Parameters                        9

Loglikelihood

          H0 Value                       -4902.779
          H0 Scaling Correction Factor      2.3071
            for MLR
          H1 Value                       -4902.779
          H1 Scaling Correction Factor      2.3071
            for MLR
```

```
Information Criteria

          Akaike (AIC)                    9823.558
          Bayesian (BIC)                  9872.487
          Sample-Size Adjusted BIC        9843.896
            (n* = (n + 2) / 24)

Chi-Square Test of Model Fit

          Value                              0.000*
          Degrees of Freedom                     0
          P-Value                           0.0000
          Scaling Correction Factor         1.0000
            for MLR

*   The chi-square value for MLM, MLMV, MLR, ULSMV, WLSM and WLSMV cannot be used
    for chi-square difference testing in the regular way.  MLM, MLR and WLSM
    chi-square difference testing is described on the Mplus website.  MLMV, WLSMV,
    and ULSMV difference testing is done using the DIFFTEST option.

RMSEA (Root Mean Square Error Of Approximation)

          Estimate                           0.000
          90 Percent C.I.                    0.000  0.000
          Probability RMSEA <= .05           0.000

CFI/TLI

          CFI                                1.000
          TLI                                1.000

Chi-Square Test of Model Fit for the Baseline Model

          Value                            948.004
          Degrees of Freedom                     3
          P-Value                           0.0000

SRMR (Standardized Root Mean Square Residual)

          Value                              0.000



MODEL RESULTS

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

 F1       BY
    IMSMETN            1.000      0.000    999.000    999.000

 F2       BY
    IMDFETN            1.000      0.000    999.000    999.000

 F3       BY
    IMPCNTR            1.000      0.000    999.000    999.000

 F1       WITH
```

F2	0.504	0.036	13.924	0.000
F3	0.429	0.033	12.861	0.000
F2 WITH				
F3	0.565	0.028	20.147	0.000
Intercepts				
IMSMETN	2.203	0.030	73.762	0.000
IMDFETN	2.511	0.031	80.771	0.000
IMPCNTR	2.504	0.028	88.636	0.000
Variances				
F1	0.649	0.038	17.176	0.000
F2	0.759	0.031	24.179	0.000
F3	0.705	0.025	27.789	0.000
Residual Variances				
IMSMETN	0.000	0.000	999.000	999.000
IMDFETN	0.000	0.000	999.000	999.000
IMPCNTR	0.000	0.000	999.000	999.000
New/Additional Parameters				
ALPHA	0.880	0.010	91.631	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix 0.180E-04
(ratio of smallest to largest eigenvalue)

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
F1 BY							
IMSMETN	1.000	1.000	1.000	1.000	1.000	1.000	1.000
F2 BY							
IMDFETN	1.000	1.000	1.000	1.000	1.000	1.000	1.000
F3 BY							
IMPCNTR	1.000	1.000	1.000	1.000	1.000	1.000	1.000
F1 WITH							
F2	0.411	0.433	0.444	0.504	0.563	0.575	0.597
F3	0.343	0.363	0.374	0.429	0.483	0.494	0.515
F2 WITH							
F3	0.493	0.510	0.519	0.565	0.611	0.620	0.637
Intercepts							
IMSMETN	2.127	2.145	2.154	2.203	2.253	2.262	2.280
IMDFETN	2.431	2.450	2.460	2.511	2.562	2.572	2.591
IMPCNTR	2.431	2.449	2.458	2.504	2.551	2.560	2.577
Variances							
F1	0.552	0.575	0.587	0.649	0.711	0.723	0.746
F2	0.678	0.697	0.707	0.759	0.810	0.820	0.840

```
    F3               0.639       0.655       0.663       0.705       0.746       0.754       0.770

 Residual Variances
    IMSMETN          0.000       0.000       0.000       0.000       0.000       0.000       0.000
    IMDFETN          0.000       0.000       0.000       0.000       0.000       0.000       0.000
    IMPCNTR          0.000       0.000       0.000       0.000       0.000       0.000       0.000

New/Additional Parameters
    ALPHA            0.855       0.861       0.864       0.880       0.895       0.898       0.904


DIAGRAM INFORMATION

  Use View Diagram under the Diagram menu in the Mplus Editor to view the diagram.
  If running Mplus from the Mplus Diagrammer, the diagram opens automatically.

  Diagram output
    p:\asda3\replication mplus\chapter 13\c13 alpha replication.dgm

     Beginning Time:  05:56:30
        Ending Time:  05:56:31
       Elapsed Time:  00:00:01
```

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```
Mplus VERSION 7.4
MUTHEN & MUTHEN
04/10/2025   5:59 AM

INPUT INSTRUCTIONS

  TITLE: WEIGHTED ESTIMATION OF TRUST ALPHA;
  DATA:        FILE = P:\ASDA3\Replication Mplus\immig.dat;
  VARIABLE:    NAMES = psu trstplt trstprt imsmetn imdfetn impcntr weight;
          USEV = psu trstplt trstprt weight;
          MISSING = ALL(88);
          WEIGHT = weight;
          CLUSTER = psu;
  ANALYSIS:    TYPE = COMPLEX;
          ESTIMATOR = MLR;
  MODEL:
          F1 BY trstplt@1;
          F2 BY trstprt@1;
          trstplt@0;
          trstprt@0;
          F1-F2 (P1-P2);
          F1 WITH F2 (P12);
  MODEL CONSTRAINT:
          NEW(ALPHA);
          ALPHA = 1.5*2*(P12)/(P1+P2+2*(P12));
  OUTPUT:     CINTERVAL;

*** WARNING
  Data set contains cases with missing on all variables.
  These cases were not included in the analysis.
  Number of cases with missing on all variables:  7
   1 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS

WEIGHTED ESTIMATION OF TRUST ALPHA;

SUMMARY OF ANALYSIS

Number of groups                                                 1
Number of observations                                        1696

Number of dependent variables                                    2
Number of independent variables                                  0
Number of continuous latent variables                            2

Observed dependent variables

  Continuous
   TRSTPLT     TRSTPRT

Continuous latent variables
   F1          F2

Variables with special functions

  Cluster variable      PSU
  Weight variable       WEIGHT

Estimator                                                      MLR
Information matrix                                        OBSERVED
```

```
Maximum number of iterations                                  1000
Convergence criterion                                    0.500D-04
Maximum number of steepest descent iterations                   20
Maximum number of iterations for H1                           2000
Convergence criterion for H1                             0.100D-03

Input data file(s)
  P:\ASDA3\Replication Mplus\immig.dat

Input data format  FREE


SUMMARY OF DATA

     Number of missing data patterns             2
     Number of clusters         125

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100


     PROPORTION OF DATA PRESENT


           Covariance Coverage
              TRSTPLT       TRSTPRT
              ________      ________
 TRSTPLT        1.000
 TRSTPRT        0.998         0.998



THE MODEL ESTIMATION TERMINATED NORMALLY



MODEL FIT INFORMATION

Number of Free Parameters                        5

Loglikelihood

          H0 Value                       -6346.443
          H0 Scaling Correction Factor      2.0679
            for MLR
          H1 Value                       -6346.443
          H1 Scaling Correction Factor      2.0679
            for MLR

Information Criteria

          Akaike (AIC)                   12702.886
          Bayesian (BIC)                 12730.066
          Sample-Size Adjusted BIC       12714.182
            (n* = (n + 2) / 24)

Chi-Square Test of Model Fit
```

```
          Value                              0.000*
          Degrees of Freedom                     0
          P-Value                           0.0000
          Scaling Correction Factor         1.0000
            for MLR

*   The chi-square value for MLM, MLMV, MLR, ULSMV, WLSM and WLSMV cannot be used
    for chi-square difference testing in the regular way.  MLM, MLR and WLSM
    chi-square difference testing is described on the Mplus website.  MLMV, WLSMV,
    and ULSMV difference testing is done using the DIFFTEST option.

RMSEA (Root Mean Square Error Of Approximation)

          Estimate                           0.000
          90 Percent C.I.                    0.000  0.000
          Probability RMSEA <= .05           0.000

CFI/TLI

          CFI                                1.000
          TLI                                1.000

Chi-Square Test of Model Fit for the Baseline Model

          Value                            388.851
          Degrees of Freedom                     1
          P-Value                           0.0000

SRMR (Standardized Root Mean Square Residual)

          Value                              0.000



MODEL RESULTS

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

 F1       BY
    TRSTPLT            1.000      0.000    999.000    999.000

 F2       BY
    TRSTPRT            1.000      0.000    999.000    999.000

 F1       WITH
    F2                 3.988      0.148     26.900      0.000

 Intercepts
    TRSTPLT            3.867      0.068     56.677      0.000
    TRSTPRT            3.838      0.064     59.953      0.000

 Variances
    F1                 4.724      0.146     32.337      0.000
    F2                 4.667      0.143     32.565      0.000

 Residual Variances
    TRSTPLT            0.000      0.000    999.000    999.000
    TRSTPRT            0.000      0.000    999.000    999.000
```

```
New/Additional Parameters
    ALPHA              0.689      0.006    116.585      0.000


QUALITY OF NUMERICAL RESULTS

     Condition Number for the Information Matrix              0.878E-04
       (ratio of smallest to largest eigenvalue)


CONFIDENCE INTERVALS OF MODEL RESULTS

                  Lower .5%  Lower 2.5%    Lower 5%    Estimate    Upper 5%  Upper 2.5%   Upper .5%

 F1       BY
    TRSTPLT          1.000       1.000       1.000       1.000       1.000       1.000       1.000

 F2       BY
    TRSTPRT          1.000       1.000       1.000       1.000       1.000       1.000       1.000

 F1       WITH
    F2               3.606       3.698       3.744       3.988       4.232       4.279       4.370

 Intercepts
    TRSTPLT          3.691       3.733       3.754       3.867       3.979       4.000       4.042
    TRSTPRT          3.673       3.712       3.732       3.838       3.943       3.963       4.002

 Variances
    F1               4.347       4.437       4.483       4.724       4.964       5.010       5.100
    F2               4.298       4.386       4.431       4.667       4.903       4.948       5.036

 Residual Variances
    TRSTPLT          0.000       0.000       0.000       0.000       0.000       0.000       0.000
    TRSTPRT          0.000       0.000       0.000       0.000       0.000       0.000       0.000

New/Additional Parameters
    ALPHA            0.674       0.677       0.679       0.689       0.699       0.700       0.704

DIAGRAM INFORMATION
  Use View Diagram under the Diagram menu in the Mplus Editor to view the diagram.
  If running Mplus from the Mplus Diagrammer, the diagram opens automatically.

  Diagram output
    p:\asda3\replication mplus\chapter 13\c13 alpha2 replication.dgm

     Beginning Time:  05:59:44
        Ending Time:  05:59:45
       Elapsed Time:  00:00:01
```

```
Mplus VERSION 7.4
MUTHEN & MUTHEN
04/10/2025   6:01 AM

INPUT INSTRUCTIONS

  TITLE:      ESS SEM Example, Complex Sampling Features ASDA3
  DATA:       FILE = P:\ASDA3\Replication Mplus\immig.dat;
  VARIABLE:   NAMES = psu trstplt trstprt imsmetn imdfetn impcntr weight;
          USEV = psu trstplt trstprt imsmetn imdfetn impcntr weight;
          MISSING = trstplt (88) trstprt (88)
          imsmetn (8) imdfetn (8) impcntr (8);
          WEIGHT = weight;
          CLUSTER = psu;
  ANALYSIS:  TYPE = COMPLEX;
  MODEL:     F1 BY imsmetn imdfetn impcntr;
             F2 BY trstplt trstprt;
             F1 ON F2;
  OUTPUT:    STANDARDIZED SAMPSTAT;

INPUT READING TERMINATED NORMALLY

ESS SEM Example, Complex Sampling Features ASDA3

SUMMARY OF ANALYSIS

Number of groups                                                 1
Number of observations                                        1703

Number of dependent variables                                    5
Number of independent variables                                  0
Number of continuous latent variables                            2

Observed dependent variables

  Continuous
   TRSTPLT     TRSTPRT     IMSMETN     IMDFETN     IMPCNTR

Continuous latent variables
   F1          F2

Variables with special functions

  Cluster variable      PSU
  Weight variable       WEIGHT

Estimator                                                      MLR
Information matrix                                        OBSERVED
Maximum number of iterations                                  1000
Convergence criterion                                    0.500D-04
Maximum number of steepest descent iterations                   20
Maximum number of iterations for H1                           2000
Convergence criterion for H1                             0.100D-03

Input data file(s)
  P:\ASDA3\Replication Mplus\immig.dat

Input data format  FREE
```

SUMMARY OF DATA

Number of missing data patterns 8
Number of clusters 125

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value 0.100

PROPORTION OF DATA PRESENT

Covariance Coverage

	TRSTPLT	TRSTPRT	IMSMETN	IMDFETN	IMPCNTR
TRSTPLT	0.996				
TRSTPRT	0.994	0.994			
IMSMETN	0.992	0.990	0.996		
IMDFETN	0.990	0.988	0.994	0.994	
IMPCNTR	0.988	0.986	0.992	0.991	0.992

SAMPLE STATISTICS

ESTIMATED SAMPLE STATISTICS

Means

	TRSTPLT	TRSTPRT	IMSMETN	IMDFETN	IMPCNTR
1	3.868	3.838	2.203	2.511	2.504

Covariances

	TRSTPLT	TRSTPRT	IMSMETN	IMDFETN	IMPCNTR
TRSTPLT	4.723				
TRSTPRT	3.988	4.667			
IMSMETN	-0.268	-0.274	0.649		
IMDFETN	-0.363	-0.365	0.504	0.759	
IMPCNTR	-0.340	-0.342	0.429	0.565	0.704

Correlations

	TRSTPLT	TRSTPRT	IMSMETN	IMDFETN	IMPCNTR
TRSTPLT	1.000				
TRSTPRT	0.849	1.000			
IMSMETN	-0.153	-0.157	1.000		
IMDFETN	-0.192	-0.194	0.718	1.000	
IMPCNTR	-0.187	-0.188	0.634	0.773	1.000

MAXIMUM LOG-LIKELIHOOD VALUE FOR THE UNRESTRICTED (H1) MODEL IS -11195.331

UNIVARIATE SAMPLE STATISTICS

UNIVARIATE HIGHER-ORDER MOMENT DESCRIPTIVE STATISTICS

Variable/ Sample Size	Mean/ Variance	Skewness/ Kurtosis	Minimum/ Maximum	% with Min/Max	Percentiles 20%/60%	40%/80%	Median
TRSTPLT	3.867	-0.163	0.000	10.26%	2.000	3.000	4.000
1696.000	4.724	-0.719	10.000	0.12%	5.000	6.000	
TRSTPRT	3.838	-0.140	0.000	10.04%	2.000	3.000	4.000
1693.000	4.663	-0.667	10.000	0.24%	5.000	6.000	
IMSMETN	2.203	0.536	1.000	16.21%	2.000	2.000	2.000
1696.000	0.649	-0.003	4.000	8.79%	2.000	3.000	
IMDFETN	2.512	0.245	1.000	9.27%	2.000	2.000	2.000
1693.000	0.760	-0.698	4.000	16.83%	3.000	3.000	
IMPCNTR	2.504	0.254	1.000	8.64%	2.000	2.000	2.000
1690.000	0.705	-0.591	4.000	15.09%	3.000	3.000	

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 16

Loglikelihood

H0 Value	-11196.114
H0 Scaling Correction Factor for MLR	2.1063
H1 Value	-11195.331
H1 Scaling Correction Factor for MLR	1.9689

Information Criteria

Akaike (AIC)	22424.227
Bayesian (BIC)	22511.269
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	22460.439

Chi-Square Test of Model Fit

Value	1.103*
Degrees of Freedom	4
P-Value	0.8939
Scaling Correction Factor for MLR	1.4195

* The chi-square value for MLM, MLMV, MLR, ULSMV, WLSM and WLSMV cannot be used for chi-square difference testing in the regular way. MLM, MLR and WLSM chi-square difference testing is described on the Mplus website. MLMV, WLSMV, and ULSMV difference testing is done using the DIFFTEST option.

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.000	
90 Percent C.I.	0.000	0.016
Probability RMSEA <= .05	1.000	

CFI/TLI

CFI	1.000
TLI	1.003

Chi-Square Test of Model Fit for the Baseline Model

Value	2216.799
Degrees of Freedom	10
P-Value	0.0000

SRMR (Standardized Root Mean Square Residual)

Value	0.005

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1 BY				
IMSMETN	1.000	0.000	999.000	999.000
IMDFETN	1.316	0.054	24.559	0.000
IMPCNTR	1.122	0.047	23.964	0.000
F2 BY				
TRSTPLT	1.000	0.000	999.000	999.000
TRSTPRT	1.007	0.063	15.916	0.000
F1 ON				
F2	-0.071	0.011	-6.407	0.000
Intercepts				
TRSTPLT	3.868	0.068	56.653	0.000
TRSTPRT	3.838	0.064	59.937	0.000
IMSMETN	2.203	0.030	73.711	0.000
IMDFETN	2.511	0.031	80.704	0.000
IMPCNTR	2.504	0.028	88.621	0.000
Variances				
F2	3.958	0.298	13.271	0.000
Residual Variances				
TRSTPLT	0.765	0.252	3.034	0.002
TRSTPRT	0.649	0.277	2.345	0.019
IMSMETN	0.266	0.016	16.619	0.000
IMDFETN	0.096	0.020	4.890	0.000
IMPCNTR	0.223	0.022	10.337	0.000
F1	0.363	0.038	9.506	0.000

STANDARDIZED MODEL RESULTS

STDYX Standardization

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1 BY				
IMSMETN	0.768	0.022	35.544	0.000
IMDFETN	0.934	0.014	67.751	0.000
IMPCNTR	0.827	0.019	43.047	0.000
F2 BY				
TRSTPLT	0.915	0.029	31.096	0.000
TRSTPRT	0.928	0.032	29.398	0.000
F1 ON				
F2	-0.228	0.032	-7.091	0.000
Intercepts				
TRSTPLT	1.780	0.044	40.682	0.000
TRSTPRT	1.777	0.043	41.495	0.000
IMSMETN	2.735	0.058	46.785	0.000
IMDFETN	2.883	0.048	60.195	0.000
IMPCNTR	2.983	0.049	60.546	0.000
Variances				
F2	1.000	0.000	999.000	999.000
Residual Variances				
TRSTPLT	0.162	0.054	3.005	0.003
TRSTPRT	0.139	0.059	2.376	0.018
IMSMETN	0.410	0.033	12.359	0.000
IMDFETN	0.127	0.026	4.929	0.000
IMPCNTR	0.316	0.032	9.940	0.000
F1	0.948	0.015	64.667	0.000

STDY Standardization

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1 BY				
IMSMETN	0.768	0.022	35.544	0.000
IMDFETN	0.934	0.014	67.751	0.000
IMPCNTR	0.827	0.019	43.047	0.000
F2 BY				
TRSTPLT	0.915	0.029	31.096	0.000
TRSTPRT	0.928	0.032	29.398	0.000
F1 ON				
F2	-0.228	0.032	-7.091	0.000
Intercepts				
TRSTPLT	1.780	0.044	40.682	0.000
TRSTPRT	1.777	0.043	41.495	0.000

IMSMETN	2.735	0.058	46.785	0.000
IMDFETN	2.883	0.048	60.195	0.000
IMPCNTR	2.983	0.049	60.546	0.000
Variances				
F2	1.000	0.000	999.000	999.000
Residual Variances				
TRSTPLT	0.162	0.054	3.005	0.003
TRSTPRT	0.139	0.059	2.376	0.018
IMSMETN	0.410	0.033	12.359	0.000
IMDFETN	0.127	0.026	4.929	0.000
IMPCNTR	0.316	0.032	9.940	0.000
F1	0.948	0.015	64.667	0.000

STD Standardization

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1 BY				
IMSMETN	0.619	0.032	19.113	0.000
IMDFETN	0.814	0.021	38.238	0.000
IMPCNTR	0.694	0.023	30.134	0.000
F2 BY				
TRSTPLT	1.990	0.075	26.541	0.000
TRSTPRT	2.004	0.071	28.340	0.000
F1 ON				
F2	-0.228	0.032	-7.091	0.000
Intercepts				
TRSTPLT	3.868	0.068	56.653	0.000
TRSTPRT	3.838	0.064	59.937	0.000
IMSMETN	2.203	0.030	73.711	0.000
IMDFETN	2.511	0.031	80.704	0.000
IMPCNTR	2.504	0.028	88.621	0.000
Variances				
F2	1.000	0.000	999.000	999.000
Residual Variances				
TRSTPLT	0.765	0.252	3.034	0.002
TRSTPRT	0.649	0.277	2.345	0.019
IMSMETN	0.266	0.016	16.619	0.000
IMDFETN	0.096	0.020	4.890	0.000
IMPCNTR	0.223	0.022	10.337	0.000
F1	0.948	0.015	64.667	0.000

R-SQUARE

Observed Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
TRSTPLT	0.838	0.054	15.548	0.000
TRSTPRT	0.861	0.059	14.699	0.000

IMSMETN	0.590	0.033	17.772	0.000
IMDFETN	0.873	0.026	33.876	0.000
IMPCNTR	0.684	0.032	21.523	0.000

Latent Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
F1	0.052	0.015	3.546	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix 0.336E-03
(ratio of smallest to largest eigenvalue)

DIAGRAM INFORMATION

Use View Diagram under the Diagram menu in the Mplus Editor to view the diagram.
If running Mplus from the Mplus Diagrammer, the diagram opens automatically.

Diagram output
p:\asda3\replication mplus\chapter 13\c13 sem replication.dgm

Beginning Time: 06:01:42
Ending Time: 06:01:43
Elapsed Time: 00:00:01

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