Appendix
MPLUS Setup Files for Models in the Present Investigation

```
TITLE: Model 0 Single-level model with manifest L1 and L2 variables;
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
 s_msc1 s_msc2 s_msc3 s_msc4 s_msct
    s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
  zmsct s_macht gr_math ;

DEFINE:
  gr_math = zmacht - s_macht;
ANALYSIS: Type is general ;
MODEL:
  zmsct on gr_math (ind_ach);
  zmsct on s_macht (Sch_Ach);

MODEL CONSTRAINT:
  new(bflpe);
  bflpe = Sch_Ach - ind_ach;

OUTPUT: sampstat stand tech1;



TITLE: MODEL 1 Doublely Manifest Multilevel Model
with manifest constructs and manifest aggregation;
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
 s_msc1 s_msc2 s_msc3 s_msc4 s_msct
    s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
  zmacht s_macht;
  cluster = idsch;
  within = zmacht ;
  between = s_macht;
  centering = groupmean(zmacht);
  missing are all (-99);
ANALYSIS: Type is twolevel ;
MODEL:

  %within%
  zmsct on zmacht (b_within);

  %between%
  zmsct on s_macht (b_betwn);

MODEL CONSTRAINT:
  new(bflpe);
  bflpe = b_betwn - b_within;
OUTPUT: sampstat stand tech1;



TITLE: model 3 Latent-manifest model with Latent constructs
based on multiple indicators, but manifest aggregation;
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
 s_msc1 s_msc2 s_msc3 s_msc4 s_msct
    s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
  zmsc1 zmsc2 zmsc3
  zmsc4 zmach1 zmach2 zmach3
  s_mach1 s_mach2  s_mach3;
  cluster = idsch;
  within = zmach1 zmach2 zmach3;
```

```
 between = s_mach1 s_mach2  s_mach3;
 centering = groupmean(zmach1 zmach2 zmach3);
 missing are all (-99);
 ANALYSIS: Type is twolevel ; algorithm=em; mconv=1000;
 ANALYSIS: Type is twolevel ; algorithm=em; mconv=1000;
 MODEL:
   %within%
   MSC_W by zmsc1 (1) ;
   MSC_W by zmsc2 (2);
   MSC_W by zmsc3 (3) ;
   MSC_W by zmsc4 (4);

   MACH_W by zmach1 (5) ;
   MACH_W by zmach2 (6);
   MACH_W by zmach3 (7) ;

    MSC_W on MACH_W (b_within);

   %between%
   MSC_B by zmsc1 (1) ;
   MSC_B by zmsc2 (2);
   MSC_B by zmsc3 (3) ;
   MSC_B by zmsc4 (4);

   MACH_B by s_mach1 (5) ;
   MACH_B by s_mach2 (6);
   MACH_B by s_mach3 (7) ;

    MSC_B on MACH_B (b_between);

MODEL CONSTRAINT:
  new(bflpe);
    bflpe = b_between - b_within;

OUTPUT: sampstat stand tech1;




TITLE: Model 3 Manifest-Lantent Model with manifest Single-indicators
 of each construct, but latent aggregation from L1 to L2.;
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
 s_msc1 s_msc2 s_msc3 s_msc4 s_msct
    s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
  zmsct zmacht;
  cluster = idsch;

ANALYSIS: Type is twolevel ;
MODEL:

  %within%
  zmsct on zmacht (b_within);

  %between%
  zmsct on zmacht (b_betwn);

MODEL CONSTRAINT:

  new(bflpe);
  bflpe = b_betwn - b_within;
OUTPUT: sampstat stand tech1;




TITLE: Model 4 Doubly-latent MLM with latent constructs
based on multiple indicators and latent aggregation;
  mult indicators; no rand slopes;
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
```

```
  s_msc1 s_msc2 s_msc3 s_msc4 s_msct
      s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
  zmsc1 zmsc2 zmsc3
  zmsc4 zmach1 zmach2 zmach3;
  cluster = idsch;
  centering = grandmean(zmach1 zmach2 zmach3);
  missing are all (-99);
ANALYSIS: Type is twolevel ; algorithm=em; mconv=1000;
  MODEL:
    %within%
    MSC_W by zmsc1 (1);
    MSC_W by  zmsc2 (2);
    MSC_W by  zmsc3 (3);
    MSC_W by  zmsc4 (4);
    MACH_W by zmach1 (5);
    MACH_W by zmach2 (6);
    MACH_W by zmach3 (7);
    MSC_W on MACH_W (b_within);

    %between%
     MSC_B by zmsc1 (1);
     MSC_B by  zmsc2 (2);
     MSC_B by  zmsc3 (3);
     MSC_B by  zmsc4 (4);
     MACH_B by zmach1 (5) ;
     MACH_B by zmach2 (6);
     MACH_B by zmach3 (7);

     MSC_B on MACH_B (b_betwn);

    MODEL CONSTRAINT:
    new(bflpe);
    bflpe = b_betwn - b_within;
OUTPUT: sampstat stand tech1;



    TITLE: Model 5A Doubly-latent MLM (Model 5) with random slopes
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
 s_msc1 s_msc2 s_msc3 s_msc4 s_msct
      s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
  zmsc1 zmsc2 zmsc3
  zmsc4 zmach1 zmach2 zmach3;
  cluster = idsch;
  missing are all (-99);
  ANALYSIS:Type is twolevel random; algorithm=integration; integration=10;
      GHFIML=OFF;

    %within%
  MODEL:
  %within%
    MSC_W by zmsc1 (1);
    MSC_W by  zmsc2 (2);
    MSC_W by  zmsc3 (3);
    MSC_W by  zmsc4 (4);
    MACH_W by zmach1 (5);
    MACH_W by zmach2 (6);
    MACH_W by zmach3 (7);

      s | MSC_W on MACH_W;

    %between%
     MSC_B by zmsc1 (1);
     MSC_B by  zmsc2 (2);
     MSC_B by  zmsc3 (3);
     MSC_B by  zmsc4 (4);
     MACH_B by zmach1 (5) ;
     MACH_B by zmach2 (6);
     MACH_B by zmach3 (7);

      [s] (b_within);
```

```
    MSC_B on MACH_B (b_betwn);

  MODEL CONSTRAINT:

    new(bflpe);
    bflpe = b_betwn - b_within;
  OUTPUT: sampstat tech1; !stand


  TITLE: Model 5B Doubly-latent MLM (Model 4) with random slopes and
Cross-level latent interaction (s on MACH_B);
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
 s_msc1 s_msc2 s_msc3 s_msc4 s_msct
    s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
 zmsc1 zmsc2 zmsc3
 zmsc4 zmach1 zmach2 zmach3;
 cluster = idsch;
 missing are all (-99);
 ANALYSIS:Type is twolevel random; algorithm=integration; integration=10;
    GHFIML=OFF;

    %within%
  MODEL:
 %within%
   MSC_W by zmsc1 (1);
   MSC_W by  zmsc2 (2);
   MSC_W by  zmsc3 (3);
   MSC_W by  zmsc4 (4);
   MACH_W by zmach1 (5);
   MACH_W by zmach2 (6);
   MACH_W by zmach3 (7);

      s | MSC_W on MACH_W;

   %between%
    MSC_B by zmsc1 (1);
    MSC_B by  zmsc2 (2);
    MSC_B by  zmsc3 (3);
    MSC_B by  zmsc4 (4);
    MACH_B by zmach1 (5) ;
    MACH_B by zmach2 (6);
    MACH_B by zmach3 (7);
     s on MACH_B;
    [s] (b_within);

    MSC_B on MACH_B (b_betwn);

  MODEL CONSTRAINT:

    new(bflpe);
    bflpe = b_betwn - b_within;
  OUTPUT: sampstat tech1; !stand



TITLE: Model 6 Doubly-latent model (Model 4) with the addition
Of L1-Gender and its latent interaction with L1-achievement;
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
 s_msc1 s_msc2 s_msc3 s_msc4 s_msct
    s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
 zmsc1 zmsc2 zmsc3 sex
 zmsc4 zmach1 zmach2 zmach3;
 cluster = idsch;
WITHIN ARE sex;
ANALYSIS: Type is twolevel random; algorithm=integration; integration=10;
      GHFIML=OFF;
MODEL:
```

```
   %within%
   MSC_W by zmsc1 (1);
   MSC_W by  zmsc2 (2);
   MSC_W by  zmsc3 (3);
   MSC_W by  zmsc4 (4);
   MACH_W by zmach1 (5);
   MACH_W by zmach2 (6);
   MACH_W by zmach3 (7);
   ISxXIMac | MACH_W xwith sex;
   MSC_W  on MACH_W  sex ISxXIMac;
  MSC_W on MACH_W (b_within);
  %between%
   MSC_B by zmsc1 (1);
   MSC_B by  zmsc2 (2);
   MSC_B by  zmsc3 (3);
   MSC_B by  zmsc4 (4);
   MACH_B by zmach1 (5) ;
   MACH_B by zmach2 (6);
   MACH_B by zmach3 (7);
  MSC_B on MACH_B (b_betwn);
MODEL CONSTRAINT:
  new(bflpe);
  bflpe = b_betwn - b_within;
OUTPUT: sampstat stand tech1;




TITLE: Model 7 Doubly-latent model (Model 4) with the addition
Of a latent quadratic component of L1-achievement;
DATA: File is bflpe.dat;
VARIABLE: Names are
 idstud idsch sex szweig1
 zmsc1 zmsc2 zmsc3 zmsc4
 zmach1 zmach2 zmach3
 zmsct zmacht
 s_msc1 s_msc2 s_msc3 s_msc4 s_msct
    s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
  zmsc1 zmsc2 zmsc3
  zmsc4 zmach1 zmach2 zmach3;
  cluster = idsch;
  missing are all (-99);
  ANALYSIS:Type is twolevel random;
  algorithm=integration em;integration=5;mconv=1000; GHFIML=OFF;
  MODEL:
    %within%
   MSC_W by zmsc1 (1);
   MSC_W by  zmsc2 (2);
   MSC_W by  zmsc3 (3);
   MSC_W by  zmsc4 (4);
   MACH_W by zmach1 (5);
   MACH_W by zmach2 (6);
   MACH_W by zmach3 (7);
     L1MACSQ | MACH_W xwith MACH_W;
     MSC_W  on MACH_W  L1MACSQ;
     MSC_W on MACH_W (b_within);
    %between%
    MSC_B by zmsc1 (1);
    MSC_B by  zmsc2 (2);
    MSC_B by  zmsc3 (3);
    MSC_B by  zmsc4 (4);
    MACH_B by zmach1 (5) ;
    MACH_B by zmach2 (6);
    MACH_B by zmach3 (7);
    MSC_B on MACH_B (b_betwn);
MODEL CONSTRAINT:
  new(bflpe);
  bflpe = b_betwn - b_within;
OUTPUT: sampstat stand tech1;




TITLE: Model 8 (Model 4 with alternative paramterizations of effect size);
  DATA: File is bflpe.dat;
  VARIABLE: Names are
   idstud idsch sex szweig1
   zmsc1 zmsc2 zmsc3 zmsc4
   zmach1 zmach2 zmach3
   zmsct zmacht
```

```
   s_msc1 s_msc2 s_msc3 s_msc4 s_msct
      s_mach1 s_mach2  s_mach3 s_macht;
USEVAR ARE
  zmsc1 zmsc2 zmsc3
  zmsc4 zmach1 zmach2 zmach3;
  cluster = idsch;
ANALYSIS: Type is twolevel ; algorithm=em; mconv=1000; GHFIML=OFF;
MODEL:
  %within%
  MSC_W by zmsc1 (1);
  MSC_W by  zmsc2 (2);
  MSC_W by  zmsc3 (3);
  MSC_W by  zmsc4 (4);
  MACH_W by zmach1 (5);
  MACH_W by zmach2 (6);
  MACH_W by zmach3 (7);
  MSC_W on MACH_W (b_within);
  MACH_W (Psi_W);
  MSC_W (Theta_W);
  %between%
   MSC_B by zmsc1 (1);
   MSC_B by  zmsc2 (2);
   MSC_B by  zmsc3 (3);
   MSC_B by  zmsc4 (4);
   MACH_B by zmach1 (5) ;
   MACH_B by zmach2 (6);
   MACH_B by zmach3 (7);
   MACH_B (Psi_B);
   MSC_B (Theta_B);
   MSC_B on MACH_B (b_betwn);
  MODEL CONSTRAINT:
  new(bflpe);
  bflpe = b_betwn - b_within;
    new(st-bflpe);
 st-bflpe = bflpe*(sqrt(Psi_B)
 /sqrt(Psi_B*b_betwn**2 + Theta_B + Psi_W*b_within**2 + Theta_W));
 new(ES1);
 ES1 = bflpe*(2*sqrt(Psi_B) /sqrt(Theta_W));
  new(ES2);
  Es2= bflpe*(2*sqrt(Psi_B)/sqrt(Psi_W*b_within**2 + Theta_W));
  new(ES3);
  Es3= bflpe*(2*sqrt(Psi_B)/sqrt((Psi_B*b_betwn**2 + Psi_W*b_within**2 + Theta_W));
OUTPUT: residual sampstat stand tech1 MODINDICES  tech4 ;
```