Supplemental Material for

"The Role of Coding Time in Estimating and Interpreting Growth Curve Models"

Jeremy C. Biesanz, Natalia Deeb-Sossa, Alison A. Papadakis, Kenneth A. Bollen, and Patrick J. Curran

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APPENDIX B

Below we present SAS Proc IML code for implementing equations [4] and [5]. The specific example uses the estimated covariance and mean structure from the linear growth Model A, Table 2 and transforms it to Model B, Table 2.

Proc IML Code

```
proc iml;
reset print;

psiold = { 28.776      12.505,
           12.505       8.201};

muold = { 39.457,
           8.063};

lold = { 1  0,
         1  2,
         1  4};

lnew= { 1  -4,
        1  -2,
        1   0};

psinew  = inv(lnew`*lnew)*lnew`*lold*psiold*lold`*lnew*inv(lnew`*lnew);
munew = inv(lnew`*lnew)*lnew`*lold*muold;

print psinew;
print munew;
run;
```

```
Output

PSINEW
     260.032    45.309
      45.309     8.201


MUNEW
      71.709
```

```
       8.063
Note:  These corresponds to the estimated model from AMOS 4.01 (Model
B, Table 2).  The small difference in the new mean from the tabled
value is due to rounding error.  If more significant digits are used in
the calculation, the results converge exactly.
```

The following SAS PROC IML program computes the regression coefficients for Mother's weight predicting the intercept and linear components as well as their standard errors to use in producing Figures 3 and 4.

```
filename recode 'c:\outfile.dat';
options nocenter linesize=100;

proc iml;

/* regression weights from AMOS presented in Table 4, Model A*/
 gamma5= { 0.045, 0.048, 0.004};

/* asymptotic covariance matrix of the regression coefficients from
AMOS*/
 acov5 =  { 0.000521690  0.000112382   0.000002876,
            0.000112382  0.000217347  -0.000018394,
            0.000002876 -0.000018394   0.000003831};

file recode;

/*calculating estimates from age 5 to 13 for every .05 years*/
do i = 0 to -8 by -.05;
  age = (5 -  i);
/*the loading matrix for Model A, Table 4 where age is centered at 5
years*/
  l5 =    { 1 0 0,
            1 2 4,
            1 4 16,
            1 6 36,
            1 8 64};
```

```
/*calculating the transformed loading matrix*/
  ls=l5;
  ls[1,2] = i;
  ls[1,3]=i*i;
  ls[2,2]=(i+2);
  ls[2,3]=(i+2)*(i+2);
  ls[3,2]=(i+4);
  ls[3,3]=(i+4)*(i+4);
  ls[4,2]=(i+6);
  ls[4,3]=(i+6)*(i+6);
  ls[5,2]=(i+8);
  ls[5,3]=(i+8)*(i+8);

/* obtaining the new gammas from equation 6 */
  gam_new = inv(ls`*ls)*ls`*l5*gamma5;
  gam_int = gam_new[1,1];
  gam_lin = gam_new[2,1];

/* computing the inverse of the transformation (t) matrix */
  inv_t = inv(inv(l5`*l5)*l5`*ls);
  i2 = {1 0, 0 1};

/* the Jacobian matrix of the Gamma's transformation from equation A24
*/
  j_gamma = (i2@inv_t)`;

/* computing the vectors of the Jacobian matrix corresponding to the
   intercept and linear components*/
  j_int={1,1,1};
  j_int[1,1]=j_gamma[1,1];
  j_int[2,1]=j_gamma[2,1];
  j_int[3,1]=j_gamma[3,1];
  j_lin={1,1,1};
  j_lin[1,1]=j_gamma[1,2];
  j_lin[2,1]=j_gamma[2,2];
  j_lin[3,1]=j_gamma[3,2];
```

```
/* computing the transformed standard errors based on equation A22*/
  se_int = sqrt(j_int`*acov5*j_int);
  se_lin = sqrt(j_lin`*acov5*j_lin);

/*writing out the file with age, intercept gamma, intercept SE, linear
gamma, and linear SE*/
 put @1 age 5.2 @10 gam_int @20 se_int @30 gam_lin @40 se_lin;
end;
closefile recode;
```