```
------------------------------------------------------------------------------------------------------------------------
      name:  <unnamed>
       log:  e:\path analyisis.log
  log type:  text
 opened on:  18 Nov 2019, 11:27:02

.
. * sembuilder
.
.
. ******************************
. * example 42g : One- and two-level mediation models (multilevel)
. ******************************
. use http://www.stata-press.com/data/r15/gsem_multmed, clear
(Fictional job-performance data)

. gen hi_perm = 1

. replace hi_perm = 0 if perform < 5.005317
(723 real changes made)

. label variable hi_perm "high performer"

. label define hi_perm 1 "high performer" 0 "low performer"

. label value hi_perm hi_perm

.
. ********************
. * Single-level mediation
. ********************
.
. *multiple regression with the reg command
. reg perform satis suppor

      Source |       SS           df       MS      Number of obs   =     1,500
-------------+----------------------------------   F(2, 1497)      =   1015.21
       Model |  691.131957         2  345.565979   Prob > F        =    0.0000
    Residual |  509.563014     1,497  .340389455   R-squared       =    0.5756
-------------+----------------------------------   Adj R-squared   =    0.5750
       Total |  1200.69497     1,499  .800997312   Root MSE        =    .58343

------------------------------------------------------------------------------
     perform |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       satis |   .8984401   .0252156    35.63   0.000     .8489785    .9479017
     support |   .6161077   .0303447    20.30   0.000      .556585    .6756303
       _cons |   4.981054    .015074   330.44   0.000     4.951486    5.010622
------------------------------------------------------------------------------

.
.
. * Muleiple Regression wtih the sem command
. sem (perform <- satis support)

Endogenous variables

Observed:  perform

Exogenous variables

Observed:  satis support

Fitting target model:

Iteration 0:   log likelihood = -3779.9224
Iteration 1:   log likelihood = -3779.9224

Structural equation model                       Number of obs     =      1,500
Estimation method  = ml
Log likelihood     = -3779.9224

------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
       _cons |   4.981054   .0150589   330.77   0.000     4.951539    5.010569
-------------+----------------------------------------------------------------
var(e.perform)|   .3397087   .0124044                      .3162461     .364912
------------------------------------------------------------------------------
```

```
LR test of model vs. saturated: chi2(0)   =      0.00, Prob > chi2 =      .

. estat gof, stats(all)

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
          chi2_ms(0) |      0.000   model vs. saturated
            p > chi2 |          .
          chi2_bs(2) |   1285.653   baseline vs. saturated
            p > chi2 |      0.000
---------------------+--------------------------------------------------------
Population error     |
              RMSEA |      0.000   Root mean squared error of approximation
 90% CI, lower bound |      0.000
         upper bound |      0.000
              pclose |      1.000   Probability RMSEA <= 0.05
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |   7567.845   Akaike's information criterion
                 BIC |   7589.098   Bayesian information criterion
---------------------+--------------------------------------------------------
Baseline comparison  |
                 CFI |      1.000   Comparative fit index
                 TLI |      1.000   Tucker-Lewis index
---------------------+--------------------------------------------------------
Size of residuals    |
                SRMR |      0.000   Standardized root mean squared residual
                  CD |      0.576   Coefficient of determination
------------------------------------------------------------------------------

. estat teffects


Direct effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
------------------------------------------------------------------------------


Indirect effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |          0  (no path)
     support |          0  (no path)
------------------------------------------------------------------------------


Total effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
------------------------------------------------------------------------------

.
. * Muleiple Regression wtih the sem command and no covariance beween Satis and support
. sem (perform <- satis support), cov(satis*support@0)

Endogenous variables

Observed:  perform

Exogenous variables

Observed:  satis support

Fitting target model:
```

```
Iteration 0:   log likelihood = -3807.5588
Iteration 1:   log likelihood = -3807.5588

Structural equation model                       Number of obs     =      1,500
Estimation method  = ml
Log likelihood     = -3807.5588

------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
       _cons |   4.981054   .0150589   330.77   0.000     4.951539    5.010569
-------------+----------------------------------------------------------------
   mean(satis)|      .0212   .0157119     1.35   0.177    -.0095948    .0519948
 mean(support)|   .0084667   .0130562     0.65   0.517    -.0171229    .0340563
-------------+----------------------------------------------------------------
var(e.perform)|   .3397087   .0124044                      .3162461     .364912
    var(satis)|   .3702972   .0135213                       .344722    .3977699
  var(support)|    .255695   .0093367                      .2380349    .2746652
------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(1)   =     55.27, Prob > chi2 = 0.0000

. estat gof, stats(all)

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
          chi2_ms(1) |     55.273   model vs. saturated
            p > chi2 |      0.000
          chi2_bs(2) |   1285.653   baseline vs. saturated
            p > chi2 |      0.000
---------------------+--------------------------------------------------------
Population error     |
              RMSEA |      0.190   Root mean squared error of approximation
 90% CI, lower bound |      0.149
         upper bound |      0.234
               pclose |      0.000   Probability RMSEA <= 0.05
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |   7631.118   Akaike's information criterion
                 BIC |   7673.623   Bayesian information criterion
---------------------+--------------------------------------------------------
Baseline comparison  |
                 CFI |      0.958   Comparative fit index
                 TLI |      0.915   Tucker-Lewis index
---------------------+--------------------------------------------------------
Size of residuals    |
                SRMR |      0.101   Standardized root mean squared residual
                  CD |      0.538   Coefficient of determination
------------------------------------------------------------------------------

. estat teffects


Direct effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
------------------------------------------------------------------------------


Indirect effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |          0  (no path)
     support |          0  (no path)
------------------------------------------------------------------------------


Total effects
```

```
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
------------------------------------------------------------------------------


. * Muleiple Regression wtih the sem command and no covariance beween Satis and support, and the equal
. * regression coefficient for satis and support
.
. sem (perform <- satis@b support@b), cov(satis*support@0)

Endogenous variables

Observed:  perform

Exogenous variables

Observed:  satis support

Fitting target model:

Iteration 0:   log likelihood = -3829.9573
Iteration 1:   log likelihood = -3828.8698
Iteration 2:   log likelihood = -3828.8669
Iteration 3:   log likelihood = -3828.8669

Structural equation model                       Number of obs     =      1,500
Estimation method  = ml
Log likelihood     = -3828.8669

 ( 1)  [perform]satis - [perform]support = 0
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .7790464    .017708    43.99   0.000     .7443394    .8137534
     support |   .7790464    .017708    43.99   0.000     .7443394    .8137534
       _cons |   4.982206   .0152733   326.20   0.000      4.95227    5.012141
-------------+----------------------------------------------------------------
   mean(satis)|      .0212   .0157119     1.35   0.177    -.0095948    .0519948
 mean(support)|   .0084667   .0130562     0.65   0.517    -.0171229    .0340563
-------------+----------------------------------------------------------------
var(e.perform)|   .3494985   .0127619                      .3253598    .3754281
    var(satis)|   .3702972   .0135213                       .344722    .3977699
  var(support)|    .255695   .0093367                      .2380349    .2746652
------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(2)   =     97.89, Prob > chi2 = 0.0000

. estat gof, stats(all)

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
          chi2_ms(2) |     97.889   model vs. saturated
            p > chi2 |      0.000
          chi2_bs(2) |   1285.653   baseline vs. saturated
            p > chi2 |      0.000
---------------------+--------------------------------------------------------
Population error     |
              RMSEA |      0.179   Root mean squared error of approximation
 90% CI, lower bound |      0.150
        upper bound |      0.210
             pclose |      0.000   Probability RMSEA <= 0.05
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |   7671.734   Akaike's information criterion
                 BIC |   7708.926   Bayesian information criterion
---------------------+--------------------------------------------------------
Baseline comparison  |
                 CFI |      0.925   Comparative fit index
                 TLI |      0.925   Tucker-Lewis index
---------------------+--------------------------------------------------------
Size of residuals    |
                SRMR |      0.105   Standardized root mean squared residual
                  CD |      0.521   Coefficient of determination
------------------------------------------------------------------------------
```

```
. estat teffects


Direct effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .7790464    .017708    43.99   0.000     .7443394    .8137534
     support |   .7790464    .017708    43.99   0.000     .7443394    .8137534
------------------------------------------------------------------------------


Indirect effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |          0  (no path)
     support |          0  (no path)
------------------------------------------------------------------------------


Total effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .7790464    .017708    43.99   0.000     .7443394    .8137534
     support |   .7790464    .017708    43.99   0.000     .7443394    .8137534
------------------------------------------------------------------------------

.
. * Muleiple Regression wtih the sem command and no covariance beween Satis and support, and fix the regression
. * coefficient of satis to perform as 0.78
.
. sem (perform <- satis@0.78 support), cov(satis*support@0)

Endogenous variables

Observed:  perform

Exogenous variables

Observed:  satis support

Fitting target model:

Iteration 0:   log likelihood = -3819.0411
Iteration 1:   log likelihood = -3818.5321
Iteration 2:   log likelihood = -3818.5316
Iteration 3:   log likelihood = -3818.5316

Structural equation model                       Number of obs     =      1,500
Estimation method  = ml
Log likelihood     = -3818.5316

 ( 1)  [perform]satis = .78
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |        .78  (constrained)
     support |    .643218   .0299794    21.46   0.000     .5844593    .7019766
       _cons |   4.983335   .0151616   328.68   0.000     4.953619    5.013052
-------------+----------------------------------------------------------------
   mean(satis)|      .0212   .0157119     1.35   0.177    -.0095948    .0519948
 mean(support)|   .0084667   .0130562     0.65   0.517    -.0171229    .0340563
-------------+----------------------------------------------------------------
var(e.perform)|   .3447153   .0125872                      .3209069    .3702901
    var(satis)|   .3702972   .0135213                       .344722    .3977699
  var(support)|    .255695   .0093367                      .2380349    .2746652
------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(2)   =     77.22, Prob > chi2 = 0.0000
```

```
. estat gof, stats(all)

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
          chi2_ms(2) |     77.218   model vs. saturated
            p > chi2 |      0.000
          chi2_bs(2) |   1285.653   baseline vs. saturated
            p > chi2 |      0.000
---------------------+--------------------------------------------------------
Population error     |
               RMSEA |      0.158   Root mean squared error of approximation
 90% CI, lower bound |      0.129
         upper bound |      0.190
              pclose |      0.000   Probability RMSEA <= 0.05
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |   7651.063   Akaike's information criterion
                 BIC |   7688.256   Bayesian information criterion
---------------------+--------------------------------------------------------
Baseline comparison  |
                 CFI |      0.941   Comparative fit index
                 TLI |      0.941   Tucker-Lewis index
---------------------+--------------------------------------------------------
Size of residuals    |
                SRMR |      0.124   Standardized root mean squared residual
                  CD |      0.490   Coefficient of determination
------------------------------------------------------------------------------

. estat teffects


Direct effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |         .78  (constrained)
     support |    .643218   .0299794    21.46   0.000     .5844593    .7019766
------------------------------------------------------------------------------


Indirect effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |          0  (no path)
     support |          0  (no path)
------------------------------------------------------------------------------


Total effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |         .78  (constrained)
     support |    .643218   .0299794    21.46   0.000     .5844593    .7019766
------------------------------------------------------------------------------

.
.
. * Muleiple Regression wtih the sem command and covariance beween Satis and support
.
. sem (perform <- satis support) (satis <- support)

Endogenous variables

Observed:  perform satis

Exogenous variables

Observed:  support

Fitting target model:
```

```
Iteration 0:   log likelihood = -3779.9224
Iteration 1:   log likelihood = -3779.9224

Structural equation model                       Number of obs     =      1,500
Estimation method  = ml
Log likelihood     = -3779.9224

------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
       _cons |   4.981054   .0150589   330.77   0.000     4.951539    5.010569
  ----------+----------------------------------------------------------------
  satis      |
     support |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
       _cons |    .019262   .0154273     1.25   0.212    -.0109749    .0494989
-------------+----------------------------------------------------------------
var(e.perform)|   .3397087   .0124044                      .3162461     .364912
  var(e.satis)|   .3569007   .0130322                      .3322507    .3833795
------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(0)   =      0.00, Prob > chi2 =      .

. estat gof, stats(all)

---------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+-----------------------------------------------------
Likelihood ratio     |
          chi2_ms(0) |      0.000   model vs. saturated
            p > chi2 |          .
          chi2_bs(3) |   1340.926   baseline vs. saturated
            p > chi2 |      0.000
---------------------+-----------------------------------------------------
Population error     |
               RMSEA |      0.000   Root mean squared error of approximation
 90% CI, lower bound |      0.000
         upper bound |      0.000
              pclose |      1.000   Probability RMSEA <= 0.05
---------------------+-----------------------------------------------------
Information criteria |
                 AIC |   7573.845   Akaike's information criterion
                 BIC |   7611.037   Bayesian information criterion
---------------------+-----------------------------------------------------
Baseline comparison  |
                 CFI |      1.000   Comparative fit index
                 TLI |      1.000   Tucker-Lewis index
---------------------+-----------------------------------------------------
Size of residuals    |
                SRMR |      0.000   Standardized root mean squared residual
                  CD |      0.244   Coefficient of determination
---------------------------------------------------------------------------

. estat teffects


Direct effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
  -----------+----------------------------------------------------------------
  satis      |
     support |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
------------------------------------------------------------------------------


Indirect effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |          0  (no path)
     support |    .205648   .0280066     7.34   0.000      .150756      .26054
  -----------+----------------------------------------------------------------
```

```
  satis      |
     support |          0  (no path)
-------------------------------------------------------------------------------


Total effects
-------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+-----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .8217557   .0404579    20.31   0.000     .7424597    .9010516
  -----------+-----------------------------------------------------------------
  satis      |
     support |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
-------------------------------------------------------------------------------

.
.
. ******************
. * Multiple-group comparison
. ******************
.
.
. sem (perform <- satis support) (satis <- support), group(hi_perm)

Endogenous variables

Observed:  perform satis

Exogenous variables

Observed:  support

Fitting target model:

Iteration 0:   log likelihood = -3005.4011
Iteration 1:   log likelihood = -3005.4011

Structural equation model                       Number of obs     =      1,500
Grouping variable  = hi_perm                    Number of groups  =          2
Estimation method  = ml
Log likelihood     = -3005.4011

Group              : low performer              Number of obs     =        723

------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .4985285   .0351988    14.16   0.000     .4295401    .5675169
     support |   .3580111   .0377894     9.47   0.000     .2839452    .4320769
       _cons |   4.492733   .0217795   206.28   0.000     4.450046     4.53542
  -----------+----------------------------------------------------------------
  satis      |
     support |   .0153721   .0399235     0.39   0.700    -.0628765    .0936207
       _cons |  -.3280669    .019511   -16.81   0.000    -.3663079    -.289826
-------------+----------------------------------------------------------------
var(e.perform)|   .2128612   .0111955                      .1920116    .2359748
  var(e.satis)|   .2376306   .0124982                      .2143549    .2634338
------------------------------------------------------------------------------

Group              : high performer             Number of obs     =        777

------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .4971039   .0293334    16.95   0.000     .4396115    .5545963
     support |   .3709442   .0313377    11.84   0.000     .3095235    .4323649
       _cons |   5.454135   .0193761   281.49   0.000     5.416158    5.492111
  -----------+----------------------------------------------------------------
  satis      |
     support |  -.0402066   .0382989    -1.05   0.294     -.115271    .0348577
       _cons |   .3561925   .0199566    17.85   0.000     .3170784    .3953067
-------------+----------------------------------------------------------------
var(e.perform)|   .1809722   .0091816                      .1638425    .1998929
  var(e.satis)|    .270686   .0137332                      .2450645    .2989862
```

```
------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(0)   =      0.00, Prob > chi2 =      .

. sem (perform <- satis support) (satis <- support), group(hi_perm) ginvariant(all)

Endogenous variables

Observed:  perform satis

Exogenous variables

Observed:  support

Fitting target model:

Iteration 0:   log likelihood = -4235.2563
Iteration 1:   log likelihood = -3760.3273
Iteration 2:   log likelihood = -3675.1152
Iteration 3:   log likelihood = -3673.5166
Iteration 4:   log likelihood = -3673.4955
Iteration 5:   log likelihood = -3673.4955

Structural equation model                       Number of obs     =      1,500
Grouping variable  = hi_perm                    Number of groups  =          2
Estimation method  = ml
Log likelihood     = -3673.4955

 ( 1)  [perform]0bn.hi_perm#c.satis - [perform]1.hi_perm#c.satis = 0
 ( 2)  [perform]0bn.hi_perm#c.support - [perform]1.hi_perm#c.support = 0
 ( 3)  [satis]0bn.hi_perm#c.support - [satis]1.hi_perm#c.support = 0
 ( 4)  [/]var(e.perform)#0bn.hi_perm - [/]var(e.perform)#1.hi_perm = 0
 ( 5)  [/]var(e.satis)#0bn.hi_perm - [/]var(e.satis)#1.hi_perm = 0
 ( 6)  [perform]0bn.hi_perm - [perform]1.hi_perm = 0
 ( 7)  [satis]0bn.hi_perm - [satis]1.hi_perm = 0

Group              : low performer              Number of obs     =        723

------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
       _cons |   4.981054   .0150589   330.77   0.000     4.951539    5.010569
  ----------+----------------------------------------------------------------
  satis      |
     support |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
       _cons |    .019262   .0154273     1.25   0.212    -.0109749    .0494989
-------------+----------------------------------------------------------------
var(e.perform)|   .3397087   .0124044                      .3162461     .364912
  var(e.satis)|   .3569007   .0130322                      .3322507    .3833795
------------------------------------------------------------------------------

Group              : high performer             Number of obs     =        777

------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  perform    |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
       _cons |   4.981054   .0150589   330.77   0.000     4.951539    5.010569
  ----------+----------------------------------------------------------------
  satis      |
     support |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
       _cons |    .019262   .0154273     1.25   0.212    -.0109749    .0494989
-------------+----------------------------------------------------------------
var(e.perform)|   .3397087   .0124044                      .3162461     .364912
  var(e.satis)|   .3569007   .0130322                      .3322507    .3833795
------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(7)   =   1336.19, Prob > chi2 = 0.0000

. estat teffects


Direct effects
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
Structural         |
  perform          |
             satis |
    low performer  |   .8984401   .0251903    35.67   0.000      .849068    .9478123
   high performer  |   .8984401   .0251903    35.67   0.000      .849068    .9478123
           support |
    low performer  |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
   high performer  |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
  -----------------+------------------------------------------------------------------
  satis            |
           support |
    low performer  |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
   high performer  |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
-------------------------------------------------------------------------------


Indirect effects
-------------------------------------------------------------------------------
                   |                 OIM
                   |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------+-----------------------------------------------------------------
Structural         |
  perform          |
             satis |
               [*] |          0  (no path)
           support |
    low performer  |    .205648   .0280066     7.34   0.000      .150756      .26054
   high performer  |    .205648   .0280066     7.34   0.000      .150756      .26054
  -----------------+-----------------------------------------------------------------
  satis            |
           support |
               [*] |          0  (no path)
-------------------------------------------------------------------------------
Note: [*] identifies parameter estimates constrained to be equal across groups.


Total effects
-------------------------------------------------------------------------------
                   |                 OIM
                   |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------+-----------------------------------------------------------------
Structural         |
  perform          |
             satis |
    low performer  |   .8984401   .0251903    35.67   0.000      .849068    .9478123
   high performer  |   .8984401   .0251903    35.67   0.000      .849068    .9478123
           support |
    low performer  |   .8217557   .0404579    20.31   0.000     .7424597    .9010516
   high performer  |   .8217557   .0404579    20.31   0.000     .7424597    .9010516
  -----------------+-----------------------------------------------------------------
  satis            |
           support |
    low performer  |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
   high performer  |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
-------------------------------------------------------------------------------

. 
. 
. *****************
. * one-level model with gsem
. ****************
. gsem (perform <- satis support) (satis <- support)

Iteration 0:   log likelihood = -2674.3421
Iteration 1:   log likelihood = -2674.3421  (backed up)

Generalized structural equation model           Number of obs     =      1,500

Response       : perform
Family         : Gaussian
Link           : identity

Response       : satis
Family         : Gaussian
Link           : identity

Log likelihood = -2674.3421

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
perform      |
       satis |   .8984401   .0251903    35.67   0.000      .849068    .9478123
     support |   .6161077   .0303143    20.32   0.000     .5566927    .6755227
```

```
         _cons |   4.981054   .0150589   330.77   0.000     4.951539    5.010569
---------------+----------------------------------------------------------------
satis          |
       support |   .2288945   .0305047     7.50   0.000     .1691064    .2886826
         _cons |    .019262   .0154273     1.25   0.212    -.0109749    .0494989
---------------+----------------------------------------------------------------
 var(e.perform)|   .3397087   .0124044                      .3162461     .364912
   var(e.satis)|   .3569007   .0130322                      .3322507    .3833795
------------------------------------------------------------------------------

. gsem, coeflegend

Generalized structural equation model           Number of obs     =      1,500

Response       : perform
Family         : Gaussian
Link           : identity

Response       : satis
Family         : Gaussian
Link           : identity

Log likelihood = -2674.3421

------------------------------------------------------------------------------
               |      Coef.  Legend
---------------+--------------------------------------------------------------
perform        |
         satis |   .8984401  _b[perform:satis]
       support |   .6161077  _b[perform:support]
         _cons |   4.981054  _b[perform:_cons]
---------------+--------------------------------------------------------------
satis          |
       support |   .2288945  _b[satis:support]
         _cons |    .019262  _b[satis:_cons]
---------------+--------------------------------------------------------------
 var(e.perform)|   .3397087  _b[/var(e.perform)]
   var(e.satis)|   .3569007  _b[/var(e.satis)]
------------------------------------------------------------------------------

. nlcom _b[perform:support]+_b[perform:satis]*_b[satis:support]

       _nl_1:  _b[perform:support]+_b[perform:satis]*_b[satis:support]

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       _nl_1 |   .8217557   .0404579    20.31   0.000     .7424597    .9010516
------------------------------------------------------------------------------

.
.
. ***********************
. * Two-level model with gsem
. ***********************
.
. gsem (perform <- satis support M1[branch]) (satis <- support M2[branch]), cov(M1[branch]*M2[branch]@0)

Fitting fixed-effects model:

Iteration 0:   log likelihood = -2674.3421
Iteration 1:   log likelihood = -2674.3421

Refining starting values:

Grid node 0:   log likelihood = -2132.1613

Fitting full model:

Iteration 0:   log likelihood = -2132.1613  (not concave)
Iteration 1:   log likelihood = -1801.3155
Iteration 2:   log likelihood = -1769.6421
Iteration 3:   log likelihood = -1705.1282
Iteration 4:   log likelihood =  -1703.746
Iteration 5:   log likelihood = -1703.7141
Iteration 6:   log likelihood =  -1703.714

Generalized structural equation model           Number of obs     =      1,500

Response       : perform
Family         : Gaussian
Link           : identity

Response       : satis
```

```
Family         : Gaussian
Link           : identity

Log likelihood =  -1703.714

 ( 1)  [perform]M1[branch] = 1
 ( 2)  [satis]M2[branch] = 1
------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
perform      |
       satis |    .604264   .0336398    17.96   0.000     .5383313    .6701968
     support |   .6981525   .0250432    27.88   0.000     .6490687    .7472364
             |
  M1[branch] |          1  (constrained)
             |
       _cons |   4.986596   .0489465   101.88   0.000     4.890663    5.082529
-------------+----------------------------------------------------------------
satis        |
     support |   .2692633   .0179649    14.99   0.000     .2340528    .3044739
             |
  M2[branch] |          1  (constrained)
             |
       _cons |   .0189202   .0570868     0.33   0.740    -.0929678    .1308083
-------------+----------------------------------------------------------------
 var(M1[branch])|   .1695962   .0302866                      .119511    .2406713
 var(M2[branch])|   .2384738   .0399154                     .1717781    .3310652
-------------+----------------------------------------------------------------
  var(e.perform)|    .201053   .0075451                     .1867957    .2163985
    var(e.satis)|   .1188436   .0044523                     .1104299    .1278983
------------------------------------------------------------------------------

.
. nlcom _b[perform:satis]*_b[satis:support]

       _nl_1:  _b[perform:satis]*_b[satis:support]

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       _nl_1 |   .1627062   .0141382    11.51   0.000     .1349958    .1904165
------------------------------------------------------------------------------

. nlcom _b[perform:support]+_b[perform:satis]*_b[satis:support]

       _nl_1:  _b[perform:support]+_b[perform:satis]*_b[satis:support]

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       _nl_1 |   .8608587   .0257501    33.43   0.000     .8103894     .911328
------------------------------------------------------------------------------

.
end of do-file

. help sem
```