1

Effect Decompositions Using Mplus

This document shows how to use Mplus to generate effect decompositions so that you can easily generate the equation for combining paths to define a combined coefficient effect. I use an example from the social phobia RET in Chapter 11 and I assume you have read that chapter. I illustrate how to generate the equation for the total program effect, TREAT, on the latent social phobia variable, LSP3.

I first identify the effect that I want to decompose and specify it using the MODEL INDIRECT command with a subcommand that uses the keyword IND. In the present case, it is the effect of TREAT on LSP3. I add to the Mplus syntax the following commands (see Table 11.1 in Chapter 11, lines 26 and 27):

```
MODEL INDIRECT:
LSP3 IND TREAT ;
```

On the left of IND is the name of the target outcome variable and on the right is the name of the target determinant of the outcome variable. I then execute the broader Mplus syntax for the model (see Table 11.1). I am not so interested in the results for the above; my goal is to use Mplus to help me determine how the different path coefficients combine to generate the effect of TREAT on LSP3 on a more conceptual level. I can even use made up or hypothetical data - anything to get the overall model to run with the above syntax so that I can isolate the relevant equation.

The output for the commands appear in the in the section called TOTAL, TOTAL INDIRECT, SPECIFIC INDIRECT, AND DIRECT EFFECTS. Here is the output:

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

Specific indirect 1
  LSP3
  NEGAPP2
  TREAT             -0.234      0.062     -3.766      0.000
```

```
Specific indirect 2
  LSP3
  PSKILLS2
  TREAT             -0.829      0.123     -6.735      0.000

Specific indirect 3
  LSP3
  EXTERN2
  TREAT              0.000      0.002     -0.017      0.986

Specific indirect 4
  LSP3
  NEGAPP2
  PSKILLS2
  TREAT             -0.208      0.053     -3.913      0.000

Specific indirect 5
  LSP3
  EXTERN2
  PSKILLS2
  TREAT              0.001      0.036      0.017      0.986

Direct
  LSP3
  TREAT             -0.488      0.136     -3.581      0.000
```

There are a total of 6 chains listed that link `TREAT` to `LSP3`. Consider `Specific indirect 1`. The variable in the last row underneath this heading is assumed to influence the variable in the next to last row which, in turn, influences the variable in the top row. So, this chain refers to `TREAT` → `NEGAPP2` → `LSP3`. From Figure 11.2 in Chapter 11, it is p_1 times p_4. We essentially work our way from the bottom to the top of the rows listed. I next examine `Specific indirect 2` and map its chain via the same logic. The chain is `TREAT` → `PSKILSS2` → `LSP3` and the path coefficients are p_2 times p_5. For `Specific indirect 3` the chain is `TREAT` → `EXTERN2` → `LSP3` and the path coefficients are p_3 times p_6. For `Specific indirect 4` the chain is `TREAT` → `PSKILLS2` → `NEGAPP2` → `LSP3` and the path coefficients are p_2 times p_8 times p_4. For `Specific indirect 5` the chain is `TREAT` → `PSKILLS2` → `EXTERN2` → `LSP3` and the path coefficients are p_2 times p_9 times p_6. Finally, a direct effect of `TREAT` on `LSP3` is listed, which is p_7. The equation for the total effect, TE, is the sum of each of these chains:

$$TE = p_1p_4 + p_2p_5 + p_3p_6 + p_2p_8p_4 + p_2p_9p_6 + p_7$$

Voila the decomposition!

Here is an example that decomposes the effect of PSKILLS2 on LSP3 in addition to the above. I use the syntax

```
MODEL INDIRECT:
LSP3 IND TREAT ;
LSP3 IND PSKILLS2 ;
```

with the latter line requesting the PSKILLS2 → LSP3 effect. Here is the output for it:

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

  Specific indirect 1
    LSP3
    NEGAPP2
    PSKILLS2          -0.177      0.045     -3.957      0.000

  Specific indirect 2
    LSP3
    EXTERN2
    PSKILLS2           0.001      0.030      0.017      0.986

  Direct
    LSP3
    PSKILLS2          -0.707      0.099     -7.109      0.000
```

For Specific indirect 1 the chain is PSKILLS2 → NEGAPP2 → LSP3 and the path coefficients are p_8 times p_4. For Specific indirect 2 the chain is PSKILLS2 → EXTERN2 → LSP3 and the path coefficients are p_9 times p_6. Finally, a direct effect of PSKILLS2 on LSP3 is listed, which reflects p_5. The equation for the effect of PSKILLS2 on LSP3 is:

PSKILLS2 →LSP3 = $p_8p_4 + p_9p_6 + p_5$

I can use this logic in conjunction with Mplus to decompose most any effect of interest. This can be helpful when using the MODEL CONSTRAINT command in Mplus or when using the Monte Carlo confidence interval approach in LISEM applications.