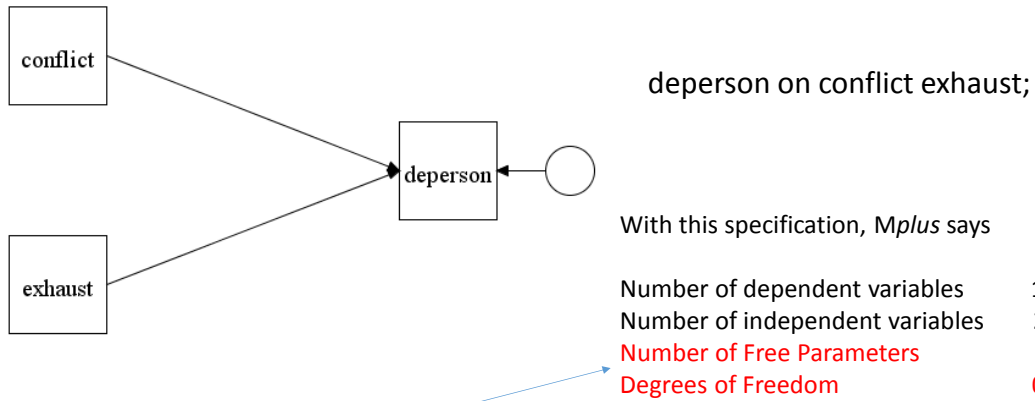
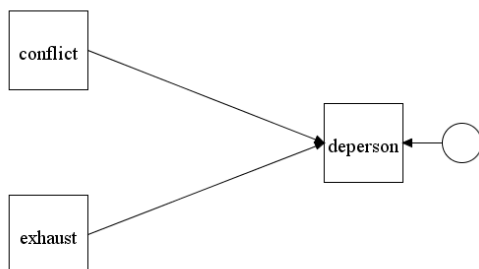


What *Mplus* estimates



These are hard to understand for those of us who learned SEM with AMOS

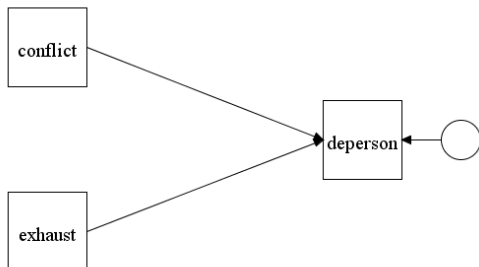
What *Mplus* estimates 2 What AMOS does



With three observed variables there are $[3 * (3+1)]/2 = 6$ variances and covariances, which AMOS calls moments.

AMOS estimates the variances of the exogenous variables, including the residual (3), and the two path coefficients (2). This equals 5, and usually we would ask AMOS to estimate the covariance between the IVs. This makes six estimates and there are no degrees of freedom left.

What *Mplus* estimates 3



The key to understanding what *Mplus* does is that the model is estimated conditional on the observed exogenous variables, but they are not treated as part of the model, and their means, variances and covariances are not model parameters (as they are in AMOS).

So, what parameters are estimated by *Mplus* for this multiple regression?

As we would expect, the two regression coefficients. Also, the intercept for the DV, and the variance of the residual. This makes the four free parameters referred to in the *Mplus* output.

What *Mplus* estimates 4

Mplus will tell us what parameters it is estimating if we request *tech1* (technical output 1)
 - see Chapter 18 of the *User's Guide* for a description of the various reports which are available.

output: tech1;

What Mplus estimates 5

Part of the *tech1* output:

TECHNICAL 1 OUTPUT

PARAMETER SPECIFICATION

	ALPHA			
	DEPERSON	CONFLICT	EXHAUST	
Mean/intercept	1	0	0	
	1			
	BETA			
	DEPERSON	CONFLICT	EXHAUST	
Regression coefficients	0	2	3	
	0	0	0	
	0	0	0	
	PSI			
	DEPERSON	CONFLICT	EXHAUST	
Variance of residual	4			
	0	0		
	0	0	0	

See Chapter 18 of the *User's Guide* for a description of the Mplus Parameter Arrays

What Mplus estimates 6

Let's demonstrate that Mplus does take the covariance between the IVs into account even though it does not formally estimate it. We do with by explicitly setting the covariance to zero and seeing if that affects the fit.

model:

```
deperson on conflict exhaust;
conflict with exhaust@0;
```

Note that the @ and 0 can be spaced if you wish:

```
conflict with exhaust @0;
```

As will be seen on the next slide, the fit is certainly affected for the worse but, also, making this request affects which Mplus actually estimates.

What Mplus estimates 7

MODEL FIT INFORMATION

Number of Free Parameters

8

← More parameters are being estimated

Chi-Square Test of Model Fit

Value	367.603
Degrees of Freedom	1
P-Value	0.0000

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.506
90 Percent C.I.	0.464 0.551
Probability RMSEA <= .05	0.000

← Dreadful GOF

CFI/TLI

CFI	0.086
TLI	-0.829

What Mplus estimates 8

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
DEPERSON ON				
CONFLICT	0.158	0.026	5.975	0.000
EXHAUST	0.350	0.023	15.384	0.000
CONFLICT WITH				
EXHAUST	0.000	0.000	999.000	999.000
Means				
CONFLICT	3.016	0.027	111.282	0.000
EXHAUST	3.517	0.031	111.891	0.000
Intercepts				
DEPERSON	0.498	0.085	5.852	0.000
Variances				
CONFLICT	1.051	0.039	26.740	0.000
EXHAUST	1.413	0.053	26.740	0.000
Residual Variances				
DEPERSON	0.808	0.030	26.739	0.000

Mplus has now included the IVs in the model and estimated their means and variances. We have prevented it estimating the covariance, hence we have a spare degree of freedom.

So we now have the original four estimates plus the means (2) and variances (2) of the IVs plus, potentially, their covariance (1).

$4 + 2 + 2 + 1 = 9$ (8 in our case)

What *Mplus* estimates 9

model:	MODEL FIT INFORMATION				
deperson on conflict exhaust;	Number of Free Parameters				9
conflict with exhaust;	Chi-Square Test of Model Fit				
	Value				0.000
	Degrees of Freedom				0
	P-Value				0.0000
	CONFLICT WITH				
	EXHAUST	0.580	0.036	16.256	0.000
	STDYX Standardization				
	CONFLICT WITH				
	EXHAUST	0.476	0.020	23.282	0.000