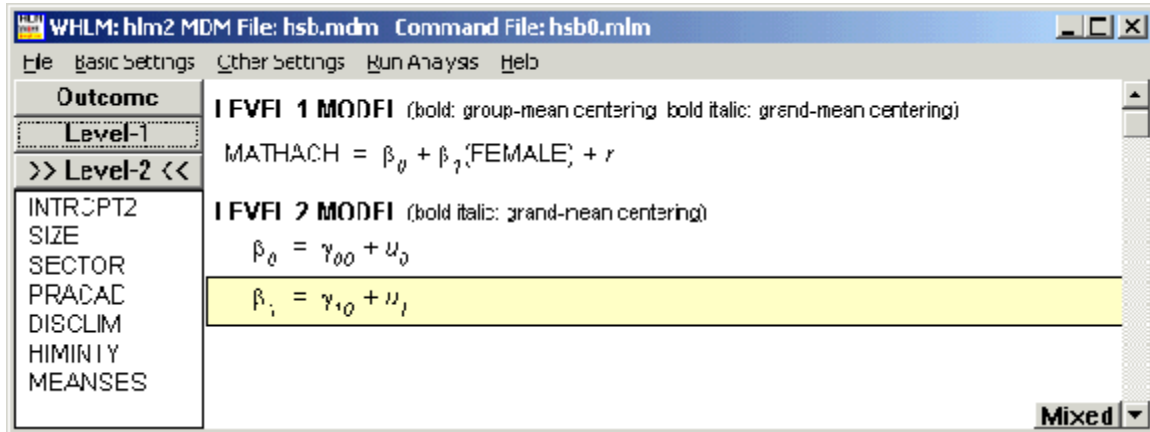
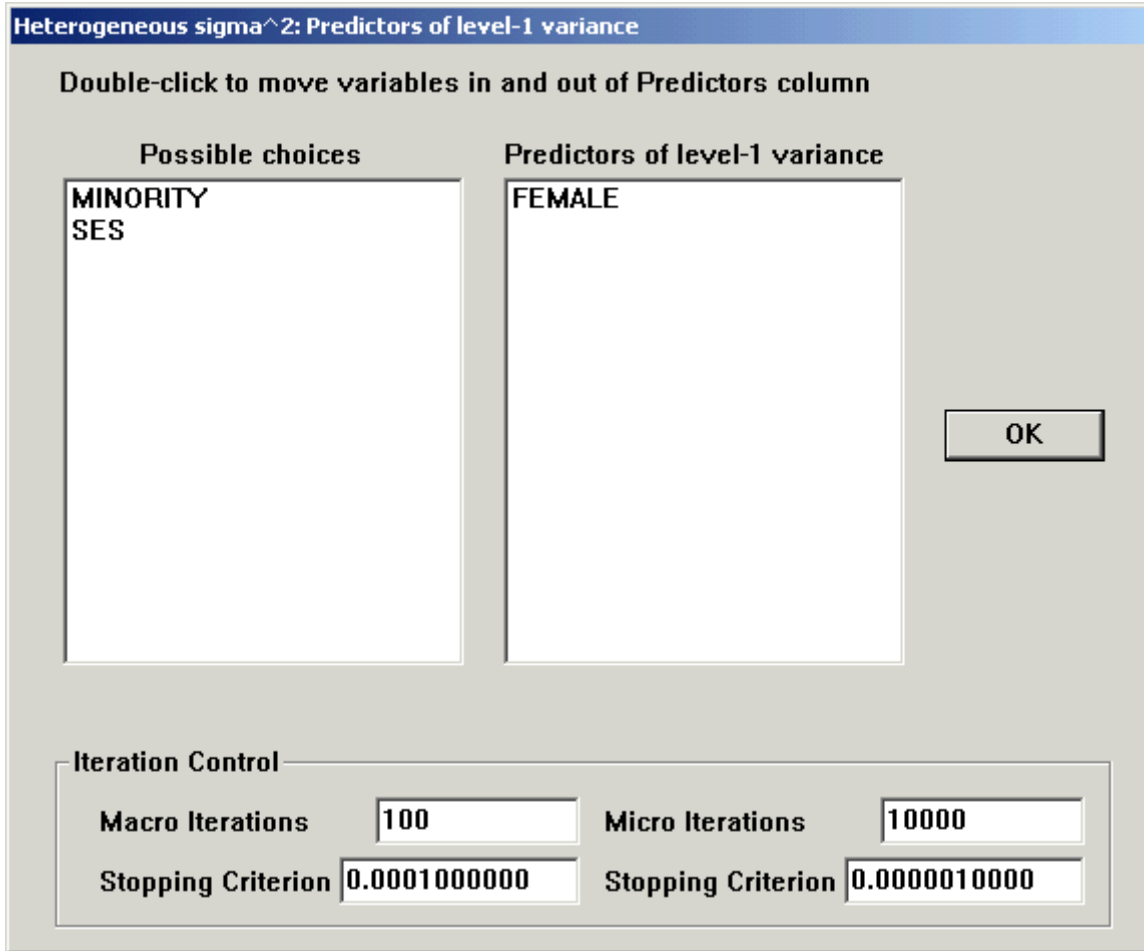


## Model heterogeneity of level-1 variances

Users may wish to estimate models that allow for heterogeneous level-1 variances. A simple example using the HS&B data would be a model that postulates that the two genders have different means and variances of math achievement scores. To specify a model that hypothesizes different central tendency and variability in math achievement for the two genders, the model displayed in the figure below must first be set up.



To model heterogeneity of level-1 variances, open the **Other Settings** menu and select the **Estimation Settings** option to open the **Estimation Settings – HLM2** dialog box. Click the **Heterogeneous sigma<sup>2</sup>** button to open the **Heterogeneous sigma<sup>2</sup> Predictors of level-1 variance** dialog box. Double-click FEMALE to enter as a variable in the **Predictors of level-1 variance** box (see the figure below for an example). Click **OK**.



The model estimated is a log linear-model for the level-1 variances, which can be generally stated as:

$$\sigma_v^2 = \exp\{\alpha_0 + \alpha_1 \text{FEMALE}_v\}$$

The output for the hypothesis test for the heterogeneous level-1 variance model is shown below.

RESULTS FOR HETEROGENEOUS SIGMA-SQUARED  
(macro iteration 4)

Var(R) = Sigma\_squared and  
log(Sigma\_squared) = alpha0 + alpha1(FEMALE)

Model for level-1 variance

Parameter		Coefficient	Standard Error	Z-ratio	P-value
INTRCPT1	,alpha0	3.70390	0.024798	149.365	0.000
FEMALE	,alpha1	-0.09122	0.034089	-2.676	0.008

Summary of Model Fit

Model	Number of Parameters	Deviance
1. Homogeneous sigma_squared	6	47049.46273
2. Heterogeneous sigma_squared	7	47042.27641

Model Comparison	Chi-square	df	P-value
Model 1 vs Model 2	7.18633	1	0.007

A comparison of the fits of the models suggests that the model with heterogeneous within-school variances appears appropriate ( $\chi^2 = 7.18547$ ,  $df = 1$ ).