Within-model.

$$\begin{bmatrix} y_{1,t}^{w} \\ y_{2,t}^{w} \end{bmatrix} = \begin{bmatrix} 0 & \phi_{12} \\ \phi_{21} & \phi_{22} \end{bmatrix} \begin{bmatrix} y_{1,t-1}^{w} \\ y_{2,t-1}^{w} \end{bmatrix} + \begin{bmatrix} \zeta_{y,1} \\ \zeta_{y,2} \end{bmatrix}$$

Between-model.

$$\begin{bmatrix} \mu_{1,i} \\ \mu_{2,i} \\ \phi_{12,i} \\ \phi_{21,i} \\ \phi_{22,i} \\ \log(\pi_{1,i}) \\ \log(\pi_{2,i}) \\ \log(\pi_{12,i}) \end{bmatrix} = \begin{bmatrix} \gamma_{\mu_1} \\ \gamma_{\mu_2} \\ \gamma_{\phi_{12}} \\ \gamma_{\phi_{21}} \\ \gamma_{\phi_{22}} \\ \gamma_{\log(\pi_1)} \\ \gamma_{\log(\pi_2)} \\ \gamma_{\log(\pi_{12})} \end{bmatrix} + \begin{bmatrix} \upsilon_{\mu_1,i} \\ \upsilon_{\mu_2,i} \\ \upsilon_{\phi_{12},i} \\ \upsilon_{\phi_{21},i} \\ \upsilon_{\phi_{22},i} \\ \upsilon_{\log(\pi_1),i} \\ \upsilon_{\log(\pi_2),i} \\ \upsilon_{\log(\pi_{12}),i} \end{bmatrix}$$