$$f(\mathbf{x}, \mathbf{z}, \boldsymbol{\theta}|\mathbf{s}, \sigma) \propto f(\mathbf{s}|\mathbf{x}, \boldsymbol{\theta}) f(\mathbf{x}|\mathbf{z}, \boldsymbol{\theta}) f(\mathbf{z}|\boldsymbol{\theta})$$
$$f(\mathbf{s}|\mathbf{x}, \boldsymbol{\theta}) \propto \prod_{i=1}^{n} \prod_{g=1}^{G} 1(\textstyle\sum_{t=1}^{T} x_{i,g,t} p_{\sigma_i,t} = s_{i,g})$$
$$f(\mathbf{x}|\mathbf{z}, \boldsymbol{\theta}) \propto \prod_{i=1}^{n} \prod_{g=1}^{G} \prod_{\mathcal{T} \in \mathbb{T}_{z_g}} \int f(\lambda|a_0, \nu) \prod_{t \in \mathcal{T}} f(x_{i,g,t}|a, \lambda)\, d\lambda$$
$$f(\mathbf{z}|\boldsymbol{\theta}) \propto \prod_{g=1}^{G} \pi_{z_g}$$