$$\Pr(\mathbf{D}) = \prod_{c=1}^{C} \left[\sum_{r=1}^{R} \left(\sum_{s_1=1}^{S} \cdots \sum_{s_{n-1}=1}^{S} \pi_{cs_1} \prod_{b \in \mathcal{I}} P^{(r)}_{s_{c\psi(b)} s_{c\phi(b)}}(t_b) \right. \right.$$

$$\left. \left. \times \prod_{b \in \mathcal{E}} P^{(r)}_{s_{c\psi(b)} D_{c\phi(b)}}(t_b) \right) \Pr(r) \right]$$