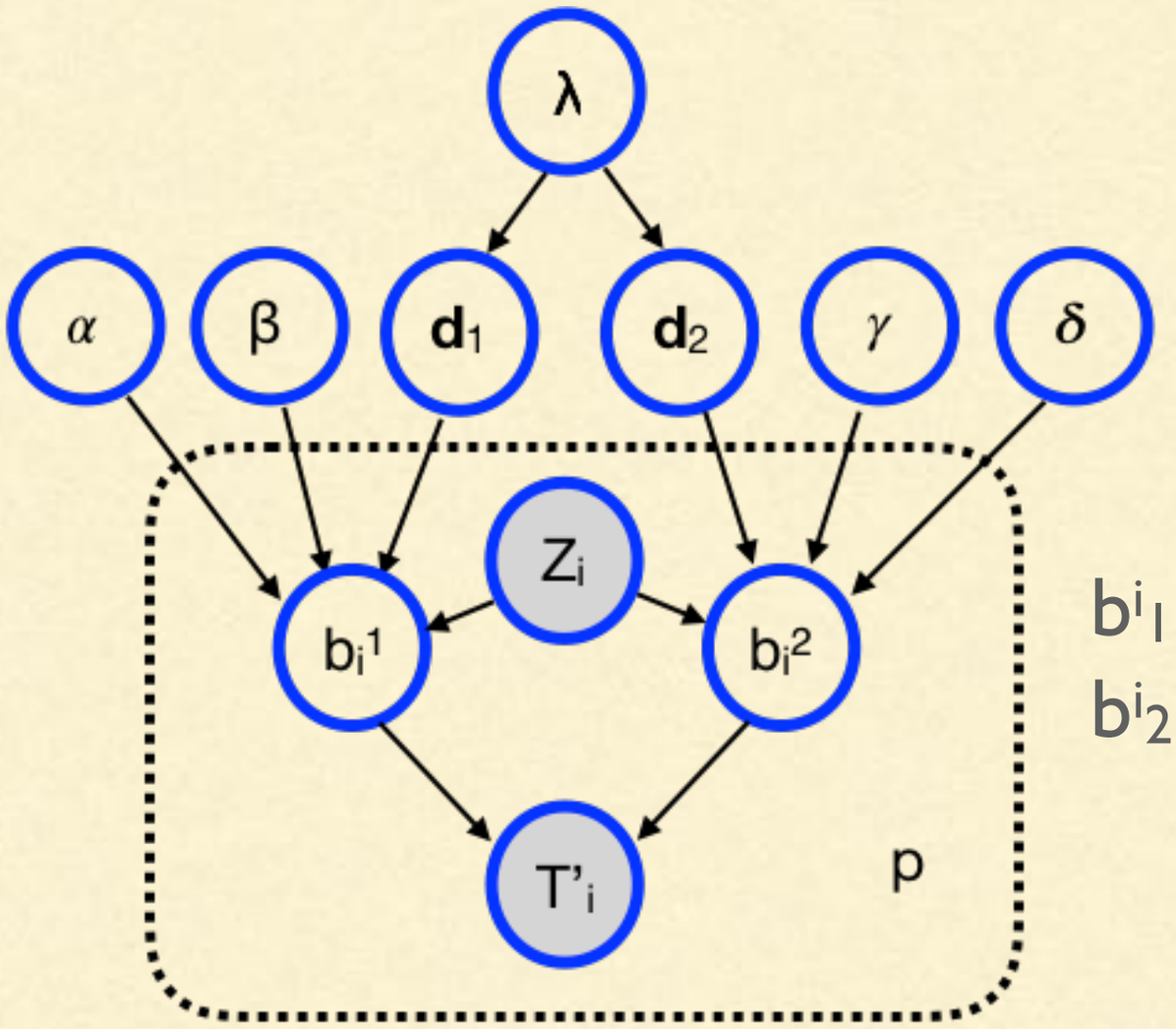
# WITH COVARIATES




$p(\alpha) = p(\beta) = p(\gamma) = p(\delta) \propto 1$

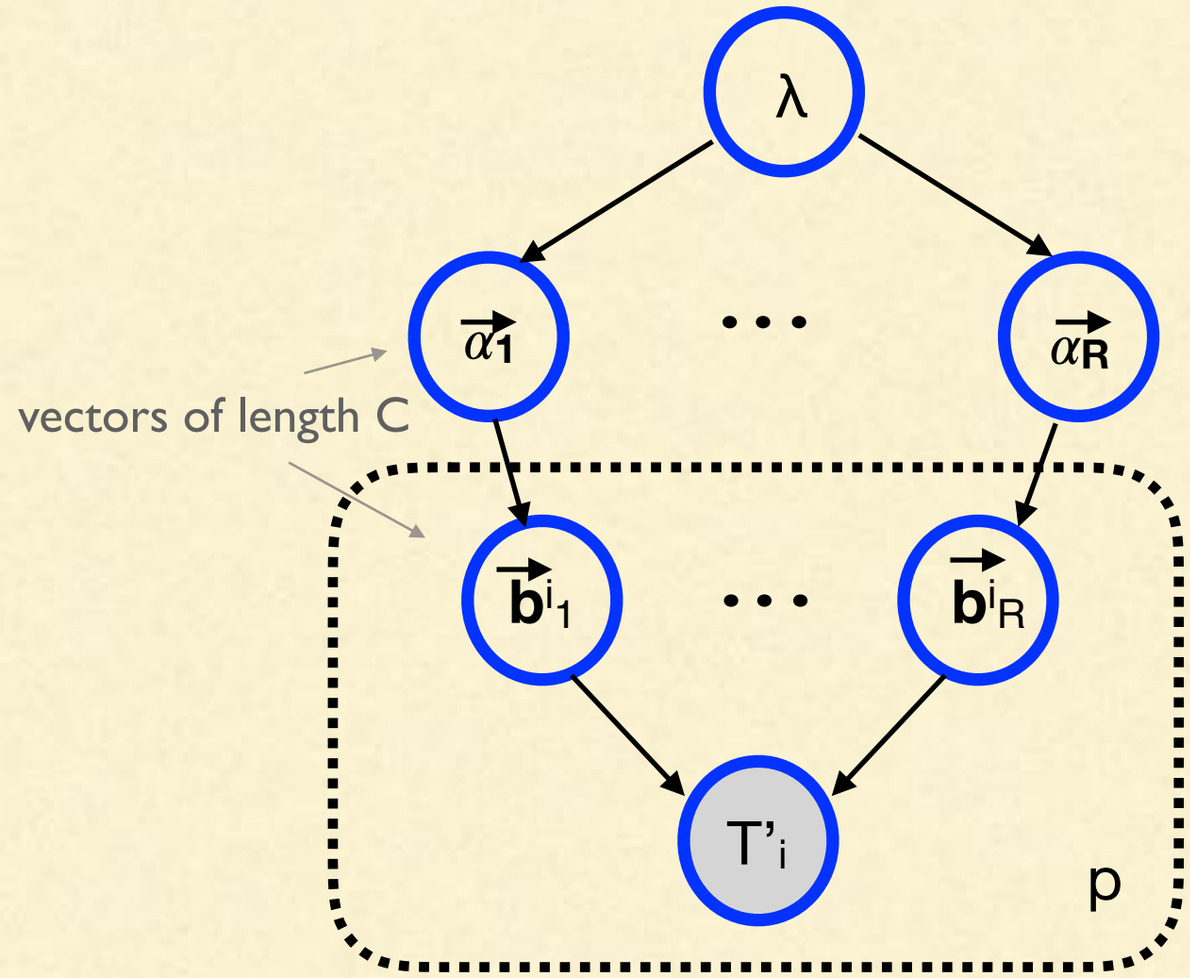
$d_1 \sim \text{Exponential}(\lambda)$
$d_2 \sim \text{Exponential}(\lambda)$

$b^i_1 \mid Z_i, d_1, \alpha, \beta \sim \text{Beta}(d_1 \exp(\alpha+\beta Z_i), d_1)$
$b^i_2 \mid Z_i, d_2, \gamma, \delta \sim \text{Beta}(d_2 \exp(\gamma+\delta Z_i), d_2)$

$\theta_i = X_i\, b_{1i} + (1-X_i)\, b^i_2$
$T'_i \sim \text{Binomial}(N_i, \theta_i)$

Note: $\log \mathbb{E}(b_{1i})/(1-\mathbb{E}(b_{1,i})) = \alpha+\beta Z_i$

# WITH MORE CATEGORIES (RXC)




$\alpha_{rc} \sim$ Exponential($\lambda_1$) i.i.d.

$b^i_r \mid \alpha_r \sim$ Dirichlet($\alpha_r$) i.i.d.

r = 1,…,R

$\theta_{ic}=X^i_r\, b^i_{1c} + X^i_R b^i_{Rc}$

c = 1… C

$T'_{ic} \sim$ Multinomial($N_i,\theta_i$)