The posterior distribution of $(\boldsymbol{\beta}, \gamma, \sigma, c)$ is given as

$$\begin{aligned}
\mathrm{p}(\boldsymbol{\beta}, \gamma, \sigma, c|\boldsymbol{Y}) &\propto L(\boldsymbol{Y}|\boldsymbol{\beta}, \gamma, \sigma, c)\pi_\beta(\beta)\pi_\gamma(\gamma)\pi_\sigma(\sigma)\pi_c(c) \\
&= \frac{1}{\prod_{i=1}^n(\boldsymbol{x}_i'\gamma)}\,\mathrm{p}\left(\epsilon_1, \ldots, \epsilon_n|\boldsymbol{\beta}, \gamma, \sigma, c\right)\pi_\beta(\beta)\pi_\gamma(\gamma)\pi_\sigma(\sigma)\pi_c(c)
\end{aligned}$$

where $\epsilon_i = (y_i - \boldsymbol{x}_i'\boldsymbol{\beta})/(\boldsymbol{x}_i'\gamma)$.

And

$$\begin{aligned}
\mathrm{p}\left(\epsilon_1, \ldots, \epsilon_n|\boldsymbol{\beta}, \gamma, \sigma, c\right) &= \prod_{i=1}^n\left(\left(\prod_{j=2}^M \frac{cj^2 + n_{\epsilon_1\cdots\epsilon_j(\epsilon_i)}(\epsilon_1, \ldots, \epsilon_{1:i-1})}{2cj^2 + n_{\epsilon_1\cdots\epsilon_{j-1}(\epsilon_i)}(\epsilon_1, \ldots, \epsilon_{1:i-1})}\right)2^{M-1}g_\sigma(\epsilon_i)\right) \\
&\leq 2^{n(M-1)}\prod_{i=1}^n g_\sigma(\epsilon_i)
\end{aligned}$$

Plug in the previous equation, it can be shown that the posterior is proper as long as it is proper under the parametric model with centering distribution G_θ when using a flat prior $p(\beta) \propto 1$.