We extend the FL symmetry as

$$q_i \to q_i + (1, \eta_q, \eta_q\xi_q, \eta_q\xi_q\rho_q)^T z_q \ , \tag{26}$$

and the mass matrices Eqs. (6) and (7) as

$$M^u = \begin{pmatrix} (B_u + C_u\xi_u + D_u\xi_u\rho_u)\eta_u^2 & -B_u\eta_u & -C_u\eta_u & -D_u\eta_u \\ -B_u\eta_u & A_u\xi_u^2 + B_u + E_u\xi_u^2\rho_u^2 & -A_u\xi_u & -E_u\xi_u\rho_u \\ -C_u\eta_u & -A_u\xi_u & A_u + \frac{C_u}{\xi_u} + F_u\xi_u^2\rho_u^3 & -F_u\xi_u^2\rho_u^2 \\ -D_u\eta_u & -E_u\xi_u\rho_u & -F_u\xi_u^2\rho_u^2 & \frac{D_u}{\xi_u\rho_u} + E_u + F_u\xi_u^2\rho_u \end{pmatrix} \tag{27}$$

and

$$M^d = \begin{pmatrix} (B_d + C_d\xi_d + D_d\xi_d\rho_d)\eta_d^2 & -B_d\eta_d & -C_d\eta_d & -D_d\eta_d \\ -B_d\eta_d & A_d\xi_d + B_d + E_d\xi_d\rho_d & -A_d & -E_d \\ -C_d\eta_d & -A_d & \frac{A_d+C_d}{\xi_d} + F_d\frac{\rho_d}{\xi_d} & -\frac{F_d}{\xi_d} \\ -D_d\eta_d & -E_d & -\frac{F_d}{\xi_d} & \frac{D_d+E_d+F_d}{\xi_d\rho_d} \end{pmatrix}, \tag{28}$$

respectively. Here, we again assume that

$$A_q \simeq B_q \simeq C_q \simeq D_q \simeq E_q \simeq F_q \quad \text{and} \quad \eta_q, \xi_q, \rho_q \ll 1 \ . \tag{29}$$

Note that we extend the model so that the mass matrices keep the features mentioned just behind Eq. (8). Since a detailed analysis goes beyond the purpose of the paper, we would like to roughly study and try to figure out their implications. Both Eqs. (27) and (28) are diagonalized by real orthogonal matrices. One can easily find that ρ_q determine the mass ratios of the fourth and third generation quarks:

$$\frac{m_t}{m_{t'}} \sim \rho_u \ , \quad \frac{m_b}{m_{b'}} \sim \rho_d \ , \tag{30}$$

where t' and b' indicate the fourth generation quarks, and all coefficients are omitted. The fourth generation quark mixings with the other three generations can also be estimated as

$$\begin{aligned} |V_{ub'}| &\simeq |V_{t'd}| \simeq |\eta_d\xi_d\rho_d| = \lambda^3|\rho_d| \ , \\ |V_{cb'}| &\simeq |V_{t's}| \simeq |\xi_d\rho_d| = \lambda^2|\rho_d| \ , \\ |V_{tb'}| &\simeq |V_{t'b}| \simeq |\rho_d| \ , \end{aligned} \tag{31}$$