Further calculations

$$P_t + \frac{\partial P_t}{\partial q_t}\, q_{it} = \frac{\partial C_{it}}{\partial q_{it}} + \sum_{s=t+1}^{T} \delta^{s-t} \left\{ \frac{\partial C_{is}}{\partial ex_{is}} \frac{\partial ex_{is}}{\partial q_{it}} - \frac{\partial P_s}{\partial q_s}\, q_{is} \sum_{j \neq i} \frac{\partial q_{js}}{\partial ex_{js}} \frac{\partial ex_{js}}{\partial q_{it}} \right\}$$

$$P_t - \frac{\partial C_{it}}{\partial q_{it}} - \sum_{s=t+1}^{T} \delta^{s-t} \left\{ \frac{\partial C_{is}}{\partial ex_{is}} \frac{\partial ex_{is}}{\partial q_{it}} \right\} = -\frac{\partial P_t}{\partial q_t}\, q_{it} - \sum_{s=t+1}^{T} \delta^{s-t} \frac{\partial P_s}{\partial q_s}\, q_{is} \sum_{j \neq i} \frac{\partial q_{js}}{\partial ex_{js}} \frac{\partial ex_{js}}{\partial q_{it}}$$

$$\frac{P_t - \frac{\partial C_{it}}{\partial q_{it}} - \sum_{s=t+1}^{T} \delta^{s-t} \left\{ \frac{\partial C_{is}}{\partial ex_{is}} \frac{\partial ex_{is}}{\partial q_{it}} \right\}}{P_t} = -\frac{\partial P_t}{\partial q_t}\, \frac{q_t}{P_t}\, s_{it} - \sum_{s=t+1}^{T} \delta^{s-t} \frac{\partial P_s}{\partial q_s} \frac{P_s}{q_s}\, s_{is}\, \frac{P_s}{P_t} \sum_{j \neq i} \frac{\partial q_{js}}{\partial ex_{js}} \frac{\partial ex_{js}}{\partial q_{it}}$$

$$\frac{P_t - \frac{\partial C_{it}}{\partial q_{it}} - \delta \left\{ \frac{\partial C_{it+1}}{\partial ex_{it+1}} \frac{\partial ex_{it+1}}{\partial q_{it}} \right\}}{P_t} = -\frac{\partial P_t}{\partial q_t}\, \frac{q_t}{P_t}\, s_{it} - \delta \frac{\partial P_{t+1}}{\partial q_{t+1}} \frac{P_{t+1}}{q_{t+1}}\, s_{it+1}\, \frac{P_{t+1}}{P_t} \sum_{j \neq i} \frac{\partial q_{jt+1}}{\partial ex_{jt+1}} \frac{\partial ex_{jt+1}}{\partial q_{it}} - \frac{FDE_i}{P_t}$$

$$\frac{P_t - DMC_{it}}{P_t} = -\beta_1 s_{it} - \beta_1\, \theta_0 s_{it+1} \frac{P_{t+1}}{P_t} - \beta_1\, \theta_1\, time_i s_{it+1} \frac{P_{t+1}}{P_t} - \frac{FDE_i}{P_t}$$