Index sets

$$HH = \{1, 2\}$$

$$SEC = \{A, B, C\}$$

1 CONSUMER $h \in HH$

1.1 Optimisation problem

$$\max_{\left(D^{\langle s,h \rangle}\right)_{s \in SEC}} U^{\langle h \rangle} = \left(\sum_{s \in SEC} \alpha^{\langle s,h \rangle} D^{\langle s,h \rangle^{\omega^{-1}(-1+\omega)}} \right)^{\omega(-1+\omega)^{-1}} \tag{1.1}$$

s.t. :

$$INC^{\langle h \rangle} + \Pi^{\langle h \rangle} = \sum_{s \in SEC} p^{\langle s \rangle} D^{\langle s,h \rangle} \quad \left(\lambda^{\mathrm{CONSUMER}^{1\,\langle h \rangle}} \right) \tag{1.2}$$

1.2 Identities

$$INC^{\langle h \rangle} = L^{\langle h \rangle} + p^{\mathrm{k}} K^{\langle h \rangle} \tag{1.3}$$

$$K^{\langle h \rangle} = ks^{\mathrm{data}\,\langle h \rangle} \tag{1.4}$$

$$L^{\langle h \rangle} = ls^{\mathrm{data}\,\langle h \rangle} \tag{1.5}$$

1.3 First order conditions

$$s \in SEC: \quad \lambda^{\mathrm{CONSUMER}^{1\,\langle h \rangle}} p^{\langle s \rangle} + \alpha^{\langle s,h \rangle} D^{\langle s,h \rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\sum_{s \in SEC} \alpha^{\langle s,h \rangle} D^{\langle s,h \rangle^{\omega^{-1}(-1+\omega)}} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \quad \left(D^{\langle s,h \rangle} \right) \tag{1.6}$$

2 FIRM $s \in SEC$

2.1 Optimisation problem

$$\max_{Y^{\langle s \rangle}, K^{\langle s \rangle}, L^{\langle s \rangle}, \left(X^{\langle si,s \rangle} \right)_{si \in SEC}} \pi^{\langle s \rangle} = -L^{\langle s \rangle} - p^{\mathrm{k}} K^{\langle s \rangle} + p^{\langle s \rangle} Y^{\langle s \rangle} - \sum_{si \in SEC} p^{\langle si \rangle} X^{\langle si,s \rangle} \tag{2.1}$$

s.t. :

$$Y^{\langle s \rangle} = \gamma^{\langle s \rangle} K^{\langle s \rangle \beta^{\mathrm{k} \langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l} \langle s \rangle}} \left(\prod_{si \in SEC} X^{\langle si,s \rangle \beta^{\mathrm{x} \langle si,s \rangle}} \right) \quad \left(\lambda^{\mathrm{FIRM}^1 \langle s \rangle} \right) \tag{2.2}$$

2.2 First order conditions

$$-\lambda^{\mathrm{FIRM}^1 \langle s \rangle} + p^{\langle s \rangle} = 0 \quad \left(Y^{\langle s \rangle} \right) \tag{2.3}$$

$$-p^{\mathrm{k}} + \beta^{\mathrm{k} \langle s \rangle} \gamma^{\langle s \rangle} \lambda^{\mathrm{FIRM}^1 \langle s \rangle} K^{\langle s \rangle -1+\beta^{\mathrm{k} \langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l} \langle s \rangle}} \left(\prod_{si \in SEC} X^{\langle si,s \rangle \beta^{\mathrm{x} \langle si,s \rangle}} \right) = 0 \quad \left(K^{\langle s \rangle} \right) \tag{2.4}$$

$$-1 + \beta^{\mathrm{l} \langle s \rangle} \gamma^{\langle s \rangle} \lambda^{\mathrm{FIRM}^1 \langle s \rangle} K^{\langle s \rangle \beta^{\mathrm{k} \langle s \rangle}} L^{\langle s \rangle -1+\beta^{\mathrm{l} \langle s \rangle}} \left(\prod_{si \in SEC} X^{\langle si,s \rangle \beta^{\mathrm{x} \langle si,s \rangle}} \right) = 0 \quad \left(L^{\langle s \rangle} \right) \tag{2.5}$$

$$si \in SEC: \quad -p^{\langle si \rangle} + \beta^{\mathrm{x} \langle si,s \rangle} \gamma^{\langle s \rangle} \lambda^{\mathrm{FIRM}^1 \langle s \rangle} X^{\langle si,s \rangle -1} K^{\langle s \rangle \beta^{\mathrm{k} \langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l} \langle s \rangle}} \left(\prod_{si' \in SEC} X^{\langle si',s \rangle \beta^{\mathrm{x} \langle si',s \rangle}} \right) = 0 \quad \left(X^{\langle si,s \rangle} \right) \tag{2.6}$$

2.3 First order conditions after reduction

$$-p^{\mathrm{k}} + \beta^{\mathrm{k} \langle s \rangle} \gamma^{\langle s \rangle} p^{\langle s \rangle} K^{\langle s \rangle -1+\beta^{\mathrm{k} \langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l} \langle s \rangle}} \left(\prod_{si \in SEC} X^{\langle si,s \rangle \beta^{\mathrm{x} \langle si,s \rangle}} \right) = 0 \quad \left(K^{\langle s \rangle} \right) \tag{2.7}$$

$$-1 + \beta^{\mathrm{l} \langle s \rangle} \gamma^{\langle s \rangle} p^{\langle s \rangle} K^{\langle s \rangle \beta^{\mathrm{k} \langle s \rangle}} L^{\langle s \rangle -1+\beta^{\mathrm{l} \langle s \rangle}} \left(\prod_{si \in SEC} X^{\langle si,s \rangle \beta^{\mathrm{x} \langle si,s \rangle}} \right) = 0 \quad \left(L^{\langle s \rangle} \right) \tag{2.8}$$

$$si \in SEC: \quad -p^{\langle si \rangle} + \beta^{\mathrm{x} \langle si,s \rangle} \gamma^{\langle s \rangle} p^{\langle s \rangle} X^{\langle si,s \rangle -1} K^{\langle s \rangle \beta^{\mathrm{k} \langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l} \langle s \rangle}} \left(\prod_{si' \in SEC} X^{\langle si',s \rangle \beta^{\mathrm{x} \langle si',s \rangle}} \right) = 0 \quad \left(\left(X^{\langle si,s \rangle} \right)_{si \in SEC} \right) \tag{2.9}$$

3 EQUILIBRIUM

3.1 Identities

$$\sum_{h \in HH} K^{\langle h \rangle} = \sum_{s \in SEC} K^{\langle s \rangle} \tag{3.1}$$

$$s \in SEC: \quad p^{\langle s \rangle} = 1 \tag{3.2}$$

$$h \in HH: \quad \Pi^{\langle h \rangle} = \pi^{\mathrm{h}\,\langle h \rangle} \left(\sum_{s \in SEC} \pi^{\langle s \rangle} \right) \tag{3.3}$$

4 Equilibrium relationships (before expansion and reduction)

$$- \sum_{h \in HH} K^{\langle h \rangle} + \sum_{s \in SEC} K^{\langle s \rangle} = 0 \tag{4.1}$$

$$h \in HH: \quad ks^{\mathrm{data}\,\langle h \rangle} - K^{\langle h \rangle} = 0 \tag{4.2}$$

$$h \in HH: \quad ls^{\mathrm{data}\,\langle h \rangle} - L^{\langle h \rangle} = 0 \tag{4.3}$$

$$h \in HH: \quad - \Pi^{\langle h \rangle} + \pi^{\mathrm{h}\,\langle h \rangle} \left(\sum_{s \in SEC} \pi^{\langle s \rangle} \right) = 0 \tag{4.4}$$

$$h \in HH: \quad U^{\langle h \rangle} - \left(\sum_{s \in SEC} \alpha^{\langle s,h \rangle} D^{\langle s,h \rangle^{\omega^{-1}(-1+\omega)}} \right)^{\omega(-1+\omega)^{-1}} = 0 \tag{4.5}$$

$$h \in HH: \quad - INC^{\langle h \rangle} + L^{\langle h \rangle} + p^{\mathrm{k}} K^{\langle h \rangle} = 0 \tag{4.6}$$

$$h \in HH: \quad - INC^{\langle h \rangle} - \Pi^{\langle h \rangle} + \sum_{s \in SEC} p^{\langle s \rangle} D^{\langle s,h \rangle} = 0 \tag{4.7}$$

$$h \in HH: \quad s \in SEC: \quad \lambda^{\mathrm{CONSUMER1}\,\langle h \rangle} p^{\langle s \rangle} + \alpha^{\langle s,h \rangle} D^{\langle s,h \rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\sum_{s \in SEC} \alpha^{\langle s,h \rangle} D^{\langle s,h \rangle^{\omega^{-1}(-1+\omega)}} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{4.8}$$

$$s \in SEC: \quad -1 + \beta^{\mathrm{l}\,\langle s \rangle} \gamma^{\langle s \rangle} p^{\langle s \rangle} K^{\langle s \rangle^{\beta^{\mathrm{k}\,\langle s \rangle}}} L^{\langle s \rangle^{-1+\beta^{\mathrm{l}\,\langle s \rangle}}} \left(\prod_{si \in SEC} X^{\langle si,s \rangle^{\beta^{\mathrm{x}\,\langle si,s \rangle}}} \right) = 0 \tag{4.9}$$

$$s \in SEC\colon \quad 1 - p^{\langle s \rangle} = 0 \tag{4.10}$$

$$s \in SEC\colon \quad -p^{\mathrm{k}} + \beta^{\mathrm{k}\,\langle s \rangle} \gamma^{\langle s \rangle} p^{\langle s \rangle} K^{\langle s \rangle -1 + \beta^{\mathrm{k}\,\langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l}\,\langle s \rangle}} \left(\prod_{si \in SEC} X^{\langle si,s \rangle \beta^{\mathrm{x}\,\langle si,s \rangle}} \right) = 0 \tag{4.11}$$

$$s \in SEC\colon \quad -Y^{\langle s \rangle} + \gamma^{\langle s \rangle} K^{\langle s \rangle \beta^{\mathrm{k}\,\langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l}\,\langle s \rangle}} \left(\prod_{si \in SEC} X^{\langle si,s \rangle \beta^{\mathrm{x}\,\langle si,s \rangle}} \right) = 0 \tag{4.12}$$

$$s \in SEC\colon \quad \pi^{\langle s \rangle} + L^{\langle s \rangle} + p^{\mathrm{k}} K^{\langle s \rangle} - p^{\langle s \rangle} Y^{\langle s \rangle} + \sum_{si \in SEC} p^{\langle si \rangle} X^{\langle si,s \rangle} = 0 \tag{4.13}$$

$$s \in SEC\colon \quad si \in SEC\colon \quad -p^{\langle si \rangle} + \beta^{\mathrm{x}\,\langle si,s \rangle} \gamma^{\langle s \rangle} p^{\langle s \rangle} X^{\langle si,s \rangle -1} K^{\langle s \rangle \beta^{\mathrm{k}\,\langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l}\,\langle s \rangle}} \left(\prod_{si' \in SEC} X^{\langle si',s \rangle \beta^{\mathrm{x}\,\langle si',s \rangle}} \right) = 0 \tag{4.14}$$

5 Equilibrium relationships (after expansion and reduction)

$$-1 + \beta^{\mathrm{l}\,\langle \mathrm{A} \rangle} \gamma^{\langle \mathrm{A} \rangle} p^{\langle \mathrm{A} \rangle} K^{\langle \mathrm{A} \rangle \beta^{\mathrm{k}\,\langle \mathrm{A} \rangle}} L^{\langle \mathrm{A} \rangle -1 + \beta^{\mathrm{l}\,\langle \mathrm{A} \rangle}} X^{\langle \mathrm{A,A} \rangle \beta^{\mathrm{x}\,\langle \mathrm{A,A} \rangle}} X^{\langle \mathrm{B,A} \rangle \beta^{\mathrm{x}\,\langle \mathrm{B,A} \rangle}} X^{\langle \mathrm{C,A} \rangle \beta^{\mathrm{x}\,\langle \mathrm{C,A} \rangle}} = 0 \tag{5.1}$$

$$-1 + \beta^{\mathrm{l}\,\langle \mathrm{B} \rangle} \gamma^{\langle \mathrm{B} \rangle} p^{\langle \mathrm{B} \rangle} K^{\langle \mathrm{B} \rangle \beta^{\mathrm{k}\,\langle \mathrm{B} \rangle}} L^{\langle \mathrm{B} \rangle -1 + \beta^{\mathrm{l}\,\langle \mathrm{B} \rangle}} X^{\langle \mathrm{A,B} \rangle \beta^{\mathrm{x}\,\langle \mathrm{A,B} \rangle}} X^{\langle \mathrm{B,B} \rangle \beta^{\mathrm{x}\,\langle \mathrm{B,B} \rangle}} X^{\langle \mathrm{C,B} \rangle \beta^{\mathrm{x}\,\langle \mathrm{C,B} \rangle}} = 0 \tag{5.2}$$

$$-1 + \beta^{\mathrm{l}\,\langle \mathrm{C} \rangle} \gamma^{\langle \mathrm{C} \rangle} p^{\langle \mathrm{C} \rangle} K^{\langle \mathrm{C} \rangle \beta^{\mathrm{k}\,\langle \mathrm{C} \rangle}} L^{\langle \mathrm{C} \rangle -1 + \beta^{\mathrm{l}\,\langle \mathrm{C} \rangle}} X^{\langle \mathrm{A,C} \rangle \beta^{\mathrm{x}\,\langle \mathrm{A,C} \rangle}} X^{\langle \mathrm{B,C} \rangle \beta^{\mathrm{x}\,\langle \mathrm{B,C} \rangle}} X^{\langle \mathrm{C,C} \rangle \beta^{\mathrm{x}\,\langle \mathrm{C,C} \rangle}} = 0 \tag{5.3}$$

$$1 - p^{\langle \mathrm{A} \rangle} = 0 \tag{5.4}$$

$$1 - p^{\langle \mathrm{B} \rangle} = 0 \tag{5.5}$$

$$1 - p^{\langle \mathrm{C} \rangle} = 0 \tag{5.6}$$

$$ks^{\mathrm{data}\,\langle 1 \rangle} - K^{\langle 1 \rangle} = 0 \tag{5.7}$$

$$ks^{\mathrm{data}\,\langle 2 \rangle} - K^{\langle 2 \rangle} = 0 \tag{5.8}$$

$$ls^{\mathrm{data}\,\langle 1 \rangle} - L^{\langle 1 \rangle} = 0 \tag{5.9}$$

$$ls^{\text{data}\langle 2\rangle} - L^{\langle 2\rangle} = 0 \tag{5.10}$$

$$-p^{\text{k}} + \beta^{\text{k}\langle A\rangle}\gamma^{\langle A\rangle}p^{\langle A\rangle}K^{\langle A\rangle^{-1+\beta^{\text{k}\langle A\rangle}}}L^{\langle A\rangle^{\beta^{\text{l}\langle A\rangle}}}X^{\langle A,A\rangle^{\beta^{\text{x}\langle A,A\rangle}}}X^{\langle B,A\rangle^{\beta^{\text{x}\langle B,A\rangle}}}X^{\langle C,A\rangle^{\beta^{\text{x}\langle C,A\rangle}}} = 0 \tag{5.11}$$

$$-p^{\text{k}} + \beta^{\text{k}\langle B\rangle}\gamma^{\langle B\rangle}p^{\langle B\rangle}K^{\langle B\rangle^{-1+\beta^{\text{k}\langle B\rangle}}}L^{\langle B\rangle^{\beta^{\text{l}\langle B\rangle}}}X^{\langle A,B\rangle^{\beta^{\text{x}\langle A,B\rangle}}}X^{\langle B,B\rangle^{\beta^{\text{x}\langle B,B\rangle}}}X^{\langle C,B\rangle^{\beta^{\text{x}\langle C,B\rangle}}} = 0 \tag{5.12}$$

$$-p^{\text{k}} + \beta^{\text{k}\langle C\rangle}\gamma^{\langle C\rangle}p^{\langle C\rangle}K^{\langle C\rangle^{-1+\beta^{\text{k}\langle C\rangle}}}L^{\langle C\rangle^{\beta^{\text{l}\langle C\rangle}}}X^{\langle A,C\rangle^{\beta^{\text{x}\langle A,C\rangle}}}X^{\langle B,C\rangle^{\beta^{\text{x}\langle B,C\rangle}}}X^{\langle C,C\rangle^{\beta^{\text{x}\langle C,C\rangle}}} = 0 \tag{5.13}$$

$$-p^{\langle A\rangle} + \beta^{\text{x}\langle A,A\rangle}\gamma^{\langle A\rangle}p^{\langle A\rangle}X^{\langle A,A\rangle^{-1}}K^{\langle A\rangle^{\beta^{\text{k}\langle A\rangle}}}L^{\langle A\rangle^{\beta^{\text{l}\langle A\rangle}}}X^{\langle A,A\rangle^{\beta^{\text{x}\langle A,A\rangle}}}X^{\langle B,A\rangle^{\beta^{\text{x}\langle B,A\rangle}}}X^{\langle C,A\rangle^{\beta^{\text{x}\langle C,A\rangle}}} = 0 \tag{5.14}$$

$$-p^{\langle A\rangle} + \beta^{\text{x}\langle A,B\rangle}\gamma^{\langle B\rangle}p^{\langle B\rangle}X^{\langle A,B\rangle^{-1}}K^{\langle B\rangle^{\beta^{\text{k}\langle B\rangle}}}L^{\langle B\rangle^{\beta^{\text{l}\langle B\rangle}}}X^{\langle A,B\rangle^{\beta^{\text{x}\langle A,B\rangle}}}X^{\langle B,B\rangle^{\beta^{\text{x}\langle B,B\rangle}}}X^{\langle C,B\rangle^{\beta^{\text{x}\langle C,B\rangle}}} = 0 \tag{5.15}$$

$$-p^{\langle A\rangle} + \beta^{\text{x}\langle A,C\rangle}\gamma^{\langle C\rangle}p^{\langle C\rangle}X^{\langle A,C\rangle^{-1}}K^{\langle C\rangle^{\beta^{\text{k}\langle C\rangle}}}L^{\langle C\rangle^{\beta^{\text{l}\langle C\rangle}}}X^{\langle A,C\rangle^{\beta^{\text{x}\langle A,C\rangle}}}X^{\langle B,C\rangle^{\beta^{\text{x}\langle B,C\rangle}}}X^{\langle C,C\rangle^{\beta^{\text{x}\langle C,C\rangle}}} = 0 \tag{5.16}$$

$$-p^{\langle B\rangle} + \beta^{\text{x}\langle B,A\rangle}\gamma^{\langle A\rangle}p^{\langle A\rangle}X^{\langle B,A\rangle^{-1}}K^{\langle A\rangle^{\beta^{\text{k}\langle A\rangle}}}L^{\langle A\rangle^{\beta^{\text{l}\langle A\rangle}}}X^{\langle A,A\rangle^{\beta^{\text{x}\langle A,A\rangle}}}X^{\langle B,A\rangle^{\beta^{\text{x}\langle B,A\rangle}}}X^{\langle C,A\rangle^{\beta^{\text{x}\langle C,A\rangle}}} = 0 \tag{5.17}$$

$$-p^{\langle B\rangle} + \beta^{\text{x}\langle B,B\rangle}\gamma^{\langle B\rangle}p^{\langle B\rangle}X^{\langle B,B\rangle^{-1}}K^{\langle B\rangle^{\beta^{\text{k}\langle B\rangle}}}L^{\langle B\rangle^{\beta^{\text{l}\langle B\rangle}}}X^{\langle A,B\rangle^{\beta^{\text{x}\langle A,B\rangle}}}X^{\langle B,B\rangle^{\beta^{\text{x}\langle B,B\rangle}}}X^{\langle C,B\rangle^{\beta^{\text{x}\langle C,B\rangle}}} = 0 \tag{5.18}$$

$$-p^{\langle B\rangle} + \beta^{\text{x}\langle B,C\rangle}\gamma^{\langle C\rangle}p^{\langle C\rangle}X^{\langle B,C\rangle^{-1}}K^{\langle C\rangle^{\beta^{\text{k}\langle C\rangle}}}L^{\langle C\rangle^{\beta^{\text{l}\langle C\rangle}}}X^{\langle A,C\rangle^{\beta^{\text{x}\langle A,C\rangle}}}X^{\langle B,C\rangle^{\beta^{\text{x}\langle B,C\rangle}}}X^{\langle C,C\rangle^{\beta^{\text{x}\langle C,C\rangle}}} = 0 \tag{5.19}$$

$$-p^{\langle C\rangle} + \beta^{\text{x}\langle C,A\rangle}\gamma^{\langle A\rangle}p^{\langle A\rangle}X^{\langle C,A\rangle^{-1}}K^{\langle A\rangle^{\beta^{\text{k}\langle A\rangle}}}L^{\langle A\rangle^{\beta^{\text{l}\langle A\rangle}}}X^{\langle A,A\rangle^{\beta^{\text{x}\langle A,A\rangle}}}X^{\langle B,A\rangle^{\beta^{\text{x}\langle B,A\rangle}}}X^{\langle C,A\rangle^{\beta^{\text{x}\langle C,A\rangle}}} = 0 \tag{5.20}$$

$$-p^{\langle C\rangle} + \beta^{\text{x}\langle C,B\rangle}\gamma^{\langle B\rangle}p^{\langle B\rangle}X^{\langle C,B\rangle^{-1}}K^{\langle B\rangle^{\beta^{\text{k}\langle B\rangle}}}L^{\langle B\rangle^{\beta^{\text{l}\langle B\rangle}}}X^{\langle A,B\rangle^{\beta^{\text{x}\langle A,B\rangle}}}X^{\langle B,B\rangle^{\beta^{\text{x}\langle B,B\rangle}}}X^{\langle C,B\rangle^{\beta^{\text{x}\langle C,B\rangle}}} = 0 \tag{5.21}$$

$$-p^{\langle C\rangle} + \beta^{\text{x}\langle C,C\rangle}\gamma^{\langle C\rangle}p^{\langle C\rangle}X^{\langle C,C\rangle^{-1}}K^{\langle C\rangle^{\beta^{\text{k}\langle C\rangle}}}L^{\langle C\rangle^{\beta^{\text{l}\langle C\rangle}}}X^{\langle A,C\rangle^{\beta^{\text{x}\langle A,C\rangle}}}X^{\langle B,C\rangle^{\beta^{\text{x}\langle B,C\rangle}}}X^{\langle C,C\rangle^{\beta^{\text{x}\langle C,C\rangle}}} = 0 \tag{5.22}$$

$$-\Pi^{\langle 1\rangle} + \pi^{\text{h}\langle 1\rangle}\left(\pi^{\langle A\rangle} + \pi^{\langle B\rangle} + \pi^{\langle C\rangle}\right) = 0 \tag{5.23}$$

$$-\Pi^{\langle 2\rangle} + \pi^{\text{h}\langle 2\rangle}\left(\pi^{\langle A\rangle} + \pi^{\langle B\rangle} + \pi^{\langle C\rangle}\right) = 0 \tag{5.24}$$

$$U^{\langle 1\rangle} - \left(\alpha^{\langle \mathrm{A},1\rangle} D^{\langle \mathrm{A},1\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B},1\rangle} D^{\langle \mathrm{B},1\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C},1\rangle} D^{\langle \mathrm{C},1\rangle^{\omega^{-1}(-1+\omega)}}\right)^{\omega(-1+\omega)^{-1}} = 0 \tag{5.25}$$

$$U^{\langle 2\rangle} - \left(\alpha^{\langle \mathrm{A},2\rangle} D^{\langle \mathrm{A},2\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B},2\rangle} D^{\langle \mathrm{B},2\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C},2\rangle} D^{\langle \mathrm{C},2\rangle^{\omega^{-1}(-1+\omega)}}\right)^{\omega(-1+\omega)^{-1}} = 0 \tag{5.26}$$

$$-Y^{\langle \mathrm{A}\rangle} + \gamma^{\langle \mathrm{A}\rangle} K^{\langle \mathrm{A}\rangle^{\beta^{\mathrm{k}\langle \mathrm{A}\rangle}}} L^{\langle \mathrm{A}\rangle^{\beta^{\mathrm{l}\langle \mathrm{A}\rangle}}} X^{\langle \mathrm{A},\mathrm{A}\rangle^{\beta^{\mathrm{x}\langle \mathrm{A},\mathrm{A}\rangle}}} X^{\langle \mathrm{B},\mathrm{A}\rangle^{\beta^{\mathrm{x}\langle \mathrm{B},\mathrm{A}\rangle}}} X^{\langle \mathrm{C},\mathrm{A}\rangle^{\beta^{\mathrm{x}\langle \mathrm{C},\mathrm{A}\rangle}}} = 0 \tag{5.27}$$

$$-Y^{\langle \mathrm{B}\rangle} + \gamma^{\langle \mathrm{B}\rangle} K^{\langle \mathrm{B}\rangle^{\beta^{\mathrm{k}\langle \mathrm{B}\rangle}}} L^{\langle \mathrm{B}\rangle^{\beta^{\mathrm{l}\langle \mathrm{B}\rangle}}} X^{\langle \mathrm{A},\mathrm{B}\rangle^{\beta^{\mathrm{x}\langle \mathrm{A},\mathrm{B}\rangle}}} X^{\langle \mathrm{B},\mathrm{B}\rangle^{\beta^{\mathrm{x}\langle \mathrm{B},\mathrm{B}\rangle}}} X^{\langle \mathrm{C},\mathrm{B}\rangle^{\beta^{\mathrm{x}\langle \mathrm{C},\mathrm{B}\rangle}}} = 0 \tag{5.28}$$

$$-Y^{\langle \mathrm{C}\rangle} + \gamma^{\langle \mathrm{C}\rangle} K^{\langle \mathrm{C}\rangle^{\beta^{\mathrm{k}\langle \mathrm{C}\rangle}}} L^{\langle \mathrm{C}\rangle^{\beta^{\mathrm{l}\langle \mathrm{C}\rangle}}} X^{\langle \mathrm{A},\mathrm{C}\rangle^{\beta^{\mathrm{x}\langle \mathrm{A},\mathrm{C}\rangle}}} X^{\langle \mathrm{B},\mathrm{C}\rangle^{\beta^{\mathrm{x}\langle \mathrm{B},\mathrm{C}\rangle}}} X^{\langle \mathrm{C},\mathrm{C}\rangle^{\beta^{\mathrm{x}\langle \mathrm{C},\mathrm{C}\rangle}}} = 0 \tag{5.29}$$

$$\lambda^{\mathrm{CONSUMER}^1\langle 1\rangle} p^{\langle \mathrm{A}\rangle} + \alpha^{\langle \mathrm{A},1\rangle} D^{\langle \mathrm{A},1\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle \mathrm{A},1\rangle} D^{\langle \mathrm{A},1\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B},1\rangle} D^{\langle \mathrm{B},1\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C},1\rangle} D^{\langle \mathrm{C},1\rangle^{\omega^{-1}(-1+\omega)}}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.30}$$

$$\lambda^{\mathrm{CONSUMER}^1\langle 1\rangle} p^{\langle \mathrm{B}\rangle} + \alpha^{\langle \mathrm{B},1\rangle} D^{\langle \mathrm{B},1\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle \mathrm{A},1\rangle} D^{\langle \mathrm{A},1\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B},1\rangle} D^{\langle \mathrm{B},1\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C},1\rangle} D^{\langle \mathrm{C},1\rangle^{\omega^{-1}(-1+\omega)}}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.31}$$

$$\lambda^{\mathrm{CONSUMER}^1\langle 1\rangle} p^{\langle \mathrm{C}\rangle} + \alpha^{\langle \mathrm{C},1\rangle} D^{\langle \mathrm{C},1\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle \mathrm{A},1\rangle} D^{\langle \mathrm{A},1\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B},1\rangle} D^{\langle \mathrm{B},1\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C},1\rangle} D^{\langle \mathrm{C},1\rangle^{\omega^{-1}(-1+\omega)}}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.32}$$

$$\lambda^{\mathrm{CONSUMER}^1\langle 2\rangle} p^{\langle \mathrm{A}\rangle} + \alpha^{\langle \mathrm{A},2\rangle} D^{\langle \mathrm{A},2\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle \mathrm{A},2\rangle} D^{\langle \mathrm{A},2\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B},2\rangle} D^{\langle \mathrm{B},2\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C},2\rangle} D^{\langle \mathrm{C},2\rangle^{\omega^{-1}(-1+\omega)}}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.33}$$

$$\lambda^{\mathrm{CONSUMER}^1\langle 2\rangle} p^{\langle \mathrm{B}\rangle} + \alpha^{\langle \mathrm{B},2\rangle} D^{\langle \mathrm{B},2\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle \mathrm{A},2\rangle} D^{\langle \mathrm{A},2\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B},2\rangle} D^{\langle \mathrm{B},2\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C},2\rangle} D^{\langle \mathrm{C},2\rangle^{\omega^{-1}(-1+\omega)}}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.34}$$

$$\lambda^{\mathrm{CONSUMER}^1\langle 2\rangle} p^{\langle \mathrm{C}\rangle} + \alpha^{\langle \mathrm{C},2\rangle} D^{\langle \mathrm{C},2\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle \mathrm{A},2\rangle} D^{\langle \mathrm{A},2\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B},2\rangle} D^{\langle \mathrm{B},2\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C},2\rangle} D^{\langle \mathrm{C},2\rangle^{\omega^{-1}(-1+\omega)}}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.35}$$

$$-INC^{\langle 1\rangle} + L^{\langle 1\rangle} + p^{\mathrm{k}} K^{\langle 1\rangle} = 0 \tag{5.36}$$

$$-INC^{\langle 2\rangle} + L^{\langle 2\rangle} + p^{\mathrm{k}} K^{\langle 2\rangle} = 0 \tag{5.37}$$

$$-INC^{\langle 1\rangle} - \Pi^{\langle 1\rangle} + p^{\langle \mathrm{A}\rangle} D^{\langle \mathrm{A},1\rangle} + p^{\langle \mathrm{B}\rangle} D^{\langle \mathrm{B},1\rangle} + p^{\langle \mathrm{C}\rangle} D^{\langle \mathrm{C},1\rangle} = 0 \tag{5.38}$$

$$-INC^{\langle 2 \rangle} - \Pi^{\langle 2 \rangle} + p^{\langle A \rangle} D^{\langle A,2 \rangle} + p^{\langle B \rangle} D^{\langle B,2 \rangle} + p^{\langle C \rangle} D^{\langle C,2 \rangle} = 0 \tag{5.39}$$

$$-K^{\langle 1 \rangle} - K^{\langle 2 \rangle} + K^{\langle A \rangle} + K^{\langle B \rangle} + K^{\langle C \rangle} = 0 \tag{5.40}$$

$$\pi^{\langle A \rangle} + L^{\langle A \rangle} + p^k K^{\langle A \rangle} + p^{\langle A \rangle} X^{\langle A,A \rangle} - p^{\langle A \rangle} Y^{\langle A \rangle} + p^{\langle B \rangle} X^{\langle B,A \rangle} + p^{\langle C \rangle} X^{\langle C,A \rangle} = 0 \tag{5.41}$$

$$\pi^{\langle B \rangle} + L^{\langle B \rangle} + p^k K^{\langle B \rangle} + p^{\langle A \rangle} X^{\langle A,B \rangle} + p^{\langle B \rangle} X^{\langle B,B \rangle} - p^{\langle B \rangle} Y^{\langle B \rangle} + p^{\langle C \rangle} X^{\langle C,B \rangle} = 0 \tag{5.42}$$

$$\pi^{\langle C \rangle} + L^{\langle C \rangle} + p^k K^{\langle C \rangle} + p^{\langle A \rangle} X^{\langle A,C \rangle} + p^{\langle B \rangle} X^{\langle B,C \rangle} + p^{\langle C \rangle} X^{\langle C,C \rangle} - p^{\langle C \rangle} Y^{\langle C \rangle} = 0 \tag{5.43}$$

6 Calibrating equations

$$-d^{\text{data}\langle B,1 \rangle} + D^{\langle B,1 \rangle} = 0 \tag{6.1}$$

$$-d^{\text{data}\langle B,2 \rangle} + D^{\langle B,2 \rangle} = 0 \tag{6.2}$$

$$-d^{\text{data}\langle C,1 \rangle} + D^{\langle C,1 \rangle} = 0 \tag{6.3}$$

$$-d^{\text{data}\langle C,2 \rangle} + D^{\langle C,2 \rangle} = 0 \tag{6.4}$$

$$-l^{\text{data}\langle A \rangle} + L^{\langle A \rangle} = 0 \tag{6.5}$$

$$-l^{\text{data}\langle B \rangle} + L^{\langle B \rangle} = 0 \tag{6.6}$$

$$-l^{\text{data}\langle C \rangle} + L^{\langle C \rangle} = 0 \tag{6.7}$$

$$-x^{\text{data}\langle A,A \rangle} + X^{\langle A,A \rangle} = 0 \tag{6.8}$$

$$-x^{\text{data}\langle A,B \rangle} + X^{\langle A,B \rangle} = 0 \tag{6.9}$$

$$-x^{\text{data}\langle A,C \rangle} + X^{\langle A,C \rangle} = 0 \tag{6.10}$$

$$-x^{\text{data}\langle \text{B,A}\rangle} + X^{\langle \text{B,A}\rangle} = 0 \tag{6.11}$$

$$-x^{\text{data}\langle \text{B,B}\rangle} + X^{\langle \text{B,B}\rangle} = 0 \tag{6.12}$$

$$-x^{\text{data}\langle \text{B,C}\rangle} + X^{\langle \text{B,C}\rangle} = 0 \tag{6.13}$$

$$-x^{\text{data}\langle \text{C,A}\rangle} + X^{\langle \text{C,A}\rangle} = 0 \tag{6.14}$$

$$-x^{\text{data}\langle \text{C,B}\rangle} + X^{\langle \text{C,B}\rangle} = 0 \tag{6.15}$$

$$-x^{\text{data}\langle \text{C,C}\rangle} + X^{\langle \text{C,C}\rangle} = 0 \tag{6.16}$$

$$-y^{\text{data}\langle \text{A}\rangle} + Y^{\langle \text{A}\rangle} = 0 \tag{6.17}$$

$$-y^{\text{data}\langle \text{B}\rangle} + Y^{\langle \text{B}\rangle} = 0 \tag{6.18}$$

$$-y^{\text{data}\langle \text{C}\rangle} + Y^{\langle \text{C}\rangle} = 0 \tag{6.19}$$

$$-1 + \pi^{\text{h}\langle 1\rangle} + \pi^{\text{h}\langle 2\rangle} = 0 \tag{6.20}$$

$$-1 + \alpha^{\langle \text{A},1\rangle\omega} + \alpha^{\langle \text{B},1\rangle\omega} + \alpha^{\langle \text{C},1\rangle\omega} = 0 \tag{6.21}$$

$$-1 + \alpha^{\langle \text{A},2\rangle\omega} + \alpha^{\langle \text{B},2\rangle\omega} + \alpha^{\langle \text{C},2\rangle\omega} = 0 \tag{6.22}$$

$$-1 + \beta^{\text{k}\langle \text{A}\rangle} + \beta^{\text{l}\langle \text{A}\rangle} + \beta^{\text{x}\langle \text{A,A}\rangle} + \beta^{\text{x}\langle \text{B,A}\rangle} + \beta^{\text{x}\langle \text{C,A}\rangle} = 0 \tag{6.23}$$

$$-1 + \beta^{\text{k}\langle \text{B}\rangle} + \beta^{\text{l}\langle \text{B}\rangle} + \beta^{\text{x}\langle \text{A,B}\rangle} + \beta^{\text{x}\langle \text{B,B}\rangle} + \beta^{\text{x}\langle \text{C,B}\rangle} = 0 \tag{6.24}$$

$$-1 + \beta^{\text{k}\langle \text{C}\rangle} + \beta^{\text{l}\langle \text{C}\rangle} + \beta^{\text{x}\langle \text{A,C}\rangle} + \beta^{\text{x}\langle \text{B,C}\rangle} + \beta^{\text{x}\langle \text{C,C}\rangle} = 0 \tag{6.25}$$

7 Equilibrium values

	Equilibrium value
p^{k}	1
$\lambda^{\mathrm{CONSUMER}^1\langle 1\rangle}$	-1
$\lambda^{\mathrm{CONSUMER}^1\langle 2\rangle}$	-1
$p^{\langle A\rangle}$	1
$p^{\langle B\rangle}$	1
$p^{\langle C\rangle}$	1
$\pi^{\langle A\rangle}$	0
$\pi^{\langle B\rangle}$	0
$\pi^{\langle C\rangle}$	0
$D^{\langle A,1\rangle}$	52.94
$D^{\langle A,2\rangle}$	64.45
$D^{\langle B,1\rangle}$	11.7
$D^{\langle B,2\rangle}$	30.79
$D^{\langle C,1\rangle}$	18.6
$D^{\langle C,2\rangle}$	43.6
$INC^{\langle 1\rangle}$	83.24
$INC^{\langle 2\rangle}$	138.84
$K^{\langle 1\rangle}$	65.07
$K^{\langle 2\rangle}$	68.77
$K^{\langle A\rangle}$	38.1
$K^{\langle B\rangle}$	35.01
$K^{\langle C\rangle}$	60.73
$L^{\langle 1\rangle}$	18.17
$L^{\langle 2\rangle}$	70.07
$L^{\langle A\rangle}$	9.44
$L^{\langle B\rangle}$	31.6
$L^{\langle C\rangle}$	47.2
$\Pi^{\langle 1\rangle}$	0
$\Pi^{\langle 2\rangle}$	0
$U^{\langle 1\rangle}$	83.24
$U^{\langle 2\rangle}$	138.84
$X^{\langle A,A\rangle}$	68.4
$X^{\langle A,B\rangle}$	131.01
$X^{\langle A,C\rangle}$	28.28
$X^{\langle B,A\rangle}$	111.91
$X^{\langle B,B\rangle}$	92.3
$X^{\langle B,C\rangle}$	86.92
$X^{\langle C,A\rangle}$	117.23
$X^{\langle C,B\rangle}$	43.7
$X^{\langle C,C\rangle}$	111.65
$Y^{\langle A\rangle}$	345.08
$Y^{\langle B\rangle}$	333.62
$Y^{\langle C\rangle}$	334.78

8   Model parameters

	Value
$\alpha^{\langle A,1 \rangle}$	0.7975
$\alpha^{\langle A,2 \rangle}$	0.6813
$\alpha^{\langle B,1 \rangle}$	0.3749
$\alpha^{\langle B,2 \rangle}$	0.4709
$\alpha^{\langle C,1 \rangle}$	0.4727
$\alpha^{\langle C,2 \rangle}$	0.5604
$\beta^{\mathrm{k}\langle A \rangle}$	0.1104
$\beta^{\mathrm{k}\langle B \rangle}$	0.1049
$\beta^{\mathrm{k}\langle C \rangle}$	0.1814
$\beta^{\mathrm{l}\langle A \rangle}$	0.0274
$\beta^{\mathrm{l}\langle B \rangle}$	0.0947
$\beta^{\mathrm{l}\langle C \rangle}$	0.141
$\beta^{\mathrm{x}\langle A,A \rangle}$	0.1982
$\beta^{\mathrm{x}\langle A,B \rangle}$	0.3927
$\beta^{\mathrm{x}\langle A,C \rangle}$	0.0845
$\beta^{\mathrm{x}\langle B,A \rangle}$	0.3243
$\beta^{\mathrm{x}\langle B,B \rangle}$	0.2767
$\beta^{\mathrm{x}\langle B,C \rangle}$	0.2596
$\beta^{\mathrm{x}\langle C,A \rangle}$	0.3397
$\beta^{\mathrm{x}\langle C,B \rangle}$	0.131
$\beta^{\mathrm{x}\langle C,C \rangle}$	0.3335
$\gamma^{\langle A \rangle}$	4.0329
$\gamma^{\langle B \rangle}$	4.2572
$\gamma^{\langle C \rangle}$	4.5311
$\pi^{\mathrm{h}\langle 1 \rangle}$	0.5