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Index sets

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

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

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

$$\max_{Y^{\langle s\rangle},K^{\langle s\rangle},L^{\langle s\rangle},Y^{\mathrm{VA}\langle s\rangle},Y^{\mathrm{INT}\langle s\rangle}} \pi^{\langle s\rangle} = -L^{\langle s\rangle} - p^{\mathrm{k}} K^{\langle s\rangle} + p^{\langle s\rangle} Y^{\langle s\rangle} - Y^{\mathrm{INT}\langle s\rangle} \left(\sum_{si \in SEC} {\beta^{\mathrm{x}\langle si,s\rangle}}^{-1} p^{\langle si\rangle} \right) \tag{2.1}$$

s.t. :

$$Y^{\langle s\rangle} = Y^{\mathrm{VA}\langle s\rangle} \qquad \left(\lambda^{\mathrm{FIRM}^{1}\langle s\rangle}\right) \tag{2.2}$$

$$Y^{\langle s\rangle} = Y^{\mathrm{INT}\langle s\rangle} \qquad \left(\lambda^{\mathrm{FIRM}^{2}\langle s\rangle}\right) \tag{2.3}$$

$$Y^{\mathrm{VA}\langle s\rangle} = \gamma^{\mathrm{yva}\langle s\rangle} {K^{\langle s\rangle}}^{\beta^{\mathrm{k}\langle s\rangle}} {L^{\langle s\rangle}}^{\beta^{\mathrm{l}\langle s\rangle}} \qquad \left(\lambda^{\mathrm{FIRM}^{3}\langle s\rangle}\right) \tag{2.4}$$

2.2 Identities

$$si \in SEC: \quad X^{\langle si,s\rangle} = {\beta^{\mathrm{x}\langle si,s\rangle}}^{-1} Y^{\mathrm{INT}\langle s\rangle} \tag{2.5}$$

2.3 First order conditions

$$-\lambda^{\mathrm{FIRM}^{1}\langle s\rangle} - \lambda^{\mathrm{FIRM}^{2}\langle s\rangle} + p^{\langle s\rangle} = 0 \qquad \left(Y^{\langle s\rangle}\right) \tag{2.6}$$

$$-p^{\mathrm{k}} + \beta^{\mathrm{k}\langle s\rangle} \gamma^{\mathrm{yva}\langle s\rangle} \lambda^{\mathrm{FIRM}^{3}\langle s\rangle} {K^{\langle s\rangle}}^{-1+\beta^{\mathrm{k}\langle s\rangle}} {L^{\langle s\rangle}}^{\beta^{\mathrm{l}\langle s\rangle}} = 0 \qquad \left(K^{\langle s\rangle}\right) \tag{2.7}$$

$$-1 + \beta^{\mathrm{l}\langle s\rangle} \gamma^{\mathrm{yva}\langle s\rangle} \lambda^{\mathrm{FIRM}^{3}\langle s\rangle} {K^{\langle s\rangle}}^{\beta^{\mathrm{k}\langle s\rangle}} {L^{\langle s\rangle}}^{-1+\beta^{\mathrm{l}\langle s\rangle}} = 0 \qquad \left(L^{\langle s\rangle}\right) \tag{2.8}$$

$$\lambda^{\mathrm{FIRM}^{1}\langle s\rangle} - \lambda^{\mathrm{FIRM}^{3}\langle s\rangle} = 0 \qquad \left(Y^{\mathrm{VA}\langle s\rangle}\right) \tag{2.9}$$

$$\lambda^{\mathrm{FIRM}^{2}\langle s\rangle} - \sum_{si \in SEC} {\beta^{\mathrm{x}\langle si,s\rangle}}^{-1} p^{\langle si\rangle} = 0 \qquad \left(Y^{\mathrm{INT}\langle s\rangle}\right) \tag{2.10}$$

2.4 First order conditions after reduction

$$-p^{\mathrm{k}} + \beta^{\mathrm{k}\langle s\rangle}\gamma^{\mathrm{yva}\langle s\rangle}\left(p^{\langle s\rangle} - \sum_{si\in SEC} {\beta^{\mathrm{x}\langle si,s\rangle}}^{-1} p^{\langle si\rangle}\right) {K^{\langle s\rangle}}^{-1+\beta^{\mathrm{k}\langle s\rangle}} {L^{\langle s\rangle}}^{\beta^{\mathrm{l}\langle s\rangle}} = 0 \quad \left(K^{\langle s\rangle}\right) \tag{2.11}$$

$$-1 + \beta^{\mathrm{l}\langle s\rangle}\gamma^{\mathrm{yva}\langle s\rangle}\left(p^{\langle s\rangle} - \sum_{si\in SEC} {\beta^{\mathrm{x}\langle si,s\rangle}}^{-1} p^{\langle si\rangle}\right) {K^{\langle s\rangle}}^{\beta^{\mathrm{k}\langle s\rangle}} {L^{\langle s\rangle}}^{-1+\beta^{\mathrm{l}\langle s\rangle}} = 0 \quad \left(L^{\langle s\rangle}\right) \tag{2.12}$$

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)

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

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

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

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

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

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

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

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

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

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

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

$$s \in SEC: \quad -Y^{\langle s\rangle} + Y^{\mathrm{VA}\langle s\rangle} = 0 \tag{4.12}$$

$$s \in SEC: \quad -Y^{\langle s\rangle} + Y^{\mathrm{INT}\langle s\rangle} = 0 \tag{4.13}$$

$$s \in SEC: \quad -Y^{\mathrm{VA}\langle s\rangle} + \gamma^{\mathrm{yva}\langle s\rangle} {K^{\langle s\rangle}}^{\beta^{\mathrm{k}\langle s\rangle}} {L^{\langle s\rangle}}^{\beta^{\mathrm{l}\langle s\rangle}} = 0 \tag{4.14}$$

$$s \in SEC: \quad \pi^{\langle s\rangle} + L^{\langle s\rangle} + p^{\mathrm{k}} K^{\langle s\rangle} - p^{\langle s\rangle} Y^{\langle s\rangle} + Y^{\mathrm{INT}\langle s\rangle} \left(\sum_{si\in SEC} {\beta^{\mathrm{x}\langle si,s\rangle}}^{-1} p^{\langle si\rangle}\right) = 0 \tag{4.15}$$

$$s \in SEC: \quad si \in SEC: \quad -X^{\langle si,s\rangle} + {\beta^{\mathrm{x}\langle si,s\rangle}}^{-1} Y^{\mathrm{INT}\langle s\rangle} = 0 \tag{4.16}$$

5 Equilibrium relationships (after expansion and reduction)

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

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

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

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

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

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

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

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

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

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

$$-p^{\mathrm{k}} + \beta^{\mathrm{k}\langle \mathrm{A} \rangle} \gamma^{\mathrm{yva}\langle \mathrm{A} \rangle} \left(p^{\langle \mathrm{A} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{A},\mathrm{A} \rangle}}^{-1} p^{\langle \mathrm{A} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{B},\mathrm{A} \rangle}}^{-1} p^{\langle \mathrm{B} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{C},\mathrm{A} \rangle}}^{-1} p^{\langle \mathrm{C} \rangle} \right) {K^{\langle \mathrm{A} \rangle}}^{-1+\beta^{\mathrm{k}\langle \mathrm{A} \rangle}} {L^{\langle \mathrm{A} \rangle}}^{\beta^{\mathrm{l}\langle \mathrm{A} \rangle}} = 0 \tag{5.11}$$

$$-p^{\mathrm{k}} + \beta^{\mathrm{k}\langle \mathrm{B} \rangle} \gamma^{\mathrm{yva}\langle \mathrm{B} \rangle} \left(p^{\langle \mathrm{B} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{A},\mathrm{B} \rangle}}^{-1} p^{\langle \mathrm{A} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{B},\mathrm{B} \rangle}}^{-1} p^{\langle \mathrm{B} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{C},\mathrm{B} \rangle}}^{-1} p^{\langle \mathrm{C} \rangle} \right) {K^{\langle \mathrm{B} \rangle}}^{-1+\beta^{\mathrm{k}\langle \mathrm{B} \rangle}} {L^{\langle \mathrm{B} \rangle}}^{\beta^{\mathrm{l}\langle \mathrm{B} \rangle}} = 0 \tag{5.12}$$

$$-p^{\mathrm{k}} + \beta^{\mathrm{k}\langle \mathrm{C} \rangle} \gamma^{\mathrm{yva}\langle \mathrm{C} \rangle} \left(p^{\langle \mathrm{C} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{A},\mathrm{C} \rangle}}^{-1} p^{\langle \mathrm{A} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{B},\mathrm{C} \rangle}}^{-1} p^{\langle \mathrm{B} \rangle} - {\beta^{\mathrm{x}\langle \mathrm{C},\mathrm{C} \rangle}}^{-1} p^{\langle \mathrm{C} \rangle} \right) {K^{\langle \mathrm{C} \rangle}}^{-1+\beta^{\mathrm{k}\langle \mathrm{C} \rangle}} {L^{\langle \mathrm{C} \rangle}}^{\beta^{\mathrm{l}\langle \mathrm{C} \rangle}} = 0 \tag{5.13}$$

$$-\Pi^{\langle 1 \rangle} + \pi^{\mathrm{h}\langle 1 \rangle} \left(\pi^{\langle \mathrm{A} \rangle} + \pi^{\langle \mathrm{B} \rangle} + \pi^{\langle \mathrm{C} \rangle} \right) = 0 \tag{5.14}$$

$$-\Pi^{\langle 2 \rangle} + \pi^{\mathrm{h}\langle 2 \rangle} \left(\pi^{\langle \mathrm{A} \rangle} + \pi^{\langle \mathrm{B} \rangle} + \pi^{\langle \mathrm{C} \rangle} \right) = 0 \tag{5.15}$$

$$U^{\langle 1 \rangle} - \left(\alpha^{\langle \mathrm{A},1 \rangle} {D^{\langle \mathrm{A},1 \rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B},1 \rangle} {D^{\langle \mathrm{B},1 \rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C},1 \rangle} {D^{\langle \mathrm{C},1 \rangle}}^{\omega^{-1}(-1+\omega)} \right)^{\omega(-1+\omega)^{-1}} = 0 \tag{5.16}$$

$$U^{\langle 2 \rangle} - \left(\alpha^{\langle \mathrm{A},2 \rangle} {D^{\langle \mathrm{A},2 \rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B},2 \rangle} {D^{\langle \mathrm{B},2 \rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C},2 \rangle} {D^{\langle \mathrm{C},2 \rangle}}^{\omega^{-1}(-1+\omega)} \right)^{\omega(-1+\omega)^{-1}} = 0 \tag{5.17}$$

$$-X^{\langle \mathrm{A},\mathrm{A} \rangle} + {\beta^{\mathrm{x}\langle \mathrm{A},\mathrm{A} \rangle}}^{-1} Y^{\mathrm{INT}\langle \mathrm{A} \rangle} = 0 \tag{5.18}$$

$$-X^{\langle\mathrm{A,B}\rangle} + {\beta^{\mathrm{x}\langle\mathrm{A,B}\rangle}}^{-1} Y^{\mathrm{INT}\langle\mathrm{B}\rangle} = 0 \tag{5.19}$$

$$-X^{\langle\mathrm{A,C}\rangle} + {\beta^{\mathrm{x}\langle\mathrm{A,C}\rangle}}^{-1} Y^{\mathrm{INT}\langle\mathrm{C}\rangle} = 0 \tag{5.20}$$

$$-X^{\langle\mathrm{B,A}\rangle} + {\beta^{\mathrm{x}\langle\mathrm{B,A}\rangle}}^{-1} Y^{\mathrm{INT}\langle\mathrm{A}\rangle} = 0 \tag{5.21}$$

$$-X^{\langle\mathrm{B,B}\rangle} + {\beta^{\mathrm{x}\langle\mathrm{B,B}\rangle}}^{-1} Y^{\mathrm{INT}\langle\mathrm{B}\rangle} = 0 \tag{5.22}$$

$$-X^{\langle\mathrm{B,C}\rangle} + {\beta^{\mathrm{x}\langle\mathrm{B,C}\rangle}}^{-1} Y^{\mathrm{INT}\langle\mathrm{C}\rangle} = 0 \tag{5.23}$$

$$-X^{\langle\mathrm{C,A}\rangle} + {\beta^{\mathrm{x}\langle\mathrm{C,A}\rangle}}^{-1} Y^{\mathrm{INT}\langle\mathrm{A}\rangle} = 0 \tag{5.24}$$

$$-X^{\langle\mathrm{C,B}\rangle} + {\beta^{\mathrm{x}\langle\mathrm{C,B}\rangle}}^{-1} Y^{\mathrm{INT}\langle\mathrm{B}\rangle} = 0 \tag{5.25}$$

$$-X^{\langle\mathrm{C,C}\rangle} + {\beta^{\mathrm{x}\langle\mathrm{C,C}\rangle}}^{-1} Y^{\mathrm{INT}\langle\mathrm{C}\rangle} = 0 \tag{5.26}$$

$$-Y^{\langle\mathrm{A}\rangle} + Y^{\mathrm{VA}\langle\mathrm{A}\rangle} = 0 \tag{5.27}$$

$$-Y^{\langle\mathrm{A}\rangle} + Y^{\mathrm{INT}\langle\mathrm{A}\rangle} = 0 \tag{5.28}$$

$$-Y^{\langle\mathrm{B}\rangle} + Y^{\mathrm{VA}\langle\mathrm{B}\rangle} = 0 \tag{5.29}$$

$$-Y^{\langle\mathrm{B}\rangle} + Y^{\mathrm{INT}\langle\mathrm{B}\rangle} = 0 \tag{5.30}$$

$$-Y^{\langle\mathrm{C}\rangle} + Y^{\mathrm{VA}\langle\mathrm{C}\rangle} = 0 \tag{5.31}$$

$$-Y^{\langle\mathrm{C}\rangle} + Y^{\mathrm{INT}\langle\mathrm{C}\rangle} = 0 \tag{5.32}$$

$$-Y^{\mathrm{VA}\langle\mathrm{A}\rangle} + \gamma^{\mathrm{yva}\langle\mathrm{A}\rangle} {K^{\langle\mathrm{A}\rangle}}^{\beta^{\mathrm{k}\langle\mathrm{A}\rangle}} {L^{\langle\mathrm{A}\rangle}}^{\beta^{\mathrm{l}\langle\mathrm{A}\rangle}} = 0 \tag{5.33}$$

$$-Y^{\mathrm{VA}\langle\mathrm{B}\rangle} + \gamma^{\mathrm{yva}\langle\mathrm{B}\rangle} {K^{\langle\mathrm{B}\rangle}}^{\beta^{\mathrm{k}\langle\mathrm{B}\rangle}} {L^{\langle\mathrm{B}\rangle}}^{\beta^{\mathrm{l}\langle\mathrm{B}\rangle}} = 0 \tag{5.34}$$

$$-{Y^{\mathrm{VA}}}^{\langle \mathrm{C}\rangle} + {\gamma^{\mathrm{yva}}}^{\langle \mathrm{C}\rangle} {K^{\langle \mathrm{C}\rangle}}^{{\beta^{\mathrm{k}}}^{\langle \mathrm{C}\rangle}} {L^{\langle \mathrm{C}\rangle}}^{{\beta^{\mathrm{l}}}^{\langle \mathrm{C}\rangle}} = 0 \tag{5.35}$$

$${\lambda^{\mathrm{CONSUMER}^{1}}}^{\langle 1\rangle} p^{\langle \mathrm{A}\rangle} + \alpha^{\langle \mathrm{A},1\rangle} {D^{\langle \mathrm{A},1\rangle}}^{-1+\omega^{-1}(-1+\omega)} \left(\alpha^{\langle \mathrm{A},1\rangle} {D^{\langle \mathrm{A},1\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B},1\rangle} {D^{\langle \mathrm{B},1\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C},1\rangle} {D^{\langle \mathrm{C},1\rangle}}^{\omega^{-1}(-1+\omega)}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.36}$$

$${\lambda^{\mathrm{CONSUMER}^{1}}}^{\langle 1\rangle} p^{\langle \mathrm{B}\rangle} + \alpha^{\langle \mathrm{B},1\rangle} {D^{\langle \mathrm{B},1\rangle}}^{-1+\omega^{-1}(-1+\omega)} \left(\alpha^{\langle \mathrm{A},1\rangle} {D^{\langle \mathrm{A},1\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B},1\rangle} {D^{\langle \mathrm{B},1\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C},1\rangle} {D^{\langle \mathrm{C},1\rangle}}^{\omega^{-1}(-1+\omega)}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.37}$$

$${\lambda^{\mathrm{CONSUMER}^{1}}}^{\langle 1\rangle} p^{\langle \mathrm{C}\rangle} + \alpha^{\langle \mathrm{C},1\rangle} {D^{\langle \mathrm{C},1\rangle}}^{-1+\omega^{-1}(-1+\omega)} \left(\alpha^{\langle \mathrm{A},1\rangle} {D^{\langle \mathrm{A},1\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B},1\rangle} {D^{\langle \mathrm{B},1\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C},1\rangle} {D^{\langle \mathrm{C},1\rangle}}^{\omega^{-1}(-1+\omega)}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.38}$$

$${\lambda^{\mathrm{CONSUMER}^{1}}}^{\langle 2\rangle} p^{\langle \mathrm{A}\rangle} + \alpha^{\langle \mathrm{A},2\rangle} {D^{\langle \mathrm{A},2\rangle}}^{-1+\omega^{-1}(-1+\omega)} \left(\alpha^{\langle \mathrm{A},2\rangle} {D^{\langle \mathrm{A},2\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B},2\rangle} {D^{\langle \mathrm{B},2\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C},2\rangle} {D^{\langle \mathrm{C},2\rangle}}^{\omega^{-1}(-1+\omega)}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.39}$$

$${\lambda^{\mathrm{CONSUMER}^{1}}}^{\langle 2\rangle} p^{\langle \mathrm{B}\rangle} + \alpha^{\langle \mathrm{B},2\rangle} {D^{\langle \mathrm{B},2\rangle}}^{-1+\omega^{-1}(-1+\omega)} \left(\alpha^{\langle \mathrm{A},2\rangle} {D^{\langle \mathrm{A},2\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B},2\rangle} {D^{\langle \mathrm{B},2\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C},2\rangle} {D^{\langle \mathrm{C},2\rangle}}^{\omega^{-1}(-1+\omega)}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.40}$$

$${\lambda^{\mathrm{CONSUMER}^{1}}}^{\langle 2\rangle} p^{\langle \mathrm{C}\rangle} + \alpha^{\langle \mathrm{C},2\rangle} {D^{\langle \mathrm{C},2\rangle}}^{-1+\omega^{-1}(-1+\omega)} \left(\alpha^{\langle \mathrm{A},2\rangle} {D^{\langle \mathrm{A},2\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B},2\rangle} {D^{\langle \mathrm{B},2\rangle}}^{\omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C},2\rangle} {D^{\langle \mathrm{C},2\rangle}}^{\omega^{-1}(-1+\omega)}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.41}$$

$$-\mathit{INC}^{\langle 1\rangle} + L^{\langle 1\rangle} + p^{\mathrm{k}} K^{\langle 1\rangle} = 0 \tag{5.42}$$

$$-\mathit{INC}^{\langle 2\rangle} + L^{\langle 2\rangle} + p^{\mathrm{k}} K^{\langle 2\rangle} = 0 \tag{5.43}$$

$$\pi^{\langle \mathrm{A}\rangle} + L^{\langle \mathrm{A}\rangle} + p^{\mathrm{k}} K^{\langle \mathrm{A}\rangle} - p^{\langle \mathrm{A}\rangle} Y^{\langle \mathrm{A}\rangle} + {Y^{\mathrm{INT}}}^{\langle \mathrm{A}\rangle} \left({\beta^{\mathrm{x}}}^{\langle \mathrm{A},\mathrm{A}\rangle^{-1}} p^{\langle \mathrm{A}\rangle} + {\beta^{\mathrm{x}}}^{\langle \mathrm{B},\mathrm{A}\rangle^{-1}} p^{\langle \mathrm{B}\rangle} + {\beta^{\mathrm{x}}}^{\langle \mathrm{C},\mathrm{A}\rangle^{-1}} p^{\langle \mathrm{C}\rangle}\right) = 0 \tag{5.44}$$

$$\pi^{\langle \mathrm{B}\rangle} + L^{\langle \mathrm{B}\rangle} + p^{\mathrm{k}} K^{\langle \mathrm{B}\rangle} - p^{\langle \mathrm{B}\rangle} Y^{\langle \mathrm{B}\rangle} + {Y^{\mathrm{INT}}}^{\langle \mathrm{B}\rangle} \left({\beta^{\mathrm{x}}}^{\langle \mathrm{A},\mathrm{B}\rangle^{-1}} p^{\langle \mathrm{A}\rangle} + {\beta^{\mathrm{x}}}^{\langle \mathrm{B},\mathrm{B}\rangle^{-1}} p^{\langle \mathrm{B}\rangle} + {\beta^{\mathrm{x}}}^{\langle \mathrm{C},\mathrm{B}\rangle^{-1}} p^{\langle \mathrm{C}\rangle}\right) = 0 \tag{5.45}$$

$$\pi^{\langle \mathrm{C}\rangle} + L^{\langle \mathrm{C}\rangle} + p^{\mathrm{k}} K^{\langle \mathrm{C}\rangle} - p^{\langle \mathrm{C}\rangle} Y^{\langle \mathrm{C}\rangle} + {Y^{\mathrm{INT}}}^{\langle \mathrm{C}\rangle} \left({\beta^{\mathrm{x}}}^{\langle \mathrm{A},\mathrm{C}\rangle^{-1}} p^{\langle \mathrm{A}\rangle} + {\beta^{\mathrm{x}}}^{\langle \mathrm{B},\mathrm{C}\rangle^{-1}} p^{\langle \mathrm{B}\rangle} + {\beta^{\mathrm{x}}}^{\langle \mathrm{C},\mathrm{C}\rangle^{-1}} p^{\langle \mathrm{C}\rangle}\right) = 0 \tag{5.46}$$

$$-\mathit{INC}^{\langle 1\rangle} - \Pi^{\langle 1\rangle} + p^{\langle \mathrm{A}\rangle} D^{\langle \mathrm{A},1\rangle} + p^{\langle \mathrm{B}\rangle} D^{\langle \mathrm{B},1\rangle} + p^{\langle \mathrm{C}\rangle} D^{\langle \mathrm{C},1\rangle} = 0 \tag{5.47}$$

$$-\mathit{INC}^{\langle 2\rangle} - \Pi^{\langle 2\rangle} + p^{\langle \mathrm{A}\rangle} D^{\langle \mathrm{A},2\rangle} + p^{\langle \mathrm{B}\rangle} D^{\langle \mathrm{B},2\rangle} + p^{\langle \mathrm{C}\rangle} D^{\langle \mathrm{C},2\rangle} = 0 \tag{5.48}$$

$$-K^{\langle 1\rangle} - K^{\langle 2\rangle} + K^{\langle \mathrm{A}\rangle} + K^{\langle \mathrm{B}\rangle} + K^{\langle \mathrm{C}\rangle} = 0 \tag{5.49}$$

6 Calibrating equations

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$-1 + {\beta^{\mathrm{k}}}^{\langle \mathrm{A} \rangle} + {\beta^{\mathrm{l}}}^{\langle \mathrm{A} \rangle} = 0 \tag{6.20}$$

$$-1 + {\beta^{\mathrm{k}}}^{\langle \mathrm{B} \rangle} + {\beta^{\mathrm{l}}}^{\langle \mathrm{B} \rangle} = 0 \tag{6.21}$$

$$-1 + {\beta^{\mathrm{k}}}^{\langle \mathrm{C} \rangle} + {\beta^{\mathrm{l}}}^{\langle \mathrm{C} \rangle} = 0 \tag{6.22}$$

$$-1 + {\pi^{\mathrm{h}}}^{\langle 1 \rangle} + {\pi^{\mathrm{h}}}^{\langle 2 \rangle} = 0 \tag{6.23}$$

$$-1 + {\alpha^{\langle \mathrm{A},1 \rangle}}^{\omega} + {\alpha^{\langle \mathrm{B},1 \rangle}}^{\omega} + {\alpha^{\langle \mathrm{C},1 \rangle}}^{\omega} = 0 \tag{6.24}$$

$$-1 + {\alpha^{\langle \mathrm{A},2 \rangle}}^{\omega} + {\alpha^{\langle \mathrm{B},2 \rangle}}^{\omega} + {\alpha^{\langle \mathrm{C},2 \rangle}}^{\omega} = 0 \tag{6.25}$$

7 Equilibrium values

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

8 Model parameters

	Value
$\alpha^{\langle \mathrm{A},1\rangle}$	0.7975
$\alpha^{\langle \mathrm{A},2\rangle}$	0.6813
$\alpha^{\langle \mathrm{B},1\rangle}$	0.3749
$\alpha^{\langle \mathrm{B},2\rangle}$	0.4709
$\alpha^{\langle \mathrm{C},1\rangle}$	0.4727
$\alpha^{\langle \mathrm{C},2\rangle}$	0.5604
$\beta^{\mathrm{k}\,\langle \mathrm{A}\rangle}$	0.8014
$\beta^{\mathrm{k}\,\langle \mathrm{B}\rangle}$	0.5256
$\beta^{\mathrm{k}\,\langle \mathrm{C}\rangle}$	0.5627
$\beta^{\mathrm{l}\,\langle \mathrm{A}\rangle}$	0.1986
$\beta^{\mathrm{l}\,\langle \mathrm{B}\rangle}$	0.4744
$\beta^{\mathrm{l}\,\langle \mathrm{C}\rangle}$	0.4373
$\beta^{\mathrm{x}\,\langle \mathrm{A},\mathrm{A}\rangle}$	5.045
$\beta^{\mathrm{x}\,\langle \mathrm{A},\mathrm{B}\rangle}$	2.5465
$\beta^{\mathrm{x}\,\langle \mathrm{A},\mathrm{C}\rangle}$	11.838
$\beta^{\mathrm{x}\,\langle \mathrm{B},\mathrm{A}\rangle}$	3.0835
$\beta^{\mathrm{x}\,\langle \mathrm{B},\mathrm{B}\rangle}$	3.6145
$\beta^{\mathrm{x}\,\langle \mathrm{B},\mathrm{C}\rangle}$	3.8516
$\beta^{\mathrm{x}\,\langle \mathrm{C},\mathrm{A}\rangle}$	2.9436
$\beta^{\mathrm{x}\,\langle \mathrm{C},\mathrm{B}\rangle}$	7.6343
$\beta^{\mathrm{x}\,\langle \mathrm{C},\mathrm{C}\rangle}$	2.9985
$\gamma^{\mathrm{yva}\,\langle \mathrm{A}\rangle}$	11.9486
$\gamma^{\mathrm{yva}\,\langle \mathrm{B}\rangle}$	10.004
$\gamma^{\mathrm{yva}\,\langle \mathrm{C}\rangle}$	6.155
$\pi^{\mathrm{h}\,\langle 1\rangle}$	0.5