Index sets

$$HH = \{l, s\}$$

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

1 CONSUMER $h \in HH$

1.1 Optimisation problem

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

$$\text{s.t. :}$$

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

1.2 Identities

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

1.3 First order conditions

$$s \in SEC: \quad \lambda^{\text{CONSUMER}^1 \langle h\rangle} p^{\langle s\rangle} + \alpha^{\langle s,h\rangle} D^{\langle s,h\rangle -1+\omega^{-1}(-1+\omega)} \left(\sum_{s \in SEC} \alpha^{\langle s,h\rangle} D^{\langle s,h\rangle \omega^{-1}(-1+\omega)}\right)^{-1+\omega(-1+\omega)^{-1}} = 0 \quad \left(D^{\langle s,h\rangle}\right) \tag{1.4}$$

2 SECTOR $s \in SEC$

2.1 Optimisation problem

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

s.t. :

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

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

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

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

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

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

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

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

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

2.4 First order conditions after reduction

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

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

3 EQUILIBRIUM

3.1 Identities

$$p^{\mathrm{l}} = 1 \tag{3.1}$$

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

$$KS = \sum_{s\in SEC} K^{\langle s\rangle} \tag{3.3}$$

$$KS = ks^{\mathrm{data}} \tag{3.4}$$

$$h \in HH: \quad K^{\langle h\rangle} = ouc^{\langle h\rangle}scale^{\langle h\rangle^{-1}}KS \tag{3.5}$$

$$LS = ls^{\mathrm{data}} \tag{3.6}$$

$$h \in HH: \quad L^{\langle h\rangle} = ouw^{\langle h\rangle}scale^{\langle h\rangle^{-1}}LS \tag{3.7}$$

$$p^{\mathrm{kc}} = p^{\mathrm{k}} \tag{3.8}$$

$$p^{\mathrm{lc}} = p^{\mathrm{l}} \tag{3.9}$$

$$\Pi = \sum_{s\in SEC} \pi^{\langle s\rangle} \tag{3.10}$$

$$K^{\mathrm{f}} = \Pi + ouc^{\mathrm{f}}KS \tag{3.11}$$

$$h \in HH: \quad CAP^{\langle h\rangle} = ouf^{\langle h\rangle}scale^{\langle h\rangle^{-1}}K^{\mathrm{f}} \tag{3.12}$$

4 Equilibrium relationships (before expansion and reduction)

$$1 - p^{\mathrm{l}} = 0 \tag{4.1}$$

$$ks^{\mathrm{data}} - KS = 0 \tag{4.2}$$

$$ls^{\mathrm{data}} - LS = 0 \tag{4.3}$$

$$p^{\mathrm{k}} - p^{\mathrm{kc}} = 0 \tag{4.4}$$

$$p^{\mathrm{l}} - p^{\mathrm{lc}} = 0 \tag{4.5}$$

$$-KS + \sum_{s \in SEC} K^{\langle s \rangle} = 0 \tag{4.6}$$

$$-\Pi + \sum_{s \in SEC} \pi^{\langle s \rangle} = 0 \tag{4.7}$$

$$-K^{\mathrm{f}} + \Pi + \alpha u c^{\mathrm{f}} KS = 0 \tag{4.8}$$

$$h \in HH: \quad -CAP^{\langle h \rangle} + \alpha v f^{\langle h \rangle} scale^{\langle h \rangle^{-1}} K^{\mathrm{f}} = 0 \tag{4.9}$$

$$h \in HH: \quad -INC^{\langle h \rangle} + \sum_{s \in SEC} p^{\langle s \rangle} D^{\langle s, h \rangle} = 0 \tag{4.10}$$

$$h \in HH: \quad -K^{\langle h \rangle} + \alpha u c^{\langle h \rangle} scale^{\langle h \rangle^{-1}} KS = 0 \tag{4.11}$$

$$h \in HH: \quad -L^{\langle h \rangle} + \alpha u w^{\langle h \rangle} scale^{\langle h \rangle^{-1}} LS = 0 \tag{4.12}$$

$$h \in HH: \quad U^{\langle h \rangle} - \left(\sum_{s \in SEC} \alpha^{\langle s, h \rangle} D^{\langle s, h \rangle^{\omega^{-1}(-1+\omega)}} \right)^{\omega(-1+\omega)^{-1}} = 0 \tag{4.13}$$

$$h \in HH: \quad CAP^{\langle h \rangle} - INC^{\langle h \rangle} + p^{\mathrm{k}} K^{\langle h \rangle} + p^{\mathrm{l}} L^{\langle h \rangle} = 0 \tag{4.14}$$

$$h \in HH: \quad s \in SEC: \quad \lambda^{\mathrm{CONSUMER1}\langle h \rangle} p^{\langle s \rangle} + \alpha^{\langle s, h \rangle} D^{\langle s, h \rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\sum_{s \in SEC} \alpha^{\langle s, h \rangle} D^{\langle s, h \rangle^{\omega^{-1}(-1+\omega)}} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{4.15}$$

$$s \in SEC: \quad 1 - p^{\langle s \rangle} = 0 \tag{4.16}$$

$$s \in SEC: \quad -p^{\mathrm{kc}} + \beta^{\mathrm{k}\langle s \rangle} \gamma^{\mathrm{yva}\langle s \rangle} \left(p^{\langle s \rangle} - \sum_{si \in SEC} \beta^{\mathrm{x}\langle si,s \rangle -1} p^{\langle si \rangle} \right) K^{\langle s \rangle -1+\beta^{\mathrm{k}\langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l}\langle s \rangle}} = 0 \tag{4.17}$$

$$s \in SEC: \quad -p^{\mathrm{lc}} + \beta^{\mathrm{l}\langle s \rangle} \gamma^{\mathrm{yva}\langle s \rangle} \left(p^{\langle s \rangle} - \sum_{si \in SEC} \beta^{\mathrm{x}\langle si,s \rangle -1} p^{\langle si \rangle} \right) K^{\langle s \rangle \beta^{\mathrm{k}\langle s \rangle}} L^{\langle s \rangle -1+\beta^{\mathrm{l}\langle s \rangle}} = 0 \tag{4.18}$$

$$s \in SEC: \quad -Y^{\langle s \rangle} + Y^{\mathrm{VA}\langle s \rangle} = 0 \tag{4.19}$$

$$s \in SEC: \quad -Y^{\langle s \rangle} + Y^{\mathrm{INT}\langle s \rangle} = 0 \tag{4.20}$$

$$s \in SEC: \quad -Y^{\mathrm{VA}\langle s \rangle} + \gamma^{\mathrm{yva}\langle s \rangle} K^{\langle s \rangle \beta^{\mathrm{k}\langle s \rangle}} L^{\langle s \rangle \beta^{\mathrm{l}\langle s \rangle}} = 0 \tag{4.21}$$

$$s \in SEC: \quad \pi^{\langle s \rangle} + p^{\mathrm{kc}} K^{\langle s \rangle} + p^{\mathrm{lc}} L^{\langle s \rangle} - p^{\langle s \rangle} Y^{\langle s \rangle} + Y^{\mathrm{INT}\langle s \rangle} \left(\sum_{si \in SEC} \beta^{\mathrm{x}\langle si,s \rangle -1} p^{\langle si \rangle} \right) = 0 \tag{4.22}$$

$$s \in SEC: \quad si \in SEC: \quad -X^{\langle si,s \rangle} + \beta^{\mathrm{x}\langle si,s \rangle -1} Y^{\mathrm{INT}\langle s \rangle} = 0 \tag{4.23}$$

5 Equilibrium relationships (after expansion and reduction)

$$1 - p^{\mathrm{l}} = 0 \tag{5.1}$$

$$1 - p^{\langle A \rangle} = 0 \tag{5.2}$$

$$1 - p^{\langle B \rangle} = 0 \tag{5.3}$$

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

$$ks^{\mathrm{data}} - KS = 0 \tag{5.5}$$

$$ls^{\mathrm{data}} - LS = 0 \tag{5.6}$$

$$p^{\mathrm{k}} - p^{\mathrm{kc}} = 0 \tag{5.7}$$

$$p^{\mathrm{l}} - p^{\mathrm{lc}} = 0 \tag{5.8}$$

$$-p^{\mathrm{kc}} + \beta^{\mathrm{k}\langle \mathrm{A}\rangle} \gamma^{\mathrm{yva}\langle \mathrm{A}\rangle} \left(p^{\langle \mathrm{A}\rangle} - \beta^{\mathrm{x}\langle \mathrm{A,A}\rangle^{-1}} p^{\langle \mathrm{A}\rangle} - \beta^{\mathrm{x}\langle \mathrm{B,A}\rangle^{-1}} p^{\langle \mathrm{B}\rangle} - \beta^{\mathrm{x}\langle \mathrm{C,A}\rangle^{-1}} p^{\langle \mathrm{C}\rangle} \right) K^{\langle \mathrm{A}\rangle^{-1+\beta^{\mathrm{k}\langle \mathrm{A}\rangle}}} L^{\langle \mathrm{A}\rangle^{\beta^{\mathrm{l}\langle \mathrm{A}\rangle}}} = 0 \tag{5.9}$$

$$-p^{\mathrm{kc}} + \beta^{\mathrm{k}\langle \mathrm{B}\rangle} \gamma^{\mathrm{yva}\langle \mathrm{B}\rangle} \left(p^{\langle \mathrm{B}\rangle} - \beta^{\mathrm{x}\langle \mathrm{A,B}\rangle^{-1}} p^{\langle \mathrm{A}\rangle} - \beta^{\mathrm{x}\langle \mathrm{B,B}\rangle^{-1}} p^{\langle \mathrm{B}\rangle} - \beta^{\mathrm{x}\langle \mathrm{C,B}\rangle^{-1}} p^{\langle \mathrm{C}\rangle} \right) K^{\langle \mathrm{B}\rangle^{-1+\beta^{\mathrm{k}\langle \mathrm{B}\rangle}}} L^{\langle \mathrm{B}\rangle^{\beta^{\mathrm{l}\langle \mathrm{B}\rangle}}} = 0 \tag{5.10}$$

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

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

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

$$-p^{\mathrm{lc}} + \beta^{\mathrm{l}\langle \mathrm{C}\rangle} \gamma^{\mathrm{yva}\langle \mathrm{C}\rangle} \left(p^{\langle \mathrm{C}\rangle} - \beta^{\mathrm{x}\langle \mathrm{A,C}\rangle^{-1}} p^{\langle \mathrm{A}\rangle} - \beta^{\mathrm{x}\langle \mathrm{B,C}\rangle^{-1}} p^{\langle \mathrm{B}\rangle} - \beta^{\mathrm{x}\langle \mathrm{C,C}\rangle^{-1}} p^{\langle \mathrm{C}\rangle} \right) K^{\langle \mathrm{C}\rangle^{\beta^{\mathrm{k}\langle \mathrm{C}\rangle}}} L^{\langle \mathrm{C}\rangle^{-1+\beta^{\mathrm{l}\langle \mathrm{C}\rangle}}} = 0 \tag{5.14}$$

$$-CAP^{\langle \mathrm{l}\rangle} + owf^{\langle \mathrm{l}\rangle} scale^{\langle \mathrm{l}\rangle^{-1}} K^{\mathrm{f}} = 0 \tag{5.15}$$

$$-CAP^{\langle \mathrm{s}\rangle} + owf^{\langle \mathrm{s}\rangle} scale^{\langle \mathrm{s}\rangle^{-1}} K^{\mathrm{f}} = 0 \tag{5.16}$$

$$-K^{\langle \mathrm{l}\rangle} + owc^{\langle \mathrm{l}\rangle} scale^{\langle \mathrm{l}\rangle^{-1}} KS = 0 \tag{5.17}$$

$$-K^{\langle \mathrm{s}\rangle} + owc^{\langle \mathrm{s}\rangle} scale^{\langle \mathrm{s}\rangle^{-1}} KS = 0 \tag{5.18}$$

$$-L^{\langle \mathrm{l}\rangle} + oww^{\langle \mathrm{l}\rangle} scale^{\langle \mathrm{l}\rangle^{-1}} LS = 0 \tag{5.19}$$

$$-L^{\langle \mathrm{s}\rangle} + oww^{\langle \mathrm{s}\rangle} scale^{\langle \mathrm{s}\rangle^{-1}} LS = 0 \tag{5.20}$$

$$U^{\langle \mathrm{l}\rangle} - \left(\alpha^{\langle \mathrm{A,l}\rangle} D^{\langle \mathrm{A,l}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{B,l}\rangle} D^{\langle \mathrm{B,l}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle \mathrm{C,l}\rangle} D^{\langle \mathrm{C,l}\rangle^{\omega^{-1}(-1+\omega)}} \right)^{\omega(-1+\omega)^{-1}} = 0 \tag{5.21}$$

$$U^{\langle \mathrm{s} \rangle} - \left(\alpha^{\langle \mathrm{A,s} \rangle} D^{\langle \mathrm{A,s} \rangle \omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{B,s} \rangle} D^{\langle \mathrm{B,s} \rangle \omega^{-1}(-1+\omega)} + \alpha^{\langle \mathrm{C,s} \rangle} D^{\langle \mathrm{C,s} \rangle \omega^{-1}(-1+\omega)} \right)^{\omega(-1+\omega)^{-1}} = 0 \tag{5.22}$$

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

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

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

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

$$-X^{\langle \mathrm{B,B} \rangle} + \beta^{\mathrm{x} \langle \mathrm{B,B} \rangle^{-1}} Y^{\mathrm{INT} \langle \mathrm{B} \rangle} = 0 \tag{5.27}$$

$$-X^{\langle \mathrm{B,C} \rangle} + \beta^{\mathrm{x} \langle \mathrm{B,C} \rangle^{-1}} Y^{\mathrm{INT} \langle \mathrm{C} \rangle} = 0 \tag{5.28}$$

$$-X^{\langle \mathrm{C,A} \rangle} + \beta^{\mathrm{x} \langle \mathrm{C,A} \rangle^{-1}} Y^{\mathrm{INT} \langle \mathrm{A} \rangle} = 0 \tag{5.29}$$

$$-X^{\langle \mathrm{C,B} \rangle} + \beta^{\mathrm{x} \langle \mathrm{C,B} \rangle^{-1}} Y^{\mathrm{INT} \langle \mathrm{B} \rangle} = 0 \tag{5.30}$$

$$-X^{\langle \mathrm{C,C} \rangle} + \beta^{\mathrm{x} \langle \mathrm{C,C} \rangle^{-1}} Y^{\mathrm{INT} \langle \mathrm{C} \rangle} = 0 \tag{5.31}$$

$$-Y^{\langle \mathrm{A} \rangle} + Y^{\mathrm{VA} \langle \mathrm{A} \rangle} = 0 \tag{5.32}$$

$$-Y^{\langle \mathrm{A} \rangle} + Y^{\mathrm{INT} \langle \mathrm{A} \rangle} = 0 \tag{5.33}$$

$$-Y^{\langle \mathrm{B} \rangle} + Y^{\mathrm{VA} \langle \mathrm{B} \rangle} = 0 \tag{5.34}$$

$$-Y^{\langle \mathrm{B} \rangle} + Y^{\mathrm{INT} \langle \mathrm{B} \rangle} = 0 \tag{5.35}$$

$$-Y^{\langle \mathrm{C} \rangle} + Y^{\mathrm{VA} \langle \mathrm{C} \rangle} = 0 \tag{5.36}$$

$$-Y^{\langle \mathrm{C} \rangle} + Y^{\mathrm{INT} \langle \mathrm{C} \rangle} = 0 \tag{5.37}$$

$$-Y^{\text{VA}\langle\text{A}\rangle} + \gamma^{\text{yva}\langle\text{A}\rangle} K^{\langle\text{A}\rangle\beta^{\text{k}\langle\text{A}\rangle}} L^{\langle\text{A}\rangle\beta^{\text{l}\langle\text{A}\rangle}} = 0 \tag{5.38}$$

$$-Y^{\text{VA}\langle\text{B}\rangle} + \gamma^{\text{yva}\langle\text{B}\rangle} K^{\langle\text{B}\rangle\beta^{\text{k}\langle\text{B}\rangle}} L^{\langle\text{B}\rangle\beta^{\text{l}\langle\text{B}\rangle}} = 0 \tag{5.39}$$

$$-Y^{\text{VA}\langle\text{C}\rangle} + \gamma^{\text{yva}\langle\text{C}\rangle} K^{\langle\text{C}\rangle\beta^{\text{k}\langle\text{C}\rangle}} L^{\langle\text{C}\rangle\beta^{\text{l}\langle\text{C}\rangle}} = 0 \tag{5.40}$$

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

$$\lambda^{\text{CONSUMER}^1\langle\text{l}\rangle} p^{\langle\text{B}\rangle} + \alpha^{\langle\text{B,l}\rangle} D^{\langle\text{B,l}\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle\text{A,l}\rangle} D^{\langle\text{A,l}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{B,l}\rangle} D^{\langle\text{B,l}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{C,l}\rangle} D^{\langle\text{C,l}\rangle^{\omega^{-1}(-1+\omega)}} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.42}$$

$$\lambda^{\text{CONSUMER}^1\langle\text{l}\rangle} p^{\langle\text{C}\rangle} + \alpha^{\langle\text{C,l}\rangle} D^{\langle\text{C,l}\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle\text{A,l}\rangle} D^{\langle\text{A,l}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{B,l}\rangle} D^{\langle\text{B,l}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{C,l}\rangle} D^{\langle\text{C,l}\rangle^{\omega^{-1}(-1+\omega)}} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.43}$$

$$\lambda^{\text{CONSUMER}^1\langle\text{s}\rangle} p^{\langle\text{A}\rangle} + \alpha^{\langle\text{A,s}\rangle} D^{\langle\text{A,s}\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle\text{A,s}\rangle} D^{\langle\text{A,s}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{B,s}\rangle} D^{\langle\text{B,s}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{C,s}\rangle} D^{\langle\text{C,s}\rangle^{\omega^{-1}(-1+\omega)}} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.44}$$

$$\lambda^{\text{CONSUMER}^1\langle\text{s}\rangle} p^{\langle\text{B}\rangle} + \alpha^{\langle\text{B,s}\rangle} D^{\langle\text{B,s}\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle\text{A,s}\rangle} D^{\langle\text{A,s}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{B,s}\rangle} D^{\langle\text{B,s}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{C,s}\rangle} D^{\langle\text{C,s}\rangle^{\omega^{-1}(-1+\omega)}} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.45}$$

$$\lambda^{\text{CONSUMER}^1\langle\text{s}\rangle} p^{\langle\text{C}\rangle} + \alpha^{\langle\text{C,s}\rangle} D^{\langle\text{C,s}\rangle^{-1+\omega^{-1}(-1+\omega)}} \left(\alpha^{\langle\text{A,s}\rangle} D^{\langle\text{A,s}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{B,s}\rangle} D^{\langle\text{B,s}\rangle^{\omega^{-1}(-1+\omega)}} + \alpha^{\langle\text{C,s}\rangle} D^{\langle\text{C,s}\rangle^{\omega^{-1}(-1+\omega)}} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \tag{5.46}$$

$$-K^{\text{f}} + \Pi + \alpha u x^{\text{f}} KS = 0 \tag{5.47}$$

$$-KS + K^{\langle\text{A}\rangle} + K^{\langle\text{B}\rangle} + K^{\langle\text{C}\rangle} = 0 \tag{5.48}$$

$$-\Pi + \pi^{\langle\text{A}\rangle} + \pi^{\langle\text{B}\rangle} + \pi^{\langle\text{C}\rangle} = 0 \tag{5.49}$$

$$CAP^{\langle\text{l}\rangle} - INC^{\langle\text{l}\rangle} + p^{\text{k}} K^{\langle\text{l}\rangle} + p^{\text{l}} L^{\langle\text{l}\rangle} = 0 \tag{5.50}$$

$$CAP^{\langle\text{s}\rangle} - INC^{\langle\text{s}\rangle} + p^{\text{k}} K^{\langle\text{s}\rangle} + p^{\text{l}} L^{\langle\text{s}\rangle} = 0 \tag{5.51}$$

$$-INC^{\langle \mathrm{l} \rangle} + p^{\langle \mathrm{A} \rangle} D^{\langle \mathrm{A,l} \rangle} + p^{\langle \mathrm{B} \rangle} D^{\langle \mathrm{B,l} \rangle} + p^{\langle \mathrm{C} \rangle} D^{\langle \mathrm{C,l} \rangle} = 0 \tag{5.52}$$

$$-INC^{\langle \mathrm{s} \rangle} + p^{\langle \mathrm{A} \rangle} D^{\langle \mathrm{A,s} \rangle} + p^{\langle \mathrm{B} \rangle} D^{\langle \mathrm{B,s} \rangle} + p^{\langle \mathrm{C} \rangle} D^{\langle \mathrm{C,s} \rangle} = 0 \tag{5.53}$$

$$\pi^{\langle \mathrm{A} \rangle} + p^{\mathrm{kc}} K^{\langle \mathrm{A} \rangle} + p^{\mathrm{lc}} L^{\langle \mathrm{A} \rangle} - p^{\langle \mathrm{A} \rangle} Y^{\langle \mathrm{A} \rangle} + Y^{\mathrm{INT}\langle \mathrm{A} \rangle} \left(\beta^{\mathrm{x}\langle \mathrm{A,A} \rangle^{-1}} p^{\langle \mathrm{A} \rangle} + \beta^{\mathrm{x}\langle \mathrm{B,A} \rangle^{-1}} p^{\langle \mathrm{B} \rangle} + \beta^{\mathrm{x}\langle \mathrm{C,A} \rangle^{-1}} p^{\langle \mathrm{C} \rangle} \right) = 0 \tag{5.54}$$

$$\pi^{\langle \mathrm{B} \rangle} + p^{\mathrm{kc}} K^{\langle \mathrm{B} \rangle} + p^{\mathrm{lc}} L^{\langle \mathrm{B} \rangle} - p^{\langle \mathrm{B} \rangle} Y^{\langle \mathrm{B} \rangle} + Y^{\mathrm{INT}\langle \mathrm{B} \rangle} \left(\beta^{\mathrm{x}\langle \mathrm{A,B} \rangle^{-1}} p^{\langle \mathrm{A} \rangle} + \beta^{\mathrm{x}\langle \mathrm{B,B} \rangle^{-1}} p^{\langle \mathrm{B} \rangle} + \beta^{\mathrm{x}\langle \mathrm{C,B} \rangle^{-1}} p^{\langle \mathrm{C} \rangle} \right) = 0 \tag{5.55}$$

$$\pi^{\langle \mathrm{C} \rangle} + p^{\mathrm{kc}} K^{\langle \mathrm{C} \rangle} + p^{\mathrm{lc}} L^{\langle \mathrm{C} \rangle} - p^{\langle \mathrm{C} \rangle} Y^{\langle \mathrm{C} \rangle} + Y^{\mathrm{INT}\langle \mathrm{C} \rangle} \left(\beta^{\mathrm{x}\langle \mathrm{A,C} \rangle^{-1}} p^{\langle \mathrm{A} \rangle} + \beta^{\mathrm{x}\langle \mathrm{B,C} \rangle^{-1}} p^{\langle \mathrm{B} \rangle} + \beta^{\mathrm{x}\langle \mathrm{C,C} \rangle^{-1}} p^{\langle \mathrm{C} \rangle} \right) = 0 \tag{5.56}$$

6 Calibrating equations

$$-k^{\mathrm{f}^{\mathrm{data}}} + K^{\mathrm{f}} = 0 \tag{6.1}$$

$$-l^{\mathrm{data}\langle \mathrm{A} \rangle} + L^{\langle \mathrm{A} \rangle} = 0 \tag{6.2}$$

$$-l^{\mathrm{data}\langle \mathrm{B} \rangle} + L^{\langle \mathrm{B} \rangle} = 0 \tag{6.3}$$

$$-l^{\mathrm{data}\langle \mathrm{C} \rangle} + L^{\langle \mathrm{C} \rangle} = 0 \tag{6.4}$$

$$-x^{\mathrm{data}\langle \mathrm{A,A} \rangle} + X^{\langle \mathrm{A,A} \rangle} = 0 \tag{6.5}$$

$$-x^{\mathrm{data}\langle \mathrm{A,B} \rangle} + X^{\langle \mathrm{A,B} \rangle} = 0 \tag{6.6}$$

$$-x^{\mathrm{data}\langle \mathrm{A,C} \rangle} + X^{\langle \mathrm{A,C} \rangle} = 0 \tag{6.7}$$

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

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

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

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

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

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

$$-y^{\text{data}\langle\text{A}\rangle} + Y^{\text{VA}\langle\text{A}\rangle} = 0 \tag{6.14}$$

$$-y^{\text{data}\langle\text{B}\rangle} + Y^{\text{VA}\langle\text{B}\rangle} = 0 \tag{6.15}$$

$$-y^{\text{data}\langle\text{C}\rangle} + Y^{\text{VA}\langle\text{C}\rangle} = 0 \tag{6.16}$$

$$CAP^{\langle\text{l}\rangle} - cap^{\text{data}\langle\text{l}\rangle} scale^{\langle\text{l}\rangle-1} = 0 \tag{6.17}$$

$$D^{\langle\text{B,l}\rangle} - d^{\text{data}\langle\text{B,l}\rangle} scale^{\langle\text{l}\rangle-1} = 0 \tag{6.18}$$

$$D^{\langle\text{B,s}\rangle} - d^{\text{data}\langle\text{B,s}\rangle} scale^{\langle\text{s}\rangle-1} = 0 \tag{6.19}$$

$$D^{\langle\text{C,l}\rangle} - d^{\text{data}\langle\text{C,l}\rangle} scale^{\langle\text{l}\rangle-1} = 0 \tag{6.20}$$

$$D^{\langle\text{C,s}\rangle} - d^{\text{data}\langle\text{C,s}\rangle} scale^{\langle\text{s}\rangle-1} = 0 \tag{6.21}$$

$$K^{\langle\text{l}\rangle} - k^{\text{data}\langle\text{l}\rangle} scale^{\langle\text{l}\rangle-1} = 0 \tag{6.22}$$

$$K^{\langle\text{s}\rangle} - k^{\text{data}\langle\text{s}\rangle} scale^{\langle\text{s}\rangle-1} = 0 \tag{6.23}$$

$$L^{\langle\text{l}\rangle} - l^{\text{data}\langle\text{l}\rangle} scale^{\langle\text{l}\rangle-1} = 0 \tag{6.24}$$

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

$$-1 + \beta^{\text{k}\langle\text{B}\rangle} + \beta^{\text{l}\langle\text{B}\rangle} = 0 \tag{6.26}$$

$$-1 + \beta^{\mathrm{k}\langle\mathrm{C}\rangle} + \beta^{\mathrm{l}\langle\mathrm{C}\rangle} = 0 \tag{6.27}$$

$$-1 + \alpha u w^{\langle\mathrm{l}\rangle} + \alpha u w^{\langle\mathrm{s}\rangle} = 0 \tag{6.28}$$

$$-1 + \alpha v f^{\langle\mathrm{l}\rangle} + \alpha v f^{\langle\mathrm{s}\rangle} = 0 \tag{6.29}$$

$$-1 + \alpha^{\langle\mathrm{A,l}\rangle\,\omega} + \alpha^{\langle\mathrm{B,l}\rangle\,\omega} + \alpha^{\langle\mathrm{C,l}\rangle\,\omega} = 0 \tag{6.30}$$

$$-1 + \alpha^{\langle\mathrm{A,s}\rangle\,\omega} + \alpha^{\langle\mathrm{B,s}\rangle\,\omega} + \alpha^{\langle\mathrm{C,s}\rangle\,\omega} = 0 \tag{6.31}$$

7 Equilibrium values

	Equilibrium value
p^{k}	1
p^{l}	1
p^{kc}	1
p^{lc}	1
K^{f}	80.9217
KS	163.4388
LS	88.233
Π	0
$\lambda^{\mathrm{CONSUMER}^1 \langle \mathrm{l} \rangle}$	-1
$\lambda^{\mathrm{CONSUMER}^1 \langle \mathrm{s} \rangle}$	-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
$CAP^{\langle \mathrm{l} \rangle}$	5.1044
$CAP^{\langle \mathrm{s} \rangle}$	6.0504
$D^{\langle \mathrm{A,l} \rangle}$	9.9136
$D^{\langle \mathrm{A,s} \rangle}$	4.044
$D^{\langle \mathrm{B,l} \rangle}$	6.6431
$D^{\langle \mathrm{B,s} \rangle}$	3.1495
$D^{\langle \mathrm{C,l} \rangle}$	9.9581
$D^{\langle \mathrm{C,s} \rangle}$	7.3678
$INC^{\langle \mathrm{l} \rangle}$	26.5147
$INC^{\langle \mathrm{s} \rangle}$	14.5613
$K^{\langle \mathrm{l} \rangle}$	10.5158
$K^{\langle \mathrm{s} \rangle}$	4.0454
$K^{\langle \mathrm{A} \rangle}$	38.0989
$K^{\langle \mathrm{B} \rangle}$	57.5316
$K^{\langle \mathrm{C} \rangle}$	67.8083
$L^{\langle \mathrm{l} \rangle}$	10.8945
$L^{\langle \mathrm{s} \rangle}$	4.4655
$L^{\langle \mathrm{A} \rangle}$	9.4287
$L^{\langle \mathrm{B} \rangle}$	39.9867
$L^{\langle \mathrm{C} \rangle}$	38.8177
$U^{\langle \mathrm{l} \rangle}$	26.5147
$U^{\langle \mathrm{s} \rangle}$	14.5613
$X^{\langle \mathrm{A,A} \rangle}$	73.3234
$X^{\langle \mathrm{A,B} \rangle}$	43.0305
$X^{\langle \mathrm{A,C} \rangle}$	31.0471
$X^{\langle \mathrm{B,A} \rangle}$	61.3203
$X^{\langle \mathrm{B,B} \rangle}$	119.9318
$X^{\langle \mathrm{B,C} \rangle}$	105.2489
$X^{\langle \mathrm{C,A} \rangle}$	45.3241
$X^{\langle \mathrm{C,B} \rangle}$	84.0875
$X^{\langle \mathrm{C,C} \rangle}$	228.0633
$Y^{\langle \mathrm{A} \rangle}$	227.4954
$Y^{\langle \mathrm{B} \rangle}$	344.5681
$Y^{\langle \mathrm{C} \rangle}$	470.9853
$Y^{\mathrm{VA} \langle \mathrm{A} \rangle}$	227.4954
$Y^{\mathrm{VA} \langle \mathrm{B} \rangle}$	344.5681
$Y^{\mathrm{VA} \langle \mathrm{C} \rangle}$	470.9853
$Y^{\mathrm{INT} \langle \mathrm{A} \rangle}$	227.4954
$Y^{\mathrm{INT} \langle \mathrm{B} \rangle}$	344.5681
$Y^{\mathrm{INT} \langle \mathrm{C} \rangle}$	470.9853

8 Model parameters

	Value
$k^{\text{f}^{\text{data}}}$	80.9217
ks^{data}	163.4388
ls^{data}	88.233
ω	2
aux^{f}	0.4951
$\alpha^{\langle A,l \rangle}$	0.6115
$\alpha^{\langle A,s \rangle}$	0.527
$\alpha^{\langle B,l \rangle}$	0.5005
$\alpha^{\langle B,s \rangle}$	0.4651
$\alpha^{\langle C,l \rangle}$	0.6128
$\alpha^{\langle C,s \rangle}$	0.7113
$\beta^{\text{k}\langle A \rangle}$	0.8016
$\beta^{\text{k}\langle B \rangle}$	0.59
$\beta^{\text{k}\langle C \rangle}$	0.6359
$\beta^{\text{l}\langle A \rangle}$	0.1984
$\beta^{\text{l}\langle B \rangle}$	0.41
$\beta^{\text{l}\langle C \rangle}$	0.3641
$\beta^{\text{x}\langle A,A \rangle}$	3.1026
$\beta^{\text{x}\langle A,B \rangle}$	8.0075
$\beta^{\text{x}\langle A,C \rangle}$	15.17
$\beta^{\text{x}\langle B,A \rangle}$	3.7099
$\beta^{\text{x}\langle B,B \rangle}$	2.873
$\beta^{\text{x}\langle B,C \rangle}$	4.475
$\beta^{\text{x}\langle C,A \rangle}$	5.0193
$\beta^{\text{x}\langle C,B \rangle}$	4.0977
$\beta^{\text{x}\langle C,C \rangle}$	2.0652
$aap^{\text{data}\langle l \rangle}$	20.4174
$d^{\text{data}\langle B,l \rangle}$	26.5723
$d^{\text{data}\langle B,s \rangle}$	31.4947
$d^{\text{data}\langle C,l \rangle}$	39.8322
$d^{\text{data}\langle C,s \rangle}$	73.6782
$\gamma^{\text{yva}\langle A \rangle}$	7.8772
$\gamma^{\text{yva}\langle B \rangle}$	6.9527
$\gamma^{\text{yva}\langle C \rangle}$	8.5098
$k^{\text{data}\langle l \rangle}$	42.0633
$k^{\text{data}\langle s \rangle}$	40.4538
$l^{\text{data}\langle l \rangle}$	43.5782
$l^{\text{data}\langle A \rangle}$	9.4287
$l^{\text{data}\langle B \rangle}$	39.9867
$l^{\text{data}\langle C \rangle}$	38.8177
$aux^{\langle l \rangle}$	0.2574
$aux^{\langle s \rangle}$	0.2475
$auw^{\langle l \rangle}$	0.4939
$auw^{\langle s \rangle}$	0.5061
$auf^{\langle l \rangle}$	0.2523
$auf^{\langle s \rangle}$	0.7477
$scale^{\langle l \rangle}$	4
$scale^{\langle s \rangle}$	10
$x^{\text{data}\langle A,A \rangle}$	73.3234
$x^{\text{data}\langle A,B \rangle}$	43.0305
$x^{\text{data}\langle A,C \rangle}$	31.0471
$x^{\text{data}\langle B,A \rangle}$	61.3203
$x^{\text{data}\langle B,B \rangle}$	119.9318
$x^{\text{data}\langle B,C \rangle}$	105.2489