

## Index sets

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

## 1 CONSUMER

### 1.1 Optimisation problem

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

s.t. :

$$H^{\text{inc}} (1 - \tau^h) = \sum_{s \in SEC} \left( -\pi^{(s)} + p^{(s)} D^{(s)} \right) \quad \left( \lambda^{\text{CONSUMER}^1} \right) \quad (1.2)$$

### 1.2 Identities

$$H^{\text{inc}} = L + TR + p^k K \quad (1.3)$$

$$K = pr^k \quad (1.4)$$

$$L = pr^1 \quad (1.5)$$

### 1.3 First order conditions

$$s \in SEC: \quad \lambda_t^{\text{CONSUMER}^1} p_t^{(s)} + \alpha^{(s)} D_t^{(s)-1+\omega^{-1}(-1+\omega)} \left( \sum_{s \in SEC} \alpha^{(s)} D_t^{(s)\omega^{-1}(-1+\omega)} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \quad \left( D_t^{(s)} \right) \quad (1.6)$$

## 2 FIRM $s \in SEC$

### 2.1 Optimisation problem

$$\max_{Y^{(s)}, K^{(s)}, L^{(s)}, (X^{(\dot{s}, s)})_{\dot{s} \in SEC}, VA^{(s)}, CI^{(s)}, T\dot{p}^{(s)}} \pi^{(s)} = T\dot{p}^{(s)} (1 - \tau) \quad (2.1)$$

s.t. :

$$Y^{(s)} = \left( \beta^{va(s)} VA^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) + \beta^{ci(s)} CI^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \right)^{\gamma^{(s)} (-1 + \gamma^{(s)})^{-1}} \left( \lambda^{FIRM^1(s)} \right) \quad (2.2)$$

$$VA^{(s)} = \left( \beta^{k(s)} K^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) + \beta^{l(s)} L^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \right)^{\gamma^{(s)} (-1 + \gamma^{(s)})^{-1}} \left( \lambda^{FIRM^2(s)} \right) \quad (2.3)$$

$$CI^{(s)} = \left( \sum_{\dot{s} \in SEC} \chi^{(\dot{s}, s)} X^{(\dot{s}, s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \right)^{\gamma^{(s)} (-1 + \gamma^{(s)})^{-1}} \left( \lambda^{FIRM^3(s)} \right) \quad (2.4)$$

$$T\dot{p}^{(s)} = p^{(s)} Y^{(s)} - L^{(s)} (1 + t^l) - p^k K^{(s)} (1 + t^k) - \sum_{\dot{s} \in SEC} p^{(\dot{s})} X^{(\dot{s}, s)} \left( \lambda^{FIRM^4(s)} \right) \quad (2.5)$$

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### 2.2 First order conditions

$$-\lambda^{FIRM^1(s)} + \lambda^{FIRM^4(s)} p^{(s)} = 0 \quad (Y^{(s)}) \quad (2.6)$$

$$-p^k \lambda^{FIRM^4(s)} (1 + t^k) + \beta^{k(s)} \lambda^{FIRM^2(s)} K^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \left( \beta^{k(s)} K^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) + \beta^{l(s)} L^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \right)^{-1 + \gamma^{(s)} (-1 + \gamma^{(s)})^{-1}} = 0 \quad (K^{(s)}) \quad (2.7)$$

$$\lambda^{FIRM^4(s)} (-1 - t^l) + \beta^{l(s)} \lambda^{FIRM^2(s)} L^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \left( \beta^{k(s)} K^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) + \beta^{l(s)} L^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \right)^{-1 + \gamma^{(s)} (-1 + \gamma^{(s)})^{-1}} = 0 \quad (L^{(s)}) \quad (2.8)$$

$$\dot{s} \in SEC: \quad -\lambda^{FIRM^4(s)} p_t^{(\dot{s})} + \chi^{(\dot{s}, s)} \lambda^{FIRM^3(s)} X_t^{(\dot{s}, s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \left( \sum_{\dot{s} \in SEC} \chi^{(\dot{s}, s)} X_t^{(\dot{s}, s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \right)^{-1 + \gamma^{(s)} (-1 + \gamma^{(s)})^{-1}} = 0 \quad (X_t^{(\dot{s}, s)}) \quad (2.9)$$

$$-\lambda^{FIRM^2(s)} + \beta^{va(s)} \lambda^{FIRM^1(s)} VA^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \left( \beta^{va(s)} VA^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) + \beta^{ci(s)} CI^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \right)^{-1 + \gamma^{(s)} (-1 + \gamma^{(s)})^{-1}} = 0 \quad (VA^{(s)}) \quad (2.10)$$

$$-\lambda^{FIRM^3(s)} + \beta^{ci(s)} \lambda^{FIRM^1(s)} CI^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \left( \beta^{va(s)} VA^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) + \beta^{ci(s)} CI^{(s)} \gamma^{(s)-1} (-1 + \gamma^{(s)}) \right)^{-1 + \gamma^{(s)} (-1 + \gamma^{(s)})^{-1}} = 0 \quad (CI^{(s)}) \quad (2.11)$$

$$1 - \tau - \lambda^{\text{FIRM}^4 \langle s \rangle} = 0 \quad \left( T \mathbf{\bar{p}}^{\langle s \rangle} \right) \quad (2.12)$$

### 2.3 First order conditions after reduction

$$-p^k (1 + t^k) (1 - \tau) + \beta^k \langle s \rangle \beta^{\text{va} \langle s \rangle} p^{\langle s \rangle} (1 - \tau) K^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} VA^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \left( \beta^k \langle s \rangle K^{\langle s \rangle \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} + \beta^l \langle s \rangle L^{\langle s \rangle \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \right)^{-1 + \gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} \left( \beta^{\text{va} \langle s \rangle} VA^{\langle s \rangle \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \right) \quad (2.13)$$

$$(-1 - t^l) (1 - \tau) + \beta^l \langle s \rangle \beta^{\text{va} \langle s \rangle} p^{\langle s \rangle} (1 - \tau) L^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} VA^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \left( \beta^k \langle s \rangle K^{\langle s \rangle \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} + \beta^l \langle s \rangle L^{\langle s \rangle \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \right)^{-1 + \gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} \left( \beta^{\text{va} \langle s \rangle} VA^{\langle s \rangle \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \right) \quad (2.14)$$

$$\mathfrak{s} \in SEC: \quad -p_t^{\langle \mathfrak{s} \rangle} (1 - \tau) + \beta^{\text{ci} \langle s \rangle} \chi^{\langle \mathfrak{s}, s \rangle} p_t^{\langle s \rangle} (1 - \tau) CI_t^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} X_t^{\langle \mathfrak{s}, s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \left( \beta^{\text{va} \langle s \rangle} VA_t^{\langle s \rangle \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} + \beta^{\text{ci} \langle s \rangle} CI_t^{\langle s \rangle \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \right)^{-1 + \gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} \left( \sum_{\mathfrak{s} \in SEC} \right) \quad (2.15)$$

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## 3 GOVERNMENT

### 3.1 Identities

$$G^{\text{inc}} = TR \quad (3.1)$$

$$G^{\text{inc}} = T^{\text{hh}} + T^{\text{firms}} + T^{\text{lk}} \quad (3.2)$$

$$T^{\text{hh}} = \tau^{\text{h}} H^{\text{inc}} \quad (3.3)$$

$$T^{\text{firms}} = \tau \left( \sum_{s \in SEC} T \mathbf{\bar{p}}^{\langle s \rangle} \right) \quad (3.4)$$

$$T^{\text{lk}} = t^l \left( \sum_{\mathfrak{s} \in SEC} L^{\langle \mathfrak{s} \rangle} \right) + t^k p^k \left( \sum_{s \in SEC} K^{\langle s \rangle} \right) \quad (3.5)$$

## 4 EQUILIBRIUM

### 4.1 Identities

$$s \in SEC: \quad Y_t^{\langle s \rangle} = D_t^{\langle s \rangle} + \sum_{si \in SEC} X_t^{\langle s, si \rangle} \quad (4.1)$$

$$K = \sum_{s \in SEC} K^{\langle s \rangle} \quad (4.2)$$

## 5 Equilibrium relationships (before expansion and reduction)

$$-p^k + K = 0 \quad (5.1)$$

$$-p^1 + L = 0 \quad (5.2)$$

$$G^{\text{inc}} - TR = 0 \quad (5.3)$$

$$K - \sum_{s \in SEC} K^{\langle s \rangle} = 0 \quad (5.4)$$

$$T^{\text{hh}} - \tau^{\text{h}} H^{\text{inc}} = 0 \quad (5.5)$$

$$T^{\text{firms}} - \tau \left( \sum_{s \in SEC} T p^{\langle s \rangle} \right) = 0 \quad (5.6)$$

$$U - \left( \sum_{s \in SEC} \alpha^{\langle s \rangle} D^{\langle s \rangle} \omega^{-1(-1+\omega)} \right)^{\omega(-1+\omega)^{-1}} = 0 \quad (5.7)$$

$$-H^{\text{inc}} (1 - \tau^{\text{h}}) + \sum_{s \in SEC} \left( -\pi^{\langle s \rangle} + p^{\langle s \rangle} D^{\langle s \rangle} \right) = 0 \quad (5.8)$$

$$T^{\text{lk}} - t^1 \left( \sum_{si \in SEC} L^{\langle si \rangle} \right) - t^k p^k \left( \sum_{s \in SEC} K^{\langle s \rangle} \right) = 0 \quad (5.9)$$

$$G^{\text{inc}} - T^{\text{hh}} - T^{\text{firms}} - T^{\text{lk}} = 0 \quad (5.10)$$

$$H^{\text{inc}} - L - TR - p^k K = 0 \quad (5.11)$$

$$s \in SEC: \quad \pi^{\langle s \rangle} - T\mathbf{p}^{\langle s \rangle} (1 - \tau) = 0 \quad (5.12)$$

$$s \in SEC: \quad -CI^{\langle s \rangle} + \left( \sum_{\mathbf{si} \in SEC} \chi^{\langle \mathbf{si}, s \rangle} X^{\langle \mathbf{si}, s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) \right)^{\gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} = 0 \quad (5.13)$$

$$s \in SEC: \quad -VA^{\langle s \rangle} + \left( \beta^{\mathbf{k} \langle s \rangle} K^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) + \beta^{\mathbf{l} \langle s \rangle} L^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) \right)^{\gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} = 0 \quad (5.14)$$

$$s \in SEC: \quad -Y^{\langle s \rangle} + \left( \beta^{\mathbf{va} \langle s \rangle} VA^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) + \beta^{\mathbf{ci} \langle s \rangle} CI^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) \right)^{\gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} = 0 \quad (5.15)$$

$$s \in SEC: \quad \lambda^{\text{CONSUMER}^1} p^{\langle s \rangle} + \alpha^{\langle s \rangle} D^{\langle s \rangle} \omega^{-1} (-1 + \omega) \left( \sum_{s \in SEC} \alpha^{\langle s \rangle} D^{\langle s \rangle} \omega^{-1} (-1 + \omega) \right)^{-1 + \omega (-1 + \omega)^{-1}} = 0 \quad (5.16)$$

$$s \in SEC: \quad (-1 - t^{\mathbf{l}}) (1 - \tau) + \beta^{\mathbf{l} \langle s \rangle} \beta^{\mathbf{va} \langle s \rangle} p^{\langle s \rangle} (1 - \tau) L^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} VA^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \left( \beta^{\mathbf{k} \langle s \rangle} K^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) + \beta^{\mathbf{l} \langle s \rangle} L^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) \right)^{-1 + \gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} \left( \beta^{\mathbf{va} \langle s \rangle} \right) \quad (5.17)$$

$$s \in SEC: \quad -p^{\mathbf{k}} (1 + t^{\mathbf{k}}) (1 - \tau) + \beta^{\mathbf{k} \langle s \rangle} \beta^{\mathbf{va} \langle s \rangle} p^{\langle s \rangle} (1 - \tau) K^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} VA^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \left( \beta^{\mathbf{k} \langle s \rangle} K^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) + \beta^{\mathbf{l} \langle s \rangle} L^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) \right)^{-1 + \gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} \left( \beta^{\mathbf{va} \langle s \rangle} \right) \quad (5.18)$$

$$s \in SEC: \quad -D^{\langle s \rangle} + Y^{\langle s \rangle} - \sum_{\mathbf{si} \in SEC} X^{\langle s, \mathbf{si} \rangle} = 0 \quad (5.19)$$

$$s \in SEC: \quad -T\mathbf{p}^{\langle s \rangle} + p^{\langle s \rangle} Y^{\langle s \rangle} - L^{\langle s \rangle} (1 + t^{\mathbf{l}}) - p^{\mathbf{k}} K^{\langle s \rangle} (1 + t^{\mathbf{k}}) - \sum_{\mathbf{si} \in SEC} p^{\langle \mathbf{si} \rangle} X^{\langle \mathbf{si}, s \rangle} = 0 \quad (5.20)$$

$$s \in SEC: \quad \mathbf{si} \in SEC: \quad -p^{\langle \mathbf{si} \rangle} (1 - \tau) + \beta^{\mathbf{ci} \langle s \rangle} \chi^{\langle \mathbf{si}, s \rangle} p^{\langle s \rangle} (1 - \tau) CI^{\langle s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} X^{\langle \mathbf{si}, s \rangle - 1 + \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle})} \left( \beta^{\mathbf{va} \langle s \rangle} VA^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) + \beta^{\mathbf{ci} \langle s \rangle} CI^{\langle s \rangle} \gamma^{\langle s \rangle - 1} (-1 + \gamma^{\langle s \rangle}) \right)^{-1 + \gamma^{\langle s \rangle} (-1 + \gamma^{\langle s \rangle})^{-1}} \quad (5.21)$$

## 6 Equilibrium relationships (after expansion and reduction)

$$-p\mathbf{r}^k + K = 0 \quad (6.1)$$

$$-p\mathbf{r}^l + L = 0 \quad (6.2)$$

$$G^{\text{inc}} - TR = 0 \quad (6.3)$$

$$T^{\text{hh}} - \tau^{\text{h}} H^{\text{inc}} = 0 \quad (6.4)$$

$$T^{\text{firms}} - \tau \left( T\mathbf{p}^{\langle A \rangle} + T\mathbf{p}^{\langle B \rangle} + T\mathbf{p}^{\langle C \rangle} \right) = 0 \quad (6.5)$$

$$U - \left( \alpha^{\langle A \rangle} D^{\langle A \rangle \omega^{-1}(-1+\omega)} + \alpha^{\langle B \rangle} D^{\langle B \rangle \omega^{-1}(-1+\omega)} + \alpha^{\langle C \rangle} D^{\langle C \rangle \omega^{-1}(-1+\omega)} \right)^{\omega(-1+\omega)^{-1}} = 0 \quad (6.6)$$

$$\pi^{\langle A \rangle} - T\mathbf{p}^{\langle A \rangle} (1 - \tau) = 0 \quad (6.7)$$

$$\pi^{\langle B \rangle} - T\mathbf{p}^{\langle B \rangle} (1 - \tau) = 0 \quad (6.8)$$

$$\pi^{\langle C \rangle} - T\mathbf{p}^{\langle C \rangle} (1 - \tau) = 0 \quad (6.9)$$

$$-CI^{\langle A \rangle} + \left( \chi^{\langle A, A \rangle} X^{\langle A, A \rangle \gamma^{\langle A \rangle - 1}(-1+\gamma^{\langle A \rangle})} + \chi^{\langle B, A \rangle} X^{\langle B, A \rangle \gamma^{\langle A \rangle - 1}(-1+\gamma^{\langle A \rangle})} + \chi^{\langle C, A \rangle} X^{\langle C, A \rangle \gamma^{\langle A \rangle - 1}(-1+\gamma^{\langle A \rangle})} \right)^{\gamma^{\langle A \rangle}(-1+\gamma^{\langle A \rangle})^{-1}} = 0 \quad (6.10)$$

$$-CI^{\langle B \rangle} + \left( \chi^{\langle A, B \rangle} X^{\langle A, B \rangle \gamma^{\langle B \rangle - 1}(-1+\gamma^{\langle B \rangle})} + \chi^{\langle B, B \rangle} X^{\langle B, B \rangle \gamma^{\langle B \rangle - 1}(-1+\gamma^{\langle B \rangle})} + \chi^{\langle C, B \rangle} X^{\langle C, B \rangle \gamma^{\langle B \rangle - 1}(-1+\gamma^{\langle B \rangle})} \right)^{\gamma^{\langle B \rangle}(-1+\gamma^{\langle B \rangle})^{-1}} = 0 \quad (6.11)$$

$$-CI^{\langle C \rangle} + \left( \chi^{\langle A, C \rangle} X^{\langle A, C \rangle \gamma^{\langle C \rangle - 1}(-1+\gamma^{\langle C \rangle})} + \chi^{\langle B, C \rangle} X^{\langle B, C \rangle \gamma^{\langle C \rangle - 1}(-1+\gamma^{\langle C \rangle})} + \chi^{\langle C, C \rangle} X^{\langle C, C \rangle \gamma^{\langle C \rangle - 1}(-1+\gamma^{\langle C \rangle})} \right)^{\gamma^{\langle C \rangle}(-1+\gamma^{\langle C \rangle})^{-1}} = 0 \quad (6.12)$$

$$-VA^{\langle A \rangle} + \left( \beta^{\text{k}\langle A \rangle} K^{\langle A \rangle \gamma^{\langle A \rangle - 1}(-1+\gamma^{\langle A \rangle})} + \beta^{\text{l}\langle A \rangle} L^{\langle A \rangle \gamma^{\langle A \rangle - 1}(-1+\gamma^{\langle A \rangle})} \right)^{\gamma^{\langle A \rangle}(-1+\gamma^{\langle A \rangle})^{-1}} = 0 \quad (6.13)$$

$$-VA^{\langle B \rangle} + \left( \beta^{\text{k}\langle B \rangle} K^{\langle B \rangle \gamma^{\langle B \rangle - 1}(-1+\gamma^{\langle B \rangle})} + \beta^{\text{l}\langle B \rangle} L^{\langle B \rangle \gamma^{\langle B \rangle - 1}(-1+\gamma^{\langle B \rangle})} \right)^{\gamma^{\langle B \rangle}(-1+\gamma^{\langle B \rangle})^{-1}} = 0 \quad (6.14)$$

$$-VA^{\langle C \rangle} + \left( \beta^{k \langle C \rangle} K^{\langle C \rangle} \gamma^{\langle C \rangle - 1} (-1 + \gamma^{\langle C \rangle}) + \beta^{l \langle C \rangle} L^{\langle C \rangle} \gamma^{\langle C \rangle - 1} (-1 + \gamma^{\langle C \rangle}) \right) \gamma^{\langle C \rangle} (-1 + \gamma^{\langle C \rangle})^{-1} = 0 \quad (6.15)$$

$$-Y^{\langle A \rangle} + \left( \beta^{\text{va} \langle A \rangle} V A^{\langle A \rangle} \gamma^{\langle A \rangle - 1} (-1 + \gamma^{\langle A \rangle}) + \beta^{\text{ci} \langle A \rangle} C I^{\langle A \rangle} \gamma^{\langle A \rangle - 1} (-1 + \gamma^{\langle A \rangle}) \right) \gamma^{\langle A \rangle} (-1 + \gamma^{\langle A \rangle})^{-1} = 0 \quad (6.16)$$

$$-Y^{(B)} + \left( \beta^{\text{va}(B)} VA^{(B)\gamma^{(B)-1}}(-1+\gamma^{(B)}) + \beta^{\text{ci}(B)} CI^{(B)\gamma^{(B)-1}}(-1+\gamma^{(B)}) \right)^{\gamma^{(B)}(-1+\gamma^{(B)})^{-1}} = 0 \quad (6.17)$$

$$-Y^{\langle C \rangle} + \left( \beta^{\text{va}\langle C \rangle} V A^{\langle C \rangle \gamma^{\langle C \rangle - 1} (-1 + \gamma^{\langle C \rangle})} + \beta^{\text{ci}\langle C \rangle} C I^{\langle C \rangle \gamma^{\langle C \rangle - 1} (-1 + \gamma^{\langle C \rangle})} \right)^{\gamma^{\langle C \rangle} (-1 + \gamma^{\langle C \rangle})^{-1}} = 0 \quad (6.18)$$

$$\lambda^{\text{CONSUMER}^1} p^{\langle A \rangle} + \alpha^{\langle A \rangle} D^{\langle A \rangle} \omega^{-1} (-1 + \omega) \left( \alpha^{\langle A \rangle} D^{\langle A \rangle} \omega^{-1} (-1 + \omega) + \alpha^{\langle B \rangle} D^{\langle B \rangle} \omega^{-1} (-1 + \omega) + \alpha^{\langle C \rangle} D^{\langle C \rangle} \omega^{-1} (-1 + \omega) \right)^{-1 + \omega (-1 + \omega)^{-1}} = 0 \quad (6.19)$$

$$\lambda^{\text{CONSUMER}^1} p^{(B)} + \alpha^{(B)} D^{(B)-1+\omega^{-1}(-1+\omega)} \left( \alpha^{(A)} D^{(A)\omega^{-1}(-1+\omega)} + \alpha^{(B)} D^{(B)\omega^{-1}(-1+\omega)} + \alpha^{(C)} D^{(C)\omega^{-1}(-1+\omega)} \right)^{-1+\omega(-1+\omega)^{-1}} = 0 \quad (6.20)$$

$$\lambda^{\text{CONSUMER}^1} p^{\langle C \rangle} + \alpha^{\langle C \rangle} D^{\langle C \rangle -1 + \omega^{-1}(-1 + \omega)} \left( \alpha^{\langle A \rangle} D^{\langle A \rangle \omega^{-1}(-1 + \omega)} + \alpha^{\langle B \rangle} D^{\langle B \rangle \omega^{-1}(-1 + \omega)} + \alpha^{\langle C \rangle} D^{\langle C \rangle \omega^{-1}(-1 + \omega)} \right)^{-1 + \omega(-1 + \omega)^{-1}} = 0 \quad (6.21)$$

$$-p^{\langle A \rangle} (1 - \tau) + \beta^{\text{ci} \langle A \rangle} \chi^{\langle A, A \rangle} p^{\langle A \rangle} (1 - \tau) CI^{\langle A \rangle - 1 + \gamma^{\langle A \rangle} - 1} (-1 + \gamma^{\langle A \rangle}) X^{\langle A, A \rangle - 1 + \gamma^{\langle A \rangle} - 1} (-1 + \gamma^{\langle A \rangle}) \left( \beta^{\text{va} \langle A \rangle} VA^{\langle A \rangle \gamma^{\langle A \rangle} - 1} (-1 + \gamma^{\langle A \rangle}) + \beta^{\text{ci} \langle A \rangle} CI^{\langle A \rangle \gamma^{\langle A \rangle} - 1} (-1 + \gamma^{\langle A \rangle}) \right)^{-1 + \gamma^{\langle A \rangle} - 1} (-1 + \gamma^{\langle A \rangle})^{-1} \left( \chi^{\langle A, A \rangle} X^{\langle A, A \rangle - 1 + \gamma^{\langle A \rangle} - 1} (-1 + \gamma^{\langle A \rangle})^{-1} \right) \quad (6.22)$$

$$-p^{(A)}(1-\tau)+\beta^{\text{ci}(B)}\chi^{(A,B)}p^{(B)}(1-\tau)CI^{(B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})}X^{(A,B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})}\left(\beta^{\text{va}(B)}VA^{(B)}\gamma^{(B)-1}(-1+\gamma^{(B)})+\beta^{\text{ci}(B)}CI^{(B)}\gamma^{(B)-1}(-1+\gamma^{(B)})\right)^{-1+\gamma^{(B)}(-1+\gamma^{(B)})^{-1}}\left(\chi^{(A,B)}X\right. \quad (6.23)$$

$$-p^{(A)}(1-\tau)+\beta^{\text{ci}(C)}\chi^{\langle A,C\rangle}p^{\langle C\rangle}(1-\tau)CT^{\langle C\rangle-1+\gamma^{\langle C\rangle-1}(-1+\gamma^{\langle C\rangle})}X^{\langle A,C\rangle-1+\gamma^{\langle C\rangle-1}(-1+\gamma^{\langle C\rangle})}\left(\beta^{\text{va}(C)}VA^{\langle C\rangle\gamma^{\langle C\rangle-1}(-1+\gamma^{\langle C\rangle})}+\beta^{\text{ci}(C)}CT^{\langle C\rangle\gamma^{\langle C\rangle-1}(-1+\gamma^{\langle C\rangle})}\right)^{-1+\gamma^{\langle C\rangle}(-1+\gamma^{\langle C\rangle})^{-1}}\left(\chi^{\langle A,C\rangle}X\right. \quad (6.24)$$

$$-p^{(B)}(1-\tau)+\beta^{\text{ci}\langle A \rangle}\chi^{\langle B,A \rangle}p^{\langle A \rangle}(1-\tau)CI^{\langle A \rangle-1+\gamma^{\langle A \rangle}-1}(-1+\gamma^{\langle A \rangle})X^{\langle B,A \rangle-1+\gamma^{\langle A \rangle}-1}(-1+\gamma^{\langle A \rangle})\left(\beta^{\text{va}\langle A \rangle}VA^{\langle A \rangle\gamma^{\langle A \rangle}-1}(-1+\gamma^{\langle A \rangle})+\beta^{\text{ci}\langle A \rangle}CI^{\langle A \rangle\gamma^{\langle A \rangle}-1}(-1+\gamma^{\langle A \rangle})\right)^{-1+\gamma^{\langle A \rangle}(-1+\gamma^{\langle A \rangle})^{-1}}\left(\chi^{\langle A,A \rangle}X\right. \quad (6.25)$$

$$-p^{(B)}(1-\tau)+\beta^{ci(B)}\chi^{(B,B)}p^{(B)}(1-\tau)CI^{(B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})}X^{(B,B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})}\left(\beta^{va(B)}VA^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})}+\beta^{ci(B)}CI^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})}\right)^{-1+\gamma^{(B)}(-1+\gamma^{(B)})^{-1}}\left(\chi^{(A,B)}X^{(A,B)}\right)^{-1+\gamma^{(B)}(-1+\gamma^{(B)})^{-1}} \quad (6.26)$$

$$-p^{(B)}(1-\tau)+\beta^{ci(C)}\chi^{(B,C)}p^{(C)}(1-\tau)CI^{(C)-1+\gamma^{(C)-1}(-1+\gamma^{(C)})}X^{(B,C)-1+\gamma^{(C)-1}(-1+\gamma^{(C)})}\left(\beta^{va(C)}VA^{(C)\gamma^{(C)-1}(-1+\gamma^{(C)})}+\beta^{ci(C)}CI^{(C)\gamma^{(C)-1}(-1+\gamma^{(C)})}\right)^{-1+\gamma^{(C)}(-1+\gamma^{(C)})^{-1}}\left(\chi^{(A,C)}X^{(A,C)}\right)^{-1+\gamma^{(C)}(-1+\gamma^{(C)})^{-1}} \quad (6.27)$$

$$-p^{(C)}(1-\tau)+\beta^{ci(A)}\chi^{(C,A)}p^{(A)}(1-\tau)CI^{(A)-1+\gamma^{(A)-1}(-1+\gamma^{(A)})}X^{(C,A)-1+\gamma^{(A)-1}(-1+\gamma^{(A)})}\left(\beta^{va(A)}VA^{(A)\gamma^{(A)-1}(-1+\gamma^{(A)})}+\beta^{ci(A)}CI^{(A)\gamma^{(A)-1}(-1+\gamma^{(A)})}\right)^{-1+\gamma^{(A)}(-1+\gamma^{(A)})^{-1}}\left(\chi^{(A,A)}X^{(A,A)}\right)^{-1+\gamma^{(A)}(-1+\gamma^{(A)})^{-1}} \quad (6.28)$$

$$-p^{(C)}(1-\tau)+\beta^{ci(B)}\chi^{(C,B)}p^{(B)}(1-\tau)CI^{(B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})}X^{(C,B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})}\left(\beta^{va(B)}VA^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})}+\beta^{ci(B)}CI^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})}\right)^{-1+\gamma^{(B)}(-1+\gamma^{(B)})^{-1}}\left(\chi^{(A,B)}X^{(A,B)}\right)^{-1+\gamma^{(B)}(-1+\gamma^{(B)})^{-1}} \quad (6.29)$$

$\infty$

$$-p^{(C)}(1-\tau)+\beta^{ci(C)}\chi^{(C,C)}p^{(C)}(1-\tau)CI^{(C)-1+\gamma^{(C)-1}(-1+\gamma^{(C)})}X^{(C,C)-1+\gamma^{(C)-1}(-1+\gamma^{(C)})}\left(\beta^{va(C)}VA^{(C)\gamma^{(C)-1}(-1+\gamma^{(C)})}+\beta^{ci(C)}CI^{(C)\gamma^{(C)-1}(-1+\gamma^{(C)})}\right)^{-1+\gamma^{(C)}(-1+\gamma^{(C)})^{-1}}\left(\chi^{(A,C)}X^{(A,C)}\right)^{-1+\gamma^{(C)}(-1+\gamma^{(C)})^{-1}} \quad (6.30)$$

$$(-1-t^l)(1-\tau)+\beta^{l(A)}\beta^{va(A)}p^{(A)}(1-\tau)L^{(A)-1+\gamma^{(A)-1}(-1+\gamma^{(A)})}VA^{(A)-1+\gamma^{(A)-1}(-1+\gamma^{(A)})}\left(\beta^{k(A)}K^{(A)\gamma^{(A)-1}(-1+\gamma^{(A)})}+\beta^{l(A)}L^{(A)\gamma^{(A)-1}(-1+\gamma^{(A)})}\right)^{-1+\gamma^{(A)}(-1+\gamma^{(A)})^{-1}}\left(\beta^{va(A)}VA^{(A)\gamma^{(A)-1}(-1+\gamma^{(A)})}\right)^{-1+\gamma^{(A)}(-1+\gamma^{(A)})^{-1}} \quad (6.31)$$

$$(-1-t^l)(1-\tau)+\beta^{l(B)}\beta^{va(B)}p^{(B)}(1-\tau)L^{(B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})}VA^{(B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})}\left(\beta^{k(B)}K^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})}+\beta^{l(B)}L^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})}\right)^{-1+\gamma^{(B)}(-1+\gamma^{(B)})^{-1}}\left(\beta^{va(B)}VA^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})}\right)^{-1+\gamma^{(B)}(-1+\gamma^{(B)})^{-1}} \quad (6.32)$$

$$(-1-t^l)(1-\tau)+\beta^{l(C)}\beta^{va(C)}p^{(C)}(1-\tau)L^{(C)-1+\gamma^{(C)-1}(-1+\gamma^{(C)})}VA^{(C)-1+\gamma^{(C)-1}(-1+\gamma^{(C)})}\left(\beta^{k(C)}K^{(C)\gamma^{(C)-1}(-1+\gamma^{(C)})}+\beta^{l(C)}L^{(C)\gamma^{(C)-1}(-1+\gamma^{(C)})}\right)^{-1+\gamma^{(C)}(-1+\gamma^{(C)})^{-1}}\left(\beta^{va(C)}VA^{(C)\gamma^{(C)-1}(-1+\gamma^{(C)})}\right)^{-1+\gamma^{(C)}(-1+\gamma^{(C)})^{-1}} \quad (6.33)$$



$$-p^k (1+t^k) (1-\tau) + \beta^{k\langle A \rangle} \beta^{\text{va}\langle A \rangle} p^{\langle A \rangle} (1-\tau) K^{\langle A \rangle -1+\gamma^{\langle A \rangle -1}(-1+\gamma^{\langle A \rangle})} V A^{\langle A \rangle -1+\gamma^{\langle A \rangle -1}(-1+\gamma^{\langle A \rangle})} \left( \beta^{k\langle A \rangle} K^{\langle A \rangle \gamma^{\langle A \rangle -1}(-1+\gamma^{\langle A \rangle})} + \beta^{l\langle A \rangle} L^{\langle A \rangle \gamma^{\langle A \rangle -1}(-1+\gamma^{\langle A \rangle})} \right)^{-1+\gamma^{\langle A \rangle}(-1+\gamma^{\langle A \rangle})^{-1}} \left( \beta^{\text{va}\langle A \rangle} V \right. \quad (6.34)$$

$$-p^k (1+t^k) (1-\tau) + \beta^{k\langle B \rangle} \beta^{\text{va}\langle B \rangle} p^{\langle B \rangle} (1-\tau) K^{\langle B \rangle -1+\gamma^{\langle B \rangle -1}(-1+\gamma^{\langle B \rangle})} V A^{\langle B \rangle -1+\gamma^{\langle B \rangle -1}(-1+\gamma^{\langle B \rangle})} \left( \beta^{k\langle B \rangle} K^{\langle B \rangle \gamma^{\langle B \rangle -1}(-1+\gamma^{\langle B \rangle})} + \beta^{l\langle B \rangle} L^{\langle B \rangle \gamma^{\langle B \rangle -1}(-1+\gamma^{\langle B \rangle})} \right)^{-1+\gamma^{\langle B \rangle}(-1+\gamma^{\langle B \rangle})^{-1}} \left( \beta^{\text{va}\langle B \rangle} V \right. \quad (6.35)$$

$$-p^k (1+t^k) (1-\tau) + \beta^{k\langle C \rangle} \beta^{\text{va}\langle C \rangle} p^{\langle C \rangle} (1-\tau) K^{\langle C \rangle -1+\gamma^{\langle C \rangle -1}(-1+\gamma^{\langle C \rangle})} V A^{\langle C \rangle -1+\gamma^{\langle C \rangle -1}(-1+\gamma^{\langle C \rangle})} \left( \beta^{k\langle C \rangle} K^{\langle C \rangle \gamma^{\langle C \rangle -1}(-1+\gamma^{\langle C \rangle})} + \beta^{l\langle C \rangle} L^{\langle C \rangle \gamma^{\langle C \rangle -1}(-1+\gamma^{\langle C \rangle})} \right)^{-1+\gamma^{\langle C \rangle}(-1+\gamma^{\langle C \rangle})^{-1}} \left( \beta^{\text{va}\langle C \rangle} V \right. \quad (6.36)$$

$$T^{\text{lk}} - t^l \left( L^{\langle A \rangle} + L^{\langle B \rangle} + L^{\langle C \rangle} \right) - t^k p^k \left( K^{\langle A \rangle} + K^{\langle B \rangle} + K^{\langle C \rangle} \right) = 0 \quad (6.37)$$

$$G^{\text{inc}} - T^{\text{hh}} - T^{\text{firms}} - T^{\text{lk}} = 0 \quad (6.38)$$

$$H^{\text{inc}} - L - TR - p^k K = 0 \quad (6.39)$$

$$K - K^{\langle A \rangle} - K^{\langle B \rangle} - K^{\langle C \rangle} = 0 \quad (6.40)$$

$$-D^{\langle A \rangle} - X^{\langle A, A \rangle} - X^{\langle A, B \rangle} - X^{\langle A, C \rangle} + Y^{\langle A \rangle} = 0 \quad (6.41)$$

$$-D^{\langle B \rangle} - X^{\langle B, A \rangle} - X^{\langle B, B \rangle} - X^{\langle B, C \rangle} + Y^{\langle B \rangle} = 0 \quad (6.42)$$

$$-D^{\langle C \rangle} - X^{\langle C, A \rangle} - X^{\langle C, B \rangle} - X^{\langle C, C \rangle} + Y^{\langle C \rangle} = 0 \quad (6.43)$$

$$-\pi^{\langle A \rangle} - \pi^{\langle B \rangle} - \pi^{\langle C \rangle} + p^{\langle A \rangle} D^{\langle A \rangle} + p^{\langle B \rangle} D^{\langle B \rangle} + p^{\langle C \rangle} D^{\langle C \rangle} - H^{\text{inc}} (1 - \tau^h) = 0 \quad (6.44)$$

$$-T \dot{p}^{\langle A \rangle} - p^{\langle A \rangle} X^{\langle A, A \rangle} + p^{\langle A \rangle} Y^{\langle A \rangle} - p^{\langle B \rangle} X^{\langle B, A \rangle} - p^{\langle C \rangle} X^{\langle C, A \rangle} - L^{\langle A \rangle} (1+t^l) - p^k K^{\langle A \rangle} (1+t^k) = 0 \quad (6.45)$$

$$-T \dot{p}^{\langle B \rangle} - p^{\langle A \rangle} X^{\langle A, B \rangle} - p^{\langle B \rangle} X^{\langle B, B \rangle} + p^{\langle B \rangle} Y^{\langle B \rangle} - p^{\langle C \rangle} X^{\langle C, B \rangle} - L^{\langle B \rangle} (1+t^l) - p^k K^{\langle B \rangle} (1+t^k) = 0 \quad (6.46)$$

$$-T \dot{p}^{\langle C \rangle} - p^{\langle A \rangle} X^{\langle A, C \rangle} - p^{\langle B \rangle} X^{\langle B, C \rangle} - p^{\langle C \rangle} X^{\langle C, C \rangle} + p^{\langle C \rangle} Y^{\langle C \rangle} - L^{\langle C \rangle} (1+t^l) - p^k K^{\langle C \rangle} (1+t^k) = 0 \quad (6.47)$$

## 7 Parameter settings

$$t^{\text{k}} = 0 \tag{7.1}$$

$$t^{\text{l}} = 0 \tag{7.2}$$

$$\tau = 0 \tag{7.3}$$

$$\tau^{\text{h}} = 0 \tag{7.4}$$

## 8 Equilibrium values

	Equilibrium values
$\lambda^{\text{CONSUMER}^1}$	-0.9978
$p^k$	1.0001
$G^{\text{inc}}$	0
$H^{\text{inc}}$	80.0057
$K$	40
$L$	40
$T^{\text{hh}}$	0
$T^{\text{firms}}$	0
$T^{\text{lk}}$	0
$TR$	0
$U$	79.8271
$p^A$	1.0013
$p^B$	1.0026
$p^C$	1.0023
$\pi^A$	0
$\pi^B$	0
$\pi^C$	0
$CI^A$	39.8256
$CI^B$	29.8056
$CI^C$	49.6959
$D^A$	29.9529
$D^B$	9.997
$D^C$	39.9004
$K^A$	19.9931
$K^B$	9.9852
$K^C$	10.0217
$L^A$	9.9994
$L^B$	19.9761
$L^C$	10.0245
$Tp^A$	0
$Tp^B$	0
$Tp^C$	0
$VA^A$	29.9561
$VA^B$	29.9249
$VA^C$	20.0401
$X^{A^A}$	9.9763
$X^{A^B}$	9.9615
$X^{A^C}$	19.9301
$X^{B^A}$	19.8974
$X^{B^B}$	9.937
$X^{B^C}$	19.881
$X^{C^A}$	9.958
$X^{C^B}$	9.9433
$X^{C^C}$	9.9516
$Y^A$	69.8208
$Y^B$	59.7124
$Y^C$	69.7533

## 9 Equilibrium values

	Equilibrium values
$\lambda^{\text{CONSUMER}^1}$	-0.9978
$p^k$	0.8001
$G^{\text{inc}}$	8.0011
$H^{\text{inc}}$	80.0057
$K$	40
$L$	40
$T^{\text{hh}}$	0
$T^{\text{firms}}$	0
$T^{\text{lk}}$	8.0011
$TR$	8.0011
$U$	79.8271
$p^A$	1.0013
$p^B$	1.0026
$p^C$	1.0023
$\pi^A$	0
$\pi^B$	0
$\pi^C$	0
$CI^A$	39.8256
$CI^B$	29.8056
$CI^C$	49.6958
$D^A$	29.9529
$D^B$	9.997
$D^C$	39.9004
$K^A$	19.9931
$K^B$	9.9852
$K^C$	10.0217
$L^A$	9.9994
$L^B$	19.9761
$L^C$	10.0245
$Tp^A$	0
$Tp^B$	0
$Tp^C$	0
$VA^A$	29.9561
$VA^B$	29.9249
$VA^C$	20.0401
$X^{A^A}$	9.9763
$X^{A^B}$	9.9615
$X^{A^C}$	19.9301
$X^{B^A}$	19.8974
$X^{B^B}$	9.937
$X^{B^C}$	19.881
$X^{C^A}$	9.958
$X^{C^B}$	9.9433
$X^{C^C}$	9.9516
$Y^A$	69.8208
$Y^B$	59.7124
$Y^C$	69.7533