

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

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

$$K = p r^k \quad (1.4)$$

$$L = p r^l \quad (1.5)$$

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

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

s.t. :

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

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

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

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

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2.2 First order conditions

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

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

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

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

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

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

$$1 - \tau - \lambda^{FIRM^4(s)} = 0 \quad (T\tilde{p}^{(s)}) \quad (2.12)$$

2.3 First order conditions after reduction

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

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

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

3 GOVERNMENT

3.1 Identities

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

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

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

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

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

4 EQUILIBRIUM

4.1 Identities

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

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

5 Equilibrium relationships (before expansion and reduction)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6 Equilibrium relationships (after expansion and reduction)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$-Y^{\langle B \rangle} + \left(\beta^{\text{va}\langle B \rangle} V A^{\langle B \rangle \gamma^{\langle B \rangle - 1} (-1 + \gamma^{\langle B \rangle})} + \beta^{\text{ci}\langle B \rangle} C I^{\langle B \rangle \gamma^{\langle B \rangle - 1} (-1 + \gamma^{\langle B \rangle})} \right)^{\gamma^{\langle B \rangle} (-1 + \gamma^{\langle B \rangle})^{-1}} = 0 \quad (6.17)$$

$$-Y^{(C)} + \left(\beta^{\text{va}(C)} VA^{(C)} \gamma^{(C)-1} (-1 + \gamma^{(C)}) + \beta^{\text{ci}(C)} CI^{(C)} \gamma^{(C)-1} (-1 + \gamma^{(C)}) \right)^{\gamma^{(C)} (-1 + \gamma^{(C)})^{-1}} = 0 \quad (6.18)$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$-p^k (1 + t^k) (1 - \tau) + \beta^{k(B)} \beta^{va(B)} p^{(B)} (1 - \tau) K^{(B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})} VA^{(B)-1+\gamma^{(B)-1}(-1+\gamma^{(B)})} \left(\beta^{k(B)} K^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})} + \beta^{l(B)} L^{(B)\gamma^{(B)-1}(-1+\gamma^{(B)})} \right)^{-1+\gamma^{(B)}(-1+\gamma^{(B)})^{-1}} \left(\beta^{va(B)} VA^{(B)} \right) \quad (6.35)$$

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

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

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

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

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

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

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

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

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

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

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

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

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7 Parameter settings

$$t^k = 0 \quad (7.1)$$

$$t^l = 0 \quad (7.2)$$

$$\tau^h = 0 \quad (7.3)$$

$$\tau = 0 \quad (7.4)$$

8 Equilibrium values

	Equilibrium values
$\lambda^{\text{CONSUMER}^1}$	-0.9978
p^k	1.0001
G^{inc}	0
H^{inc}	80.0057
K	40
L	40
T^{hh}	0
T^{firms}	0
T^{lk}	0
TR	0
U	79.8271
p^A	1.0013
p^B	1.0026
p^C	1.0023
π^A	0
π^B	0
π^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

9 Equilibrium values

	Equilibrium values
$\lambda^{\text{CONSUMER}^1}$	-0.9978
p^k	0.8001
G^{inc}	8.0011
H^{inc}	80.0057
K	40
L	40
T^{hh}	0
T^{firms}	0
T^{lk}	8.0011
TR	8.0011
U	79.8271
p^A	1.0013
p^B	1.0026
p^C	1.0023
π^A	0
π^B	0
π^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