

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. :

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

1.2 Identities

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

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

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

1.3 First order conditions

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

2 FIRM $s \in SEC$

2.1 Optimisation problem

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

s.t. :

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

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

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

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

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2.2 First order conditions

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

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

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

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

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

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

$$1 - \tau - \lambda^{\text{FIRM}^4(s)} = 0 \quad (T\dot{\mathbf{x}}^{(s)}) \quad (2.12)$$

2.3 First order conditions after reduction

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

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

$$\dot{\mathbf{s}} \in \text{SEC}: \quad -p^{(\dot{\mathbf{s}})} (1 - \tau) + \beta^{\text{ci}(s)} \chi^{(\dot{\mathbf{s}},s)} p^{(s)} (1 - \tau) CI^{(s)-1+\gamma^{(s)-1}(-1+\gamma^{(s)})} X^{(\dot{\mathbf{s}},s)-1+\gamma^{(s)-1}(-1+\gamma^{(s)})} \left(\beta^{\text{va}(s)} VA^{(s)\gamma^{(s)-1}(-1+\gamma^{(s)})} + \beta^{\text{ci}(s)} CI^{(s)\gamma^{(s)-1}(-1+\gamma^{(s)})} \right)^{-1+\gamma^{(s)}(-1+\gamma^{(s)})^{-1}} \left(\sum_{\dot{\mathbf{s}} \in \text{SEC}} \right) \quad (2.15)$$

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3 GOVERNMENT

3.1 Identities

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

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

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

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

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

4 EQUILIBRIUM

4.1 Identities

$$s \in SEC: Y^{(s)} = D^{(s)} + \sum_{si \in SEC} X^{(s, si)} \quad (4.1)$$

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

5 Equilibrium relationships (before expansion and reduction)

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

$$pw^l - L = 0 \quad (5.2)$$

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

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

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

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

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

$$-T^{lk} + t^l \left(\sum_{si \in SEC} L^{(si)} \right) + t^k p^k \left(\sum_{s \in SEC} K^{(s)} \right) = 0 \quad (5.8)$$

$$-H^{inc} (1 - \tau^h) - \sum_{s \in SEC} \pi^{(s)} + \sum_{s \in SEC} p^{(s)} D^{(s)} = 0 \quad (5.9)$$

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

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

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

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

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

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

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

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

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

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

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

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

6 Equilibrium relationships (after expansion and reduction)

$$pw^k - K = 0 \quad (6.1)$$

$$pw^l - L = 0 \quad (6.2)$$

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

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

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

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

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

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

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

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

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

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

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

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

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

$$-Y^{(A)} + \left(\beta^{va(A)} VA^{(A)} \gamma^{(A)-1} (-1+\gamma^{(A)}) + \beta^{ci(A)} CI^{(A)} \gamma^{(A)-1} (-1+\gamma^{(A)}) \right) \gamma^{(A)} (-1+\gamma^{(A)})^{-1} = 0 \quad (6.16)$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

7 Parameter settings

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

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

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

$$\tau = 0 \tag{7.4}$$

8 Equilibrium values

	Equilibrium value
$\lambda^{\text{CONSUMER}^1}$	-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
$\pi^{(A)}$	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
$T\bar{x}^{(A)}$	0
$T\bar{x}^{(B)}$	0
$T\bar{x}^{(C)}$	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 value
$\lambda^{\text{CONSUMER}^1}$	-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
$\pi^{(A)}$	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
$T\bar{x}^{(A)}$	0
$T\bar{x}^{(B)}$	0
$T\bar{x}^{(C)}$	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