Consumption Tax in HANK

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1 One-Asset HANK

Households There is a continuum of households i. Utility function

$$E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{c_{it}^{1-\sigma}}{1-\sigma} - \varphi \frac{n_{it}^{1+\nu}}{1+\nu} \right\}.$$

Budget constraint and borrowing constraint

$$\begin{aligned}
&c_{it} + a_{it} = w_t e_{it} n_{it} + (1+r_t) a_{it-1} - \tau_t \bar{\tau}(e_{it}) + d_t \bar{d}(e_{it}) \\
&a_{it} \geq \underline{a}.
\end{aligned}$$

Lagrangian

$$\mathcal{L}_i = E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{c_{it}^{1-\sigma}}{1-\sigma} - \varphi \frac{n_{it}^{1+\nu}}{1+\nu} + \lambda_{it} \left[w_t e_{it} n_{it} + (1+r_t) a_{it-1} - \tau_t \bar{\tau}(e_{it}) + d_t \bar{d}(e_{it}) - c_{it} - a_{it} \right] \right\}.$$

Optimal labor supply and consumption-saving decisions

$$\begin{aligned}
w_t &= \frac{\varphi n_{it}^{\nu}}{e_{it} c_{it}^{-\sigma}}. \\
c_{it}^{-\sigma} &= \beta E_t (1+r_{t+1}) c_{it+1}^{-\sigma}.
\end{aligned}$$

Firms Production function of intermediate goods

$$y_{jt} = Z_t n_{jt}.$$

Phillips curve

$$\log(1+\pi_t) = \kappa \left(\frac{w_t}{Z_t} - \frac{1}{\mu} \right) + \frac{1}{1+r_{t+1}} \frac{Y_{t+1}}{Y_t} \log(1+\pi_{t+1}).$$

Aggregate dividends

$$d_t = Y_t - w_t N_t - \psi_t.$$

Government Government budget constraint

$$\tau_t = r_t B + G_t.$$

Monetary policy

$$i_t = r_t^* + \phi \pi_t + \phi_y (Y_t - Y_{ss})$$

Fisher equation

$$1 + r_t = \frac{1 + i_{t-1}}{1+\pi_t}.$$

Market clearing Resource constraint and clearing in the bond a

$$Y_t = \int_i c_{it} di + G_t + \psi_t.$$

Clearing in the bond and labor markets

$$B_t = \int_i a_{it} di; \quad N_t = \int_i e_{it} n_{it} di.$$

2 One-Asset HANK with Consumption Tax

Households There is a continuum of households i. Utility function

$$E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{c_{it}^{1-\sigma}}{1-\sigma} - \varphi \frac{n_{it}^{1+\nu}}{1+\nu} \right\}.$$

Budget constraint and borrowing constraint

$$\begin{aligned} &(1+\tau_{ct})c_{it} + a_{it} = (1-\tau_n) w_t e_{it} n_{it} + (1+r_t) a_{it-1} - \tau_t \bar{\tau}(e_{it}) + d_t \bar{d}(e_{it}) \\ &a_{it} \geq \underline{a}. \end{aligned}$$

Lagrangian

$$\begin{aligned} \mathcal{L}_i = E_0 \sum_{t=0}^{\infty} \beta^t \Bigg\{ & \frac{c_{it}^{1-\sigma}}{1-\sigma} - \varphi \frac{n_{it}^{1+\nu}}{1+\nu} \\ & + \lambda_{it} \left[(1-\tau_n) w_t e_{it} n_{it} + (1+r_t) a_{it-1} - \tau_t \bar{\tau}(e_{it}) + d_t \bar{d}(e_{it}) - (1+\tau_{ct}) c_{it} - a_{it} \right] \Bigg\}. \end{aligned}$$

Optimal labor supply and consumption-saving decisions

$$\begin{aligned} w_t &= \frac{(1+\tau_{ct})\varphi n_{it}^{\nu}}{(1-\tau_n) e_{it} c_{it}^{-\sigma}}. \\ c_{it}^{-\sigma} &= \beta E_t \frac{1+\tau_{ct}}{1+\tau_{ct+1}} (1+r_{t+1}) c_{it+1}^{-\sigma}. \end{aligned}$$

Firms Production function of intermediate goods

$$y_{jt} = Z_t n_{jt}.$$

Phillips curve

$$\log(1+\pi_t) = \kappa \left(\frac{w_t}{Z_t} - \frac{1}{\mu} \right) + \frac{1}{1+r_{t+1}} \frac{Y_{t+1}}{Y_t} \log(1+\pi_{t+1}).$$

Aggregate dividends

$$d_t = Y_t - w_t N_t - \psi_t.$$

Government Government budget constraint

$$\tau_t = r_t B + G_t - \tau_{ct} C_t - \tau_n N_t.$$

Monetary policy

$$i_t = r_t^* + \phi \pi_t + \phi_y (Y_t - Y_{ss})$$

Fisher equation

$$1 + r_t = \frac{1 + i_{t-1}}{1 + \pi_t}.$$

Market clearing Resource constraint

$$Y_t = \int_i c_{it} di + G_t + \psi_t.$$

Clearing in the bond and labor markets

$$B_t = \int_i a_{it} di; \quad N_t = \int_i e_{it} n_{it} di.$$

3 One-Asset HANK with Consumption Tax and Sticky Wage

To complete.