Should we Stop Taxing Homes?

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Should we Stop Taxing Homes?

- Investment in housing is like investment in capital, so it should not be taxed

- But... we also consume housing, and housing services should be taxed

- How should housing be taxed?
  - Should property taxes be used?
  - Should rents (and imputed rents) be taxed?
  - Or should we use no taxes at all?

Preview of results

- When we consider only income taxes on labor, capital, and housing, housing is like capital
  - Only the labor income should be taxed in the steady state
  - Along the transition, housing and capital may be taxed or subsidized

- Housing is treated just like capital

Preview of results

- But housing is very different from capital
- The labor income tax is taxing the services of housing, at the same rate as it taxes the other consumption goods
- This becomes apparent when we allow for both consumption taxes and taxes on labor income
- If consumption is taxed, then housing services should also be taxed
- A VAT on rents and imputed rents should be used

Outline

- Model and competitive equilibrium
- Optimal taxation with a representative household
- Interpretation: taxation of intermediate goods with restrictions on taxes.
- Extension: Land

Related literature

- Chamley (1986) and Judd (1985) - zero capital taxes in long run
- Straub, Werning (2014), Chari, Nicolini, and Teles (2016) - taxation of initial capital
- Correia (1996), Jones, Manuelli and Rossi (1997), Reis (2011) - incomplete factor taxation
- Saez and Stantcheva (2016) - capital in the utility function
- Werning (2007) - redistribution

The Model - Preferences

- Preferences of a representative household are

$$\sum_{t=0}^{\infty} \beta^t U(c_t, h_t, l_t, n_t)$$

with c_t - consumption, h_t - housing, l_t - leisure, n_t - labor

- Leisure is combined with consumption goods and housing, to produce a composite good C_t, to a CRS function $C_t = C(c_t, h_t, l_t)$

- Households derive disutility from time spent as labor or leisure

$$U(c_t, h_t, l_t, n_t) = u[C(c_t, h_t, l_t)] - v(l_t, n_t)$$

The Model - Preferences

- Households are endowed with one unit of time that can be split between labor and leisure time

$$v\left(l_t, n_t\right) = v\left(l_t + n_t\right) = v\left(1\right)$$

- The preferences of the representative household are

$$\sum_{t=0}^{\infty} \beta^t u\left[C\left(c_t, h_t, l_t\right)\right]$$

- This guarantees utility function is homothetic

The Model - Technology

- The technology is described by

$$c_t + g_t + h_{t+1} - \left(1 - \delta^h\right) h_t + k_{t+1} - \left(1 - \delta^k\right) k_t \leq F\left(k_t, n_t\right)$$

- Private and public consumption and investment in housing and capital are produced with a CRS function of capital and labor

- Capital and housing depreciate at rates δ^k and δ^h

First Best

- The first best problem is

$$\max \sum_{t=0}^{\infty} \beta^t u \left[C \left(c_t, h_t, l_t \right) \right]$$

$$\text{st} \quad c_t + g_t + h_{t+1} - \left(1 - \delta^h\right) h_t + k_{t+1} - \left(1 - \delta^k\right) k_t \leq F \left(k_t, n_t \right)$$

- Optimality conditions

$$\frac{C_{l,t}}{C_{c,t}} = F_{n,t}$$

$$u_{C,t} C_{c,t} = \beta u_{C,t+1} C_{c,t+1} \left[1 - \delta^k + F_{k,t+1} \right]$$

$$\frac{C_{h,t+1}}{C_{c,t+1}} - \delta^h = F_{k,t+1} - \delta^k$$

Competitive equilibrium with taxes

$$\begin{aligned}
&(1+\tau_t^c)\,c_t + \left(1+\tau_t^h\right) r_t^h h_t + \frac{1}{R_{t+1}} b_{t+1} - \left(1-l_t^b\right) b_t \\
&+ k_{t+1} - \left(1-l_t^k\right)\left[1+\left(1-\tau_t^k\right)\left(r_t^k-\delta^k\right)\right] k_t \\
&+ h_{t+1}^I - \left(1-l_t^h\right)\left[1+\left(1-\tau_t^{hI}\right)\left(r_t^h-\delta^h\right)\right] h_t^I = (1-\tau_t^n)\,w_t n_t
\end{aligned}$$

Housing for consumption h_t and housing for investment h_t^I

Rental markets for capital and housing, rental prices are r_t^k and r_t^h

Levies on three assets: bonds l_t^b, capital l_t^k, housing l_t^h

Three income taxes: capital τ_t^k, housing τ_t^{hI}, labor τ_t^n

Two consumption taxes: consumption good τ_t^c and housing τ_t^h

Competitive equilibrium - marginal conditions

$$\frac{C_{l,t}}{C_{c,t}} = \frac{1-\tau_t^n}{1+\tau_t^c} F_{n,t}$$

$$\frac{u_{C,t} C_{c,t}}{\beta u_{C,t+1} C_{c,t+1}} = \frac{1+\tau_t^c}{1+\tau_{t+1}^c} \left(1 - l_{t+1}^k\right) \left[1 + \left(1 - \tau_{t+1}^k\right) \left(F_{k,t+1} - \delta^k\right)\right]$$

$$\begin{aligned} &\left(1 - l_{t+1}^k\right) \left[1 + \left(1 - \tau_{t+1}^k\right) \left(F_{k,t+1} - \delta^k\right)\right] \\ = &\left(1 - l_{t+1}^h\right) \left[1 + \left(1 - \tau_{t+1}^{hI}\right) \left(\frac{C_{h,t+1}}{C_{c,t+1}} \frac{\left(1+\tau_{t+1}^c\right)}{\left(1+\tau_{t+1}^h\right)} - \delta^h\right)\right] \end{aligned}$$

Ramsey - Implementability condition

- An allocation can be implemented as a competitive equilibrium iff it meets the resource constraints and the following implementability condition

$$\sum_{t=0}^{\infty} \beta^t u_{C,t} \left[C_{c,t} c_t - C_{l,t} n_t\right] + \sum_{t=0}^{\infty} \beta^{t+1} u_{C,t+1} C_{h,t+1} h_{t+1} = V_0$$

$$\text{or} \quad \sum_{t=1}^{\infty} \beta^t u_{C,t} \left[C_t - C_{l,t}\right] + u_{C,0} \left[C_{c,0} c_0 - C_{l,0} n_0\right] = V_0$$

- Assume that the government has precommited to initial wealth in utility terms - Armenter (2008), Chari, Nicolini and Teles (2016)

$$V_0 = \frac{u_{C,0} C_{c,0}}{1+\tau_0^c} \left[\begin{array}{c} \left(1 - l_0^b\right) b_0 + \left(1 - l_0^h\right) \left[1 + \left(1 - \tau_0^h\right) \left(u_0^h - \delta\right)\right] h_0 \\ + \left(1 - l_0^k\right) \left[1 + \left(1 - \tau_0^k\right) \left(u_0^k - \delta\right)\right] k_0 \end{array} \right]$$

- This restricts direct and indirect confiscation through valuation effects

Ramsey solution - marginal conditions

$$\frac{C_{l,t}}{C_{c,t}F_{n,t}} = \frac{1+\varphi\frac{u_{CC,t}}{u_{C,t}}\left[C_t - C_{l,t}\right] + \varphi\left[1-\frac{C_{lc,t}}{C_{c,t}}\right]}{1+\varphi\frac{u_{CC,t}}{u_{C,t}}\left[C_t - C_{l,t}\right] + \varphi\left[1-\frac{C_{ll,t}}{C_{l,t}}\right]}$$

$$\frac{\frac{u_{C,t}C_{c,t}}{\beta u_{C,t+1}C_{c,t+1}}}{1-\delta+F_{k,t+1}} = \frac{1+\varphi\frac{u_{CC,t+1}}{u_{C,t+1}}\left[C_{t+1} - C_{l,t+1}\right] + \varphi\left[1-\frac{C_{lc,t+1}}{C_{c,t+1}}\right]}{1+\varphi\frac{u_{CC,t}}{u_{C,t}}\left[C_t - C_{l,t}\right] + \varphi\left[1-\frac{C_{lc,t}}{C_{c,t}}\right]}$$

$$\frac{\frac{C_{h,t+1}}{C_{c,t+1}}-\delta^h}{F_{k,t+1}-\delta^k} = \frac{1+\varphi\frac{u_{CC,t+1}}{u_{C,t+1}}\left[C_{t+1} - C_{l,t+1}\right] + \varphi\left[1-\frac{C_{lc,t+1}}{C_{c,t+1}}\right]}{1+\varphi\frac{u_{CC,t+1}}{u_{C,t+1}}\left[C_{t+1} - C_{l,t+1}\right] + \varphi\left[1-\frac{C_{lh,t+1}}{C_{h,t+1}}\right]}$$

Ramsey solution - marginal conditions

- With weak separability $C(c_t, h_t, l_t) = C(D(c_t, h_t), l_t)$

- Since

$$\frac{C_{lc,t}}{C_{c,t}} = \frac{C_{lD,t}D_{c,t}}{C_{D,t}D_{c,t}} = \frac{C_{lD,t}}{C_{D,t}} \quad \text{and} \quad \frac{C_{lh,t}}{C_{h,t}} = \frac{C_{lD,t}D_{h,t}}{C_{D,t}D_{h,t}} = \frac{C_{lD,t}}{C_{D,t}}$$

- The wedge below is equal to one

$$\frac{\frac{C_{h,t+1}}{C_{c,t+1}} - \delta^h}{F_{k,t+1} - \delta^k} = \frac{1 + \varphi \frac{u_{CC,t+1}}{u_{C,t+1}}\left[C_{t+1} - C_{l,t+1}\right] + \varphi\left[1 - \frac{C_{lc,t+1}}{C_{c,t+1}}\right]}{1 + \varphi \frac{u_{CC,t+1}}{u_{C,t+1}}\left[C_{t+1} - C_{l,t+1}\right] + \varphi\left[1 - \frac{C_{lh,t+1}}{C_{h,t+1}}\right]} = 1$$

Ramsey: Implementation with income taxes

- Labor taxes

$$\frac{C_{l,t}}{C_{c,t}F_{n,t}} = 1 - \tau_t^n$$

- Capital levy

$$\frac{u_{C,t}C_{c,t}}{\beta u_{C,t+1}C_{c,t+1}} = 1 + \left(1 - \tau_{t+1}^k\right) F_{k,t+1} - \delta^k$$

- Housing levy

$$\left(1 - \tau_{t+1}^k\right)\left(F_{k,t+1} - \delta^k\right) = \left(1 - \tau_{t+1}^{hI}\right)\left(\frac{C_{h,t+1}}{C_{c,t+1}} - \delta^h\right) \rightarrow \tau_{t+1}^{hI} = \tau_{t+1}^k$$

Ramsey: Implementation with consumption taxes

- Consumption taxes

$$\frac{C_{l,t}}{C_{c,t}F_{n,t}} = \frac{1}{1+\tau_t^c}$$

- Capital levy

$$\frac{u_{C,t}C_{c,t}}{\beta u_{C,t+1}C_{c,t+1}} = \frac{1+\tau_t^c}{1+\tau_{t+1}^c}\left[1+\left(1-\tau_{t+1}^k\right)F_{k,t+1}-\delta^k\right]$$

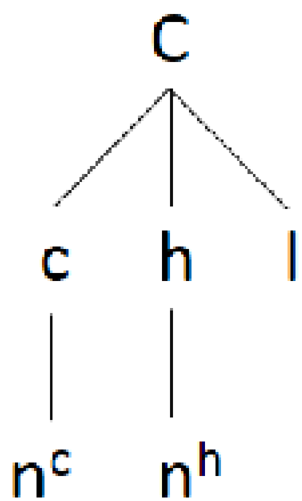
- Housing levy

$$\left(1-\tau_{t+1}^k\right)\left(F_{k,t+1}-\delta^k\right) = \left(1-\tau_{t+1}^{hI}\right)\left(\frac{C_{h,t+1}}{C_{c,t+1}}\frac{\left(1+\tau_{t+1}^c\right)}{\left(1+\tau_{t+1}^h\right)}-\delta^h\right)$$

- Need taxes on (imputed) rents $\tau_{t+1}^h = \tau_{t+1}^c$ for $\tau_{t+1}^{hI} = \tau_{t+1}^k$

Taxation of intermediate goods?

- C is a final good produced with intermediate goods c, h, and input l



- Cannot tax final good or l, otherwise would tax the endowment, lump sum

- Can only tax $n^c + n^h$, c and h

Taxation of intermediate goods?

- Diamond and Mirrlees does not apply because it is not possible to tax the final good

- In general want to tax intermediate goods at different rates, in order to tax l indirectly

- With weak separability in l, distorting between c and h does not help in taxing l

Extensions

- Land - no land accumulation, so taxation does not distort choices. The only constraint is the initial promise

- General preferences - it may be optimal to distort between capital and housing accumulation if (total) elasticities of consumption and housing are different

How do we model land?

- Land is in fixed supply

$$T_t = T$$

- Land is used together with a structure (trailer home) to produce the housing good

$$H_t = H\left(h_t, T_t\right)$$

- Preferences

$$U = \sum_{t=0}^{\infty} \beta^t \left[u\left(C\left(c_t, H\left(h_t, T_t\right), l_t\right)\right) - \omega\left(n_t, l_t\right)\right]$$

- Technology

$$c_t + g_t + h_{t+1} - (1-\delta)\, h_t + k_{t+1} - (1-\delta)\, k_t \leq F\left(k_t, n_t\right)$$

Optimal taxation of land

- In this model, any taxation of land is optimal. Future taxation of land does not affect the accumulation of land because there is no such accumulation

- The future taxation of land affects the value of land in period zero, but that is compensated with the initial levy to keep the initial V_0 constant

- One of the solutions is to tax both housing and land at the same rate. This might be the simple way to implement. The initial levies would be adjusted accordingly

Conclusion - Should we stop taxing homes?

- Yes: Should not tax wealth or income on both capital and housing

- No: Should tax rents (and imputed rents), with a VAT tax, because the same tax applies to other consumption goods

- Of course, there ways of doing this that look like wealth or income taxes on housing

- Heterogeneity does not change features of the optimal tax - same as Werning (2007)

Extension 1 - Competitive equilibrium with land

- Separate taxation of land and buildings

- Distinguish land as investment T_t^I from consumption of land T_t

- The budget constraints become

$$
\begin{aligned}
&(1+\tau_t^c)\, c_t + \left(1+\tau_t^h\right) r_t^h h_t + \left(1+\tau_t^T\right) r_t^T T_t + \frac{1}{R_{t+1}} b_{t+1} - \left(1-l_t^b\right) b_t \\
&+ k_{t+1} - \left(1-l_t^k\right)\left[1+\left(1-\tau_t^k\right)\left(r_t^k-\delta^k\right)\right] k_t \\
&+ h_{t+1}^I - \left(1-l_t^h\right)\left[1+\left(1-\tau_t^{hI}\right)\left(r_t^h-\delta^h\right)\right] h_t^I \\
&+ p_t^T T_{t+1}^I - \left(1-l_t^T\right)\left[p_t^T+\left(1-\tau_t^{TI}\right) r_t^T\right] T_t^I = (1-\tau_t^n)\, w_t n_t
\end{aligned}
$$

Competitive equilibrium with land - marginal conditions

$$\frac{C_{l,t}}{C_{c,t}F_{n,t}} = \frac{1-\tau_t^n}{1+\tau_t^c}$$

$$\frac{u_{C,t}C_{c,t}}{\beta u_{C,t+1}C_{c,t+1}} = \frac{1+\tau_t^c}{1+\tau_{t+1}^c}\left(1-l_{t+1}^k\right)\left[1+\left(1-\tau_{t+1}^k\right)\left(F_{k,t+1}-\delta^k\right)\right]$$

$$\begin{aligned}
&\left(1-l_{t+1}^k\right)\left[1+\left(1-\tau_{t+1}^k\right)\left(F_{k,t+1}-\delta^k\right)\right] \\
&= \left(1-l_{t+1}^h\right)\left[1+\left(1-\tau_{t+1}^{hI}\right)\left(\frac{C_{H,t+1}H_{h,t+1}}{C_{c,t+1}}\frac{\left(1+\tau_{t+1}^c\right)}{\left(1+\tau_{t+1}^h\right)}-\delta^h\right)\right] \\
&= \frac{1-l_{t+1}^T}{p_t^T}\left[p_{t+1}^T+\left(1-\tau_{t+1}^{TI}\right)\frac{C_{H,t+1}H_{T,t+1}}{C_{c,t+1}}\frac{\left(1+\tau_{t+1}^c\right)}{\left(1+\tau_{t+1}^T\right)}\right]
\end{aligned}$$

Implementability condition with land

- Same as before as long as C and H are constant returns to scale

$$\text{or} \quad \sum_{t=1}^{\infty} \beta^t u_{C,t} \left[C_t - C_{l,t}\right] + u_{C,0} \left[C_{c,0} c_0 - C_{l,0} n_0\right] = V_0$$

- Assume that the government has precommited to initial wealth in utility terms (Armenter, 2008)

$$V_0 = \frac{u_{C,0} C_{c,0}}{1+\tau_0^c} \left[\begin{array}{c} \left(1 - l_0^b\right) b_0 + \left(1 - l_0^h\right) \left[1 + \left(1 - \tau_0^h\right) \left(r_0^h - \delta^h\right)\right] h_0 \\ + \left(1 - l_0^k\right) \left[1 + \left(1 - \tau_0^k\right) \left(r_0^k - \delta^k\right)\right] k_0 \\ + \left(1 - l_0^T\right) \left[p_0^T + \left(1 - \tau_0^{TI}\right) r_0^T\right] T_0^I \end{array} \right]$$

The Ramsey solution with land - marginal conditions

$$\frac{C_{l,t}}{C_{c,t}F_{n,t}} = \frac{1+\varphi\frac{u_{CC,t}}{u_{C,t}}\left[C_t - C_{l,t}\right] + \varphi\left[1-\frac{C_{lc,t}}{C_{c,t}}\right]}{1+\varphi\frac{u_{CC,t}}{u_{C,t}}\left[C_t - C_{l,t}\right] + \varphi\left[1-\frac{C_{ll,t}}{C_{l,t}}\right]}$$

$$\frac{\frac{u_{C,t}C_{c,t}}{\beta u_{C,t+1}C_{c,t+1}}}{1-\delta+F_{k,t+1}} = \frac{1+\varphi\frac{u_{CC,t+1}}{u_{C,t+1}}\left[C_{t+1} - C_{l,t+1}\right] + \varphi\left[1-\frac{C_{lc,t+1}}{C_{c,t+1}}\right]}{1+\varphi\frac{u_{CC,t}}{u_{C,t}}\left[C_t - C_{l,t}\right] + \varphi\left[1-\frac{C_{lc,t}}{C_{c,t}}\right]}$$

$$\frac{\frac{C_{H,t+1}H_{h,t+1}}{C_{c,t+1}} - \delta^h}{F_{k,t+1}-\delta^k} = \frac{1+\varphi\frac{u_{CC,t+1}}{u_{C,t+1}}\left[C_{t+1} - C_{l,t+1}\right] + \varphi\left[1-\frac{C_{lc,t+1}}{C_{c,t+1}}\right]}{1+\varphi\frac{u_{CC,t+1}}{u_{C,t+1}}\left[C_{t+1} - C_{l,t+1}\right] + \varphi\left[1-\frac{C_{lH,t+1}}{C_{H,t+1}}\right]}$$

Same as before but... no marginal condition for land

Extension 2 - General utility function $U(c_t, h_t, n_t)$

- Same marginal conditions

$$-\frac{U_n(t)}{U_c(t)F_{n,t}} = \frac{1+\varphi\left(1+\sigma_t^{cc}+\sigma_t^{cn}+\sigma_t^{ch}\right)}{1+\varphi\left(1+\sigma_t^{nc}+\sigma_t^{nn}+\sigma_t^{nh}\right)}$$

$$\beta\left[1-\delta+F_{k,t+1}\right]\frac{U_c(t+1)}{U_c(t)} = \frac{1+\varphi\left(1+\sigma_t^{cc}+\sigma_t^{cn}+\sigma_t^{ch}\right)}{1+\varphi\left(1+\sigma_{t+1}^{cc}+\sigma_{t+1}^{cn}+\sigma_{t+1}^{ch}\right)}$$

$$\frac{U_h(t+1)}{U_c(t+1)F_{k,t+1}} = \frac{1+\varphi\left(1+\sigma_{t+1}^{cc}+\sigma_{t+1}^{cn}+\sigma_{t+1}^{ch}\right)}{1+\varphi\left(1+\sigma_{t+1}^{hc}+\sigma_{t+1}^{hn}+\sigma_{t+1}^{hh}\right)}$$

- with

$$\sigma_t^{ij} = \frac{U_{ij}(t)j(t)}{u_i(t)}$$

General utility function $U(c_t, h_t, n_t)$

- What matters are own and cross price elasticities - GE
- The same results apply on capital taxation as before
  - Do not tax in the long run
  - Tax or subsidize along the transition
- With strong separability and constant elasticities, never tax/subsidize capital

General utility function $U\left(c_t, h_t, n_t\right)$

- It may be optimal to distort between consumption and housing and therefore also between capital and housing

$$\left(1-l_{t+1}^{k}\right)\left[1+F_{k,t+1}-\delta^{k}\right]=\left(1-l_{t+1}^{h}\right)\left[1+\frac{C_{h,t+1}}{C_{c,t+1}}\frac{\left(1+\tau_{t+1}^{c}\right)}{\left(1+\tau_{t+1}^{h}\right)}-\delta^{h}\right]$$

- Taxing housing at a different rate from consumption may be a way of taxing leisure

- Incomplete factor taxation as in Correia (1996), Jones, Manuelli and Rossi (1997), Reis (2011)

Extension 3 - Heterogeneity

- Consider an economy with two agents: 1 and 2

- The social welfare function is $\theta U^1 + (1 - \theta) U^2$

- Different endowments of capital, housing, or bonds

- Do not restrict initial levies: Werning (2007)

Heterogeneity

- With strong separability and equal elasticities for consumption and housing
  - Never tax capital or housing accumulation
  - All agents benefit from this, regardless of their endowments..
- All agents benefit from capital and housing not being taxed

  And the levies be used instead

Heterogeneity

- Preferences are

$$U^i = \sum_{t=0}^{\infty} \beta^t \left[\frac{\left(c_t^i\right)^{1-\sigma} - 1}{1-\sigma} + \frac{\left(h_t^i\right)^{1-\sigma} - 1}{1-\sigma} - \eta \left(n_t^i\right)^{1+\psi} \right]$$

- The resource constraints are

$$\begin{aligned} c_t^1 + c_t^2 + g_t + h_{t+1}^1 + h_{t+1}^2 - (1-\delta)\left(h_t^1 + h_t^2\right) \\ + k_{t+1}^1 + k_{t+1}^2 - (1-\delta)\left(k_t^1 + k_t^2\right) \leq F\left(n_t^1 + n_t^2, k_t^1 + k_t^2\right) \end{aligned}$$

Heterogeneity - competitive equilibrium

- Since the taxes must be the same for the two agents an implementable allocation must also satisfy the following marginal conditions that equate the marginal rates of substitution across agents

$$\frac{u^1_{c,t}}{u^2_{c,t}} = \frac{u^1_{h,t}}{u^2_{h,t}} \qquad \frac{u^1_{c,t}}{u^2_{c,t}} = \frac{u^1_{n,t}}{u^2_{n,t}} \qquad \frac{u^1_{c,t}}{u^2_{c,t}} = \frac{u^1_{c,t+1}}{u^2_{c,t+1}}$$

- These conditions can be written as

$$u^1_{c,t} = \gamma u^2_{c,t} \qquad u^1_{n,t} = \gamma u^2_{n,t} \qquad u^1_{h,t} = \gamma u^2_{h,t}$$

- Given our specific functional form, these imply that

$$c^1_t = \gamma^{-1/\sigma^c} c^2_t \qquad n^1_t = \gamma^{1/\psi} n^2_t \qquad h^{u1}_t = \gamma^{-1/\sigma^h} h^{u2}_t$$

Heterogeneity - competitive equilibrium

- We can write Ramsey problem using only agent 2's allocations to find the following optimality conditions

$$\frac{-u^1_{n,t}}{u^1_{c,t}F_{n,t}} = \frac{-u^2_{n,t}}{u^2_{c,t}F_{n,t}} = \frac{\gamma^{1-1/\sigma}\left[\theta + \varphi^1(1-\sigma)\right] + 1 - \theta + \varphi^2(1-\sigma)}{\gamma^{1+1/\psi}\left[\theta + \varphi^1(1+\psi)\right] + 1 - \theta + \varphi^2(1+\psi)} \cdot \frac{1+\gamma^{1/\psi}}{1+\gamma^{-1/\sigma}}$$

$$\frac{u^1_{c,t}}{\beta u^1_{c,t+1}} = \frac{u^2_{c,t}}{\beta u^2_{c,t+1}} = 1 - \delta + F_{k,t+1}$$

$$\frac{u^1_{h,t+1}}{u^1_{c,t+1}} - \delta^h = \frac{u^2_{h,t+1}}{u^2_{c,t+1}} - \delta^h = F_{k,t+1} - \delta^k$$