A Baseline HANK for Chile

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Motivation

- Increasing number of HANK models with different features.
- Not many works comparing implications of different features.
- We analyze and compare the mechanisms of adding labor and financial frictions.
- Part of the research agenda of the Central Bank of Chile.

This Paper

- We analyze 3 HANK models with different frictions and the impact through the transmission channels.

Research question: how different frictions affect the transmission channel of Fiscal/Monetary Policies?

A HANK Model Calibrated for Chile:

- Replicates key moments of the economy
- Decompose consumption between: direct, indirect, average and distributional channels
- Effects of Transfer progressivity and Monetary Policy

Related Literature

Fiscal Policy in HANK:

- Auclert et al. (2018), Patterson (2023)

Two-Assets HANK:

- Kaplan et al. (2018)

Agenda

1. Consumption's Decomposition
2. Models and dynamics
3. Conclusion

1. Consumption's Decomposition

Sources of Consumption Fluctuations

- What is behind of the movement of aggregate consumption given a shock is not trivial.
- It can come from substitutions, income effects.
- In HANK models it can come from some specific part of the distribution.
- Following Kaplan et al. (2018) and Patterson (2023). Given a generic policy shock p_k:

$$dC_t \equiv d\int c_t(i;\mathbf{r},\mathbf{T},\mathbf{y})di = \underbrace{\int \frac{\partial c_t(i;\mathbf{r},\mathbf{T},\mathbf{y})}{\partial p_k} dp_k di}_{\text{direct}} + \underbrace{\int \frac{\partial c_t(i;\mathbf{r},\mathbf{T},\mathbf{y})}{\partial \chi_k} d\chi(i)di}_{\text{Indirect}} \quad (1)$$

Sources of Consumption Fluctuations: Decomposition

Given a generic policy shock p_k:

$$dC_t \equiv d\int c_t(i;\mathbf{r},\mathbf{T},\mathbf{y})di = \underbrace{\int \frac{\partial c_t(i;\mathbf{r},\mathbf{T},\mathbf{y})}{\partial p_k} dp_k di}_{\text{direct}} + \underbrace{\int \frac{\partial c_t(i;\mathbf{r},\mathbf{T},\mathbf{y})}{\partial \chi_k} d\chi(i)di}_{\text{Indirect}}$$

Lets take as an example a Fiscal transfer T, a further decomposition can be written:

$$\boldsymbol{dC_t} = \boldsymbol{\overline{Q}_t dr} + \underbrace{\boldsymbol{\overline{M}_t d\overline{T}} + \boldsymbol{\overline{M}_t d\overline{y}}}_{\text{Average}} + \underbrace{\boldsymbol{COV_i(M_t(i), dT(i))} + \boldsymbol{COV_i(M_t(i), dy(i))}}_{\text{Distributional}} \tag{2}$$

2. Models

Models' common features

- GE Model, time is discrete $t = 0...T$, no Aggregate uncertainty
- **Households:** ▸ Households' Value Function ▸ Model's MPCs
  - Measure one, s.t. idiosyncratic income risk
  - Consume, save, receive wage $w_t(z_t)$ and receive a government transfer $f(z_t)$
- **Government**: ▸ Government's Budget
  - Labor income taxes and debt.
  - Transfers $f(z) = T_t z^{-\aleph_f} f_0$
  - Fiscal Balance evolves smoothly over time $dB_t^g = \rho_T(dB_{t-1}^g + dT_t)$
  - Taylor rule $i_t = r^\star + \phi_\pi \pi_t$
- **Firms:**
  - Intermediate firms $y_{j,t} = Z_t k_{j,t-1}^{\alpha}(h_{j,t} n_{j,t})^{1-\alpha}$ in monopolistic comp (markup μ)
  - Price Frictions (Rotemberg) $\rightarrow$ NKPC
  - Capital adjustment costs

Liquid-Illiquid Aggregates

- Following Kaplan et al. (2018) we use 3 data sources to obtain the Assets Aggregates. ▸ Aggregates deteils

Liquid		Illiquid		Total
	CMF		CMF+CB+SII	
Revolving consumer debt	-0.12	Net housing	1.93	
Deposits	0.05	Net durables	0.13	
Fixed income	0.12			
Equity	0.12			
Total	0.17		2.06	2.23

Table: Values are expressed as a fraction of 2017 GDP.

Liquid and Illiquid Asset Distribution in Chile

- Following the methodology used by Kaplan and Violante (2014) we calculate the the share of Hand-to-Mouth households using the Financial Households' Survey of 2017.

	Data
Frac. with b $\approx$ 0 and a $=$ 0	0.08
Frac. with b $\approx$ 0 and a $>$ 0	0.31

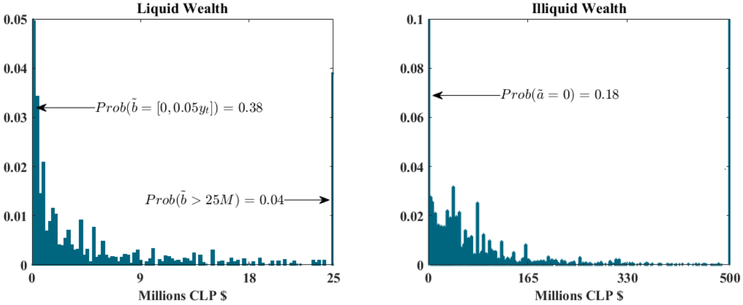


Figure: Distributions of Liquid and Illiquid Wealth

Comparing different labor markets

- Sticky-wages:
  - Union negotiate wages, s.t. Rotemberg cost
  - NKWPC, relating wage inflation with hours worked and workers' preferences.

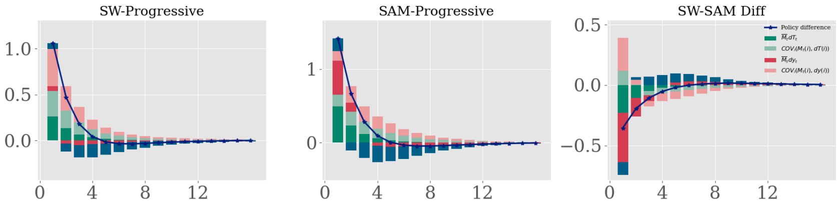
- Search and Matching: ▸ Households' Value Function ▸ Calibration
  - Unemployment (extensive margin), hours (intensive margin)
  - Search frictions a la Diamond-Mortensen-Pissarides
  - Job Market intermediary with free-entry condition
  - A Union determines hours H_t (intensive margin): $\psi H_t^{\varphi} = \mathcal{U}'(1 - \tau_t^w) w_t$
  - Bargained wage $w_t = (1 - \eta)\omega + \eta(mpl_t + c_v \theta_t)$

Some intuition: The SaM model produce a precautionary motive, producing higher MPCs. The unemployment mass is concentrated in the lower part of the productivity distribution.

Comparing Labor Markets: Fiscal Transfer

Loose Monetary Policy

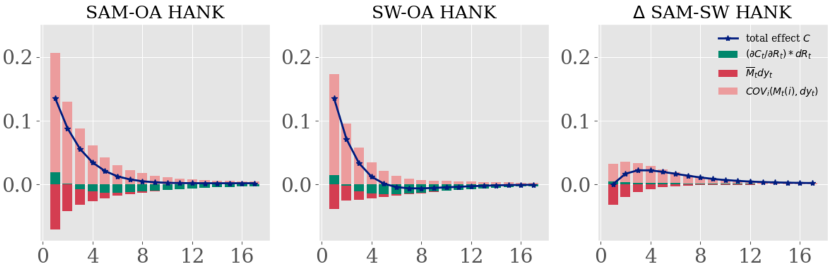
$$dC_t = \overline{Q}_t dr + \underbrace{\overline{M}_t d\overline{T} + \overline{M}_t d\overline{y}}_{\text{Average}} + \underbrace{COV_i(M_t(i), dT(i)) + COV_i(M_t(i), dy(i))}_{\text{Distributional}}$$



Notes: The fiscal transfer triggers a boom. The SaM Model's response is about 40% bigger than the SW Model.

Comparing Labor Markets: Monetary Policy Shocks

$$dC_t = \underbrace{\overline{Q}_t dr}_{\text{Average-direct}} + \underbrace{\overline{M}_t d\overline{y}}_{\text{Average-indirect}} + \underbrace{COV_i(M_t(i), dy(i))}_{\text{Distributional-indirect}}$$



Notes: In the SaM Model, the distributional-indirect effect is more persistent than in the SW Model. It is due to the persistent of the unemployment state.

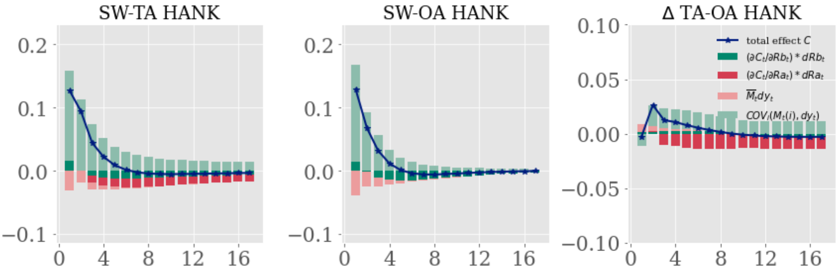
Comparing Financial Frictions

- Full Illiquid Asset:
  - There is an illiquid Asset used by the firm, Households cannot transform it into a liquid Asset, Auclert et al. (2018).
- Illiquid Asset with adjustment cost:
  - **Households:** ▸ Households' Value Function ▸ Calibration
    - Households are able to move wealth between Assets paying a cost Φ_t
    - Liquid and illiquid Asset, with financial cost Kaplan et al. (2018) ▸ Household problem

$$\Phi_t(a', a) = \frac{\chi_1}{\chi_2}\left|\frac{a' - (1+r_t^a)a}{(1+r_t^a)a + \chi_0}\right|^{\chi_2} |(1+r_t^a)a + \chi_0|$$

χ_0 and χ_2 are used as targets to calibrate the shares of Hand-to-Mouth Households.

Comparing Financial Frictions: Monetary Policy Shock



Notes: The economy accumulates more capital, producing a lower return of the illiquid asset, thus producing a re-distributional effect (from riches to poors).

Conclusion

- The election of a Baseline HANK model is not trivial:
  - SAM Model: The Income-Risk feature produce higher MPCs, implying a higher direct effect from Fiscal Transfers, thus a higher aggregate effect.
  - TA Model: Generates a more persistent response to shocks, due to the possibility to increase/diminish the gains created by the Asset prices.
- In terms of parsimonious and added features the SaM model is capable of produce distributional channels not adding a too complex mechanism.

Households' Value Function

Back

- The Household problem is defined as follows:

$$V_t(z, \boldsymbol{a}, s) = \max_{c, \boldsymbol{a}} \; u(c) + \beta \sum_{z,s} \Pi(z, z', s, s') V_{t+1}(z', \boldsymbol{a}', s')$$

$$\text{s.t. } c + \sum_h a'_h = \sum_h (1 + r_{ht}) a_h + y(z, s) + f_t(z)$$

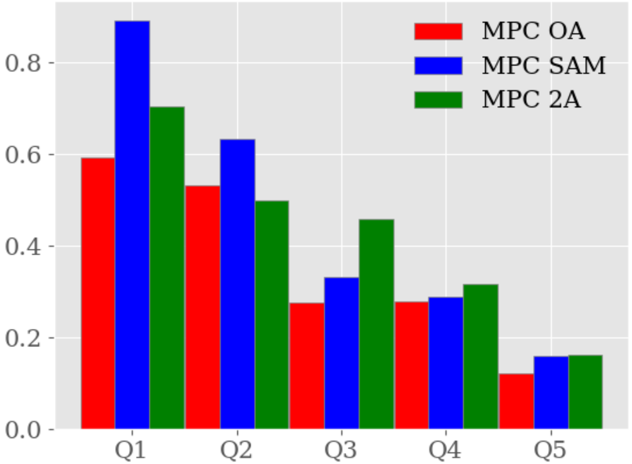
$$\boldsymbol{a} \geq 0.$$

- Given optimal policies $c_t^\star(z, \boldsymbol{a}, s)$, ${a'}_t^\star(z, \boldsymbol{a}, s)$, ${b'}_t^\star(z, \boldsymbol{a}, s)$, and denoting $\Psi(z, \boldsymbol{a}, s) = Pr(z_t = z, a_{t-1} \in A, s_t = s)$ the probability of that combination of states. The distribution Ψ_t has a law of motion:

$$\Psi_{t+1}(z', \boldsymbol{a}', s') = \sum_{z,s} \Psi_t(z', \boldsymbol{a}'^{\star -1}, s') \Pi(z, z', s, s')$$

Model's MPCs

Back



Government's Budget

Back

- The government's budget constraint is then given by:

$$B^g_{t+1} = T_t + \omega w_t U_t - \tau^w_t w_t H_t N_t + (1 + r_t) B^g_t.$$

- The evolution of the fiscal balance depends on a smoothing parameter ρ_T, which determines to what extent additional spending is financed with debt according to:

$$dB^g_t = \rho_T (dB^g_{t-1} + dT_t).$$

Aggregates deteils

Back

- To develop our two-asset structure as in Kaplan et al. (2018). We use:
  - Financial Statements available in the Financial Markets Commission (CMF) for Banking System, Financial Intermediaries and Non-Banking companies,
  - Microdata of Real Estate official values (SII).
  - Financial Household's Survey 2017 for the Net durables Assets' holding.
- Sample: December 2017 (Fiscal year: 2017).

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Calibration

Back

	Description	SaM	Source/Target	Two-Asset	Source/Target
Preferences					
β	Discount factor	0.95	Share of HtM (0.42)	0.96	Share of HtM (0.38)
γ	Elasticity of Intertemporal Substitution	1		0.5	
ψ	Disutility of labor	0.57	Hours worked (1)	1.7	Hours worked (1)
φ	Frisch elasticity of labor supply	1		1	
r	Eq. interest rate	2%		2%	
Labor Market and Wages					
η	Union's bargaining power	0.5	Mortensen & Pissarides (1994)	-	
α	Elasticity matching function	0.5	Mortensen & Pissarides (1994)	-	
s	Separation rate	0.04	Unemployment rate (0.08)	-	
c_v	Vacancy cost	0.18	*Internally calibrated*	-	
m	Matching efficiency	0.537	Job finding rate	-	
Fiscal and Monetary Policy					
τ_w	Labor income tax	0.09	*Internally calibrated*	0.09	*Internally calibrated*
ϕ_π	Taylor rule (inflation)	1.25			
ϕ_U	Taylor rule (unemployment)	-1		-	
Production					
Z	TPF	0.52	Normalized aggregate output (1)	0.49	Normalized aggregate output (1)
α_K	Capital share	0.34		0.34	
δ	Depreciation rate	0.01		0.01	
ε_I	Capital adjustment costs	2		2	
κ	Slope of P.C.	0.1			
K	Capital in SS.	2.01		2.01	
Financial Friction					
χ_0	Capital share	-		0.0038	Poor Hand-to-Mouth (0.07)
χ_1	Depreciation rate	-		8.55	
χ_2	Capital adjustment costs	-		2.035 Rich Hand-to-Mouth (0.31)	

Table: Models' Calibration

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$$\text{s.t. } c + b' + a'_h = (1+r_t)^a a + (1+r_t^b)b + y(z,s) + d(z) + f_t(z) + \Phi_t(a',a)$$

$$\boldsymbol{b} \geq 0 \;\text{ and }\; \boldsymbol{a} \geq 0.$$

- Given optimal policies $c_t^\star(z,\boldsymbol{a},s)$, ${a'}_t^\star(z,\boldsymbol{a},s)$, ${b'}_t^\star(z,\boldsymbol{a},s)$, and denoting $\Psi(z,\boldsymbol{a},s) = Pr(z_t = z, a_{t-1} \in A, s_t = s)$ the probability of that combination of states. The distribution Ψ_t has a law of motion:

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Household problem

Back

$$V(u_t, z_t, b_{t-1}) = \max_{c_t, b_t} u(c_t) + \beta[p(\theta_t)V(e_{t+1}, z_{t+1}, b_t) + (1 - p(\theta_t))V(u_{t+1}, z_{t+1}, b_t)]$$

$$\text{s.t.} \quad c_t + b_t = (1 + r_t)b_{t-1} + \omega z_t - \tau_t \overline{\tau}(z_t) + d_t \overline{d}(z_t)$$

$$b_t \geq 0$$

$$V(e_t, z_t, b_{t-1}) = \max_{c_t, b_t} u(c_t) + \beta[(1 - \delta)V(e_{t+1}, z_{t+1}, b_t) + \delta V(u_{t+1}, z_{t+1}, b_t)]$$

$$\text{s.t.} \quad c_t + b_t = (1 + r_t)b_{t-1} + w_t z_t - \tau_t \overline{\tau}(z_t) + d_t \overline{d}(z_t)$$

$$b_t \geq 0$$