Heterogeneous-Agent Macro as a Gateway to Behavioral Macro

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Slides at `https://benjaminmoll.com/CEMLA_behavioral_macro/`

CEMLA

Present Bias Amplifies the Household Balance-Sheet Channels of Macroeconomic Policy

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CEMLA

HA Macro as a Gateway to Behavioral Macro

Philosophy of heterogeneous-agent macro:

- build things from ground up, take individual behavior seriously
- flesh out implications for macro policy, fluctuations

Enormously successful research program...

Household finance & behavioral econ literatures:

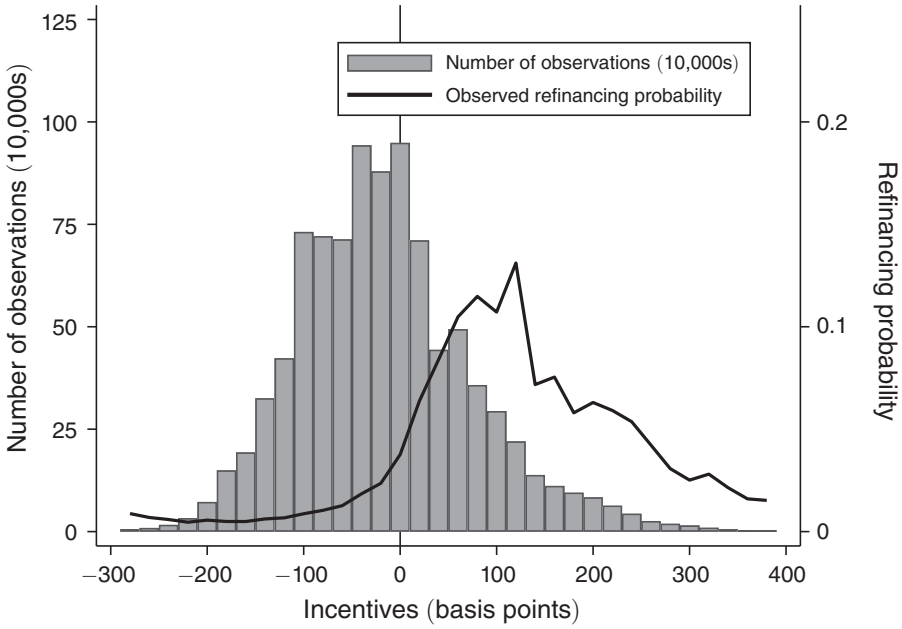
- Empirical findings that are hard to rationalize w optimizing behavior
  1. pension saving
  2. credit card borrowing
  3. mortgage refinancing
  4. ...
- Propose alternative models that do rationalize empirical findings

Logical question: Does incorporating such behavior into our (HA) macro models change our thinking about macro policy, fluctuations?

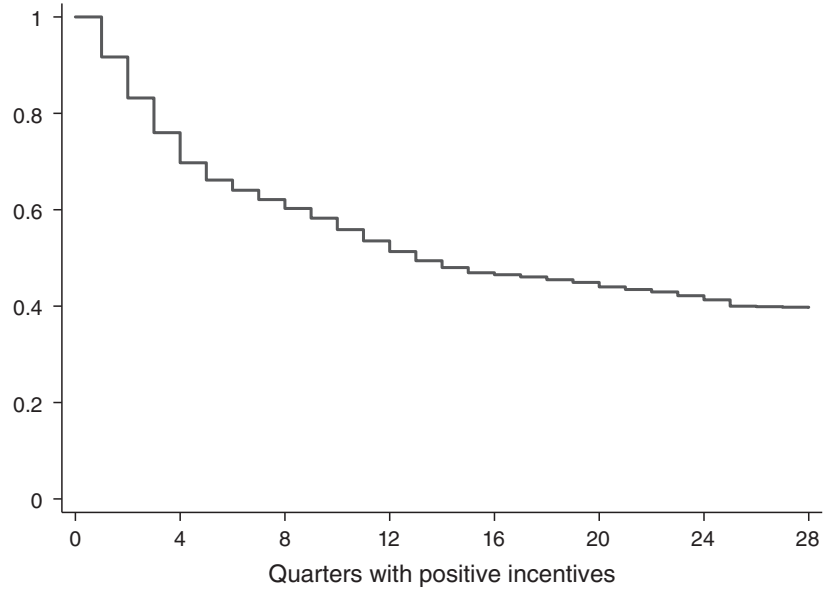
Mortgage refinancing: large delays, sums left on table

Andersen et al (AER 2020) on refinancing of Danish fixed-rate mortgages

(a) Interest savings left on table



(b) Refinancing delays



Note: Prediction of (S, s) model = refinance whenever incentive > 0 where incentive $\approx$ potential savings = $r_{\text{old}} - r_{\text{new}}$ − fixed cost (ADL threshold)

- Also: inconsistencies that violate optimal inaction, instead Calvo

Questions:

1. Where does this inertia come from?
2. Does incorporating it change our thinking about macro policy?

A Bottom-Up Approach to Behavioral Macro

Behavioral macro is well-established field, many important contributions

Most theoretical work uses RA rather than HA models

- RA models hard to connect to micro data
- often top-down approach: pick behavioral biases to fit macro data
- sometimes feels a bit reverse-engineered

Usefulness of heterogeneous-agent modeling? Bottom-up approach

- starting point: empirical findings about individual behavior
- easier to link HA models to huge body of micro work in household finance, behavioral econ, psychology,...

This talk: (baby) attempt at doing this = paper with Laibson and Maxted

A number of other recent HA macro papers move in same direction

Auclert-Rognlie-Straub, Boutros, Maxted, Laibson-Maxted-Moll, Lian, Kueng, ...

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Question

Idea with long tradition (Strotz 1956, ...)

- dynamically inconsistent preferences alter dynamic choices
- particular form with strong empirical support: present bias
  (e.g. Ashraf-Karlan-Yin, Augenblick-Niederle-Sprenger, Laibson-Maxted-Repetto-Tobacman, ...)

Monetary and fiscal policy $\Rightarrow$ household consumption and saving

- = leading examples of dynamic choices affected by present bias

To what extent does present bias alter impact of these policy tools?

(To be clear: present bias = β-δ preferences = quasi-hyperbolic discounting)

What We Do

Starting point: "positive household finance"

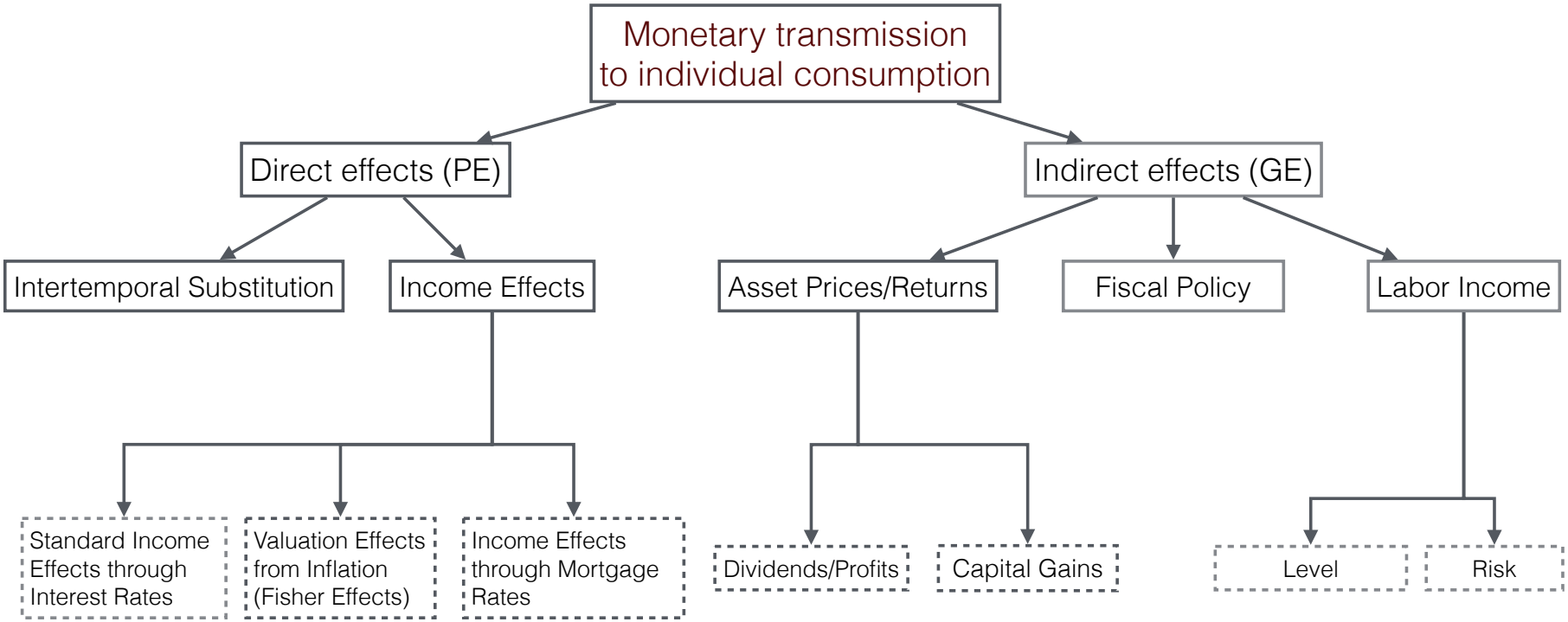
- households face complex financial planning problem, behavior is influenced by psychological factors
- want our model to capture relevant complexities

Develop partial-equilibrium heterogeneous-household model with

1. rich household balance sheets ("Aiyagari w mortgages & housing")
   (e.g. Guerrieri-Lorenzoni-Prato, Wong, Eichenbaum-Rebelo-Wong, Kaplan-Mitman-Violante,...)
   - assets: liquid wealth and illiquid housing
   - liabilities: credit card debt and fixed-rate mortgages
   - liquidity constraints
2. present biased preferences
   - naïve present bias with procrastination

Goal: understand how interaction of (1)+(2) affects policy transmission

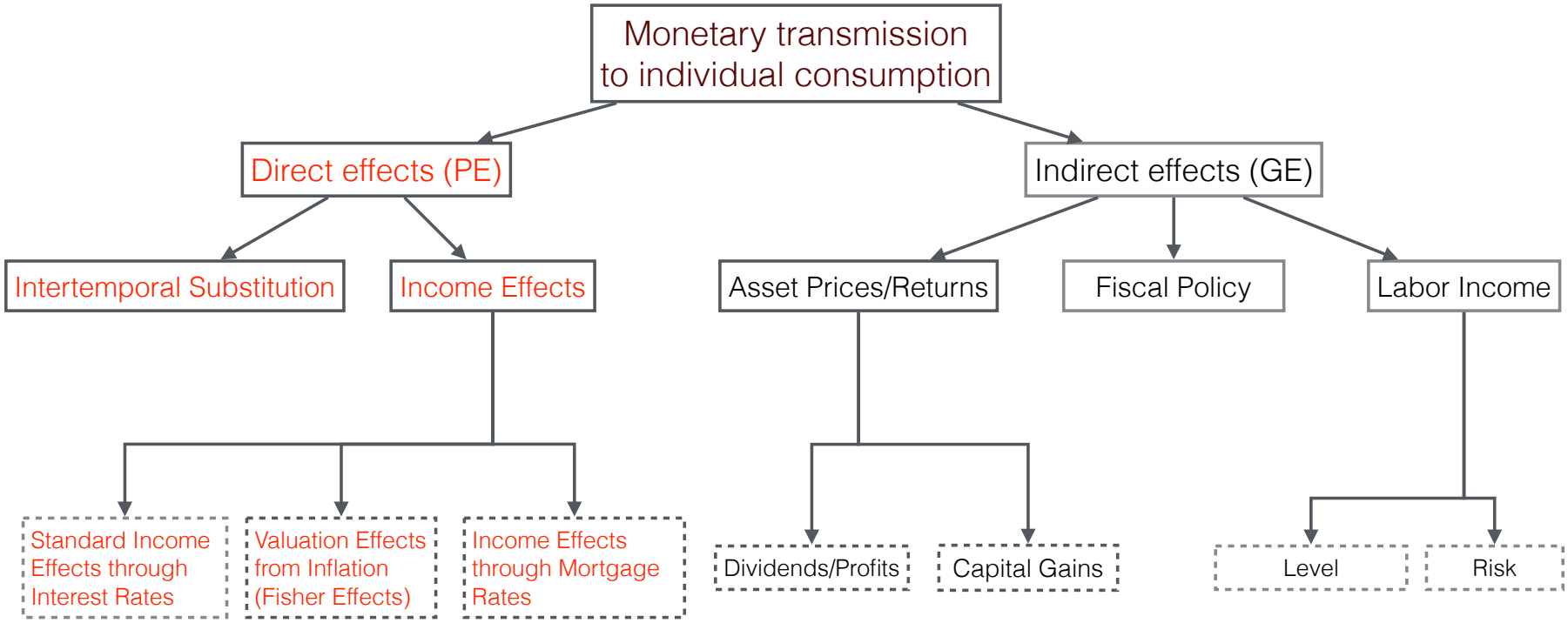
Our Scope: Monetary Policy Transmission



Important: today $\neq$ GE analysis, want to first understand PE

Paper: speculative discussion through lens of HANK literature

Our Scope: Monetary Policy Transmission



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Paper: speculative discussion through lens of HANK literature

What We Find

1. Fiscal policy
   - present bias amplifies potency
   - generically increases economy's average MPC
2. Monetary policy
   - present bias amplifies potency...
   - ... but at same time slows down transmission speed

Both effects of present bias move model toward data

3. Methods (not today's focus)
   - continuous-time present bias, option value problem via HJBQVI

What We Find

1. Fiscal policy
   - present bias amplifies potency
   - generically increases economy's average MPC
2. Monetary policy
   - present bias amplifies potency...
     - cash-out refis = liquidity injections to high-MPC households
   - ... but at same time slows down transmission speed
     - refinancing inertia due to procrastination

Both effects of present bias move model toward data

3. Methods (not today's focus)
   - continuous-time present bias, option value problem via HJBQVI

Model

Plan for model exposition

1. Household balance sheets: “Aiyagari with mortgages & housing”
2. Time preferences: naïve present bias
3. Refinancing procrastination

Household Balance Sheets

- Continuum of households
- Stochastic income y_t, liquid wealth b_t, housing h, mortgage m_t
- Can refinance mortgage at cost (both \$ and effort – details later)
- When not refinancing:

$$\dot{b}_t = y_t + r_t b_t + \omega^{cc} b_t^- - (r_t^m + \xi) m_t - c_t$$

$$\dot{m}_t = -\xi m_t$$

  - credit card limit: $b_t \geq \underline{b}$
  - LTV constraint: $m_t \leq \theta h$

- Note shortcut: housing h is fixed and cannot be adjusted
  $\Rightarrow$ when taking to data, restrict to home-owners who do not move
- "Monetary policy": exogenous process for liquid rate r_t
- Mortgage interest rate r_t^m fixed until refinance, then $r_t^m = r_t + \omega^m$

Why refinance?

1. Rate refinancing motive
    - Lower mortgage interest payments if market rate falls
2. Cash-out refinancing motive
    - Access home equity during low-income spells (c smoothing)
    - Replace expensive credit card debt w cheaper mortgage debt

- Model: refinancing is costly
    - fixed cost κ^{refi}, effort cost $\bar{\varepsilon} \approx 0$

Time preferences: naïve present bias

Key behavioral element: present bias = β-δ discounting

Additional assumption: households are naïve about their present bias

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Discrete-time warmup:

- Current self discounts all future selves by $\beta < 1$

$$u(c_0) + \beta \sum_{t=1}^{\infty} \delta^t u(c_t)$$

- Naïveté: current self believes future selves time-consistent ($\beta = 1$)
  $\Rightarrow$ no game between current and future selves

Time preferences: naïve present bias

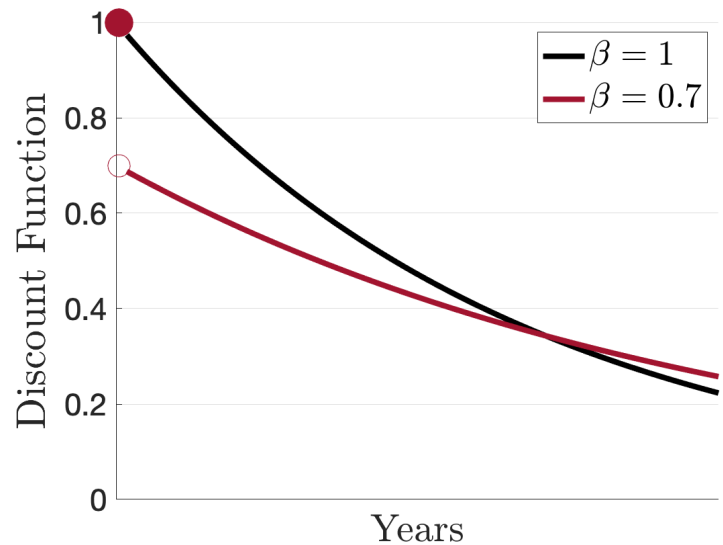
Key behavioral element: present bias = β-δ discounting

Additional assumption: households are naïve about their present bias

Continuous time:

- Current self discounts all future selves by $\beta < 1$
- Take period length $\to 0$

Discount function $D(s) = \begin{cases} 1 & \text{if } s = 0 \\ \beta e^{-\rho s} & \text{if } s > 0 \end{cases}$



Why continuous time? Tractable approx. of daily/weekly time-steps

(Laibson-Maxted, Augenblick, Augenblick-Rabin, McClure et al.)

Refinancing Procrastination

Large empirical literature: households slow to refinance – think Calvo
(e.g. Andersen-Campbell-Nielsen-Ramadorai, Keys-Pope-Pope,...)

Naïve $\beta < 1$ naturally generates such refinancing procrastination

- Key ingredient: effort cost $\bar{\varepsilon} \approx 0$
- Application of result from theory literature (O'Donoghue-Rabin): naïfs procrastinate on immediate-cost delayed-benefit tasks
- Take $\bar{\varepsilon} \to 0$: no effect when $\beta = 1$ but procrastination when $\beta < 1$
- Monetary cost not enough. See discussion in paper.

How get Calvo? Stochastic $\varepsilon_t \in \{\underline{\varepsilon}, \bar{\varepsilon}\}$, flicks from $\bar{\varepsilon}$ to $\underline{\varepsilon}$ at rate ϕ

- $\underline{\varepsilon} < \beta\bar{\varepsilon} \Rightarrow$ procrastinate whenever $\varepsilon_t = \bar{\varepsilon}$, refi whenever $\varepsilon_t = \underline{\varepsilon}$
- True even though we take limit as $\underline{\varepsilon}, \bar{\varepsilon} \to 0$

Effect of $\beta < 1$ on Policy Functions

Skip today

Calibration and Results

Calibration and results

Always show results for 3 cases

1. Rational Benchmark: $\beta = 1$, ~~Procrastination~~
2. Intermediate Case: $\beta < 1$, ~~Procrastination~~
3. Behavioral Benchmark: $\beta < 1$, Procrastination

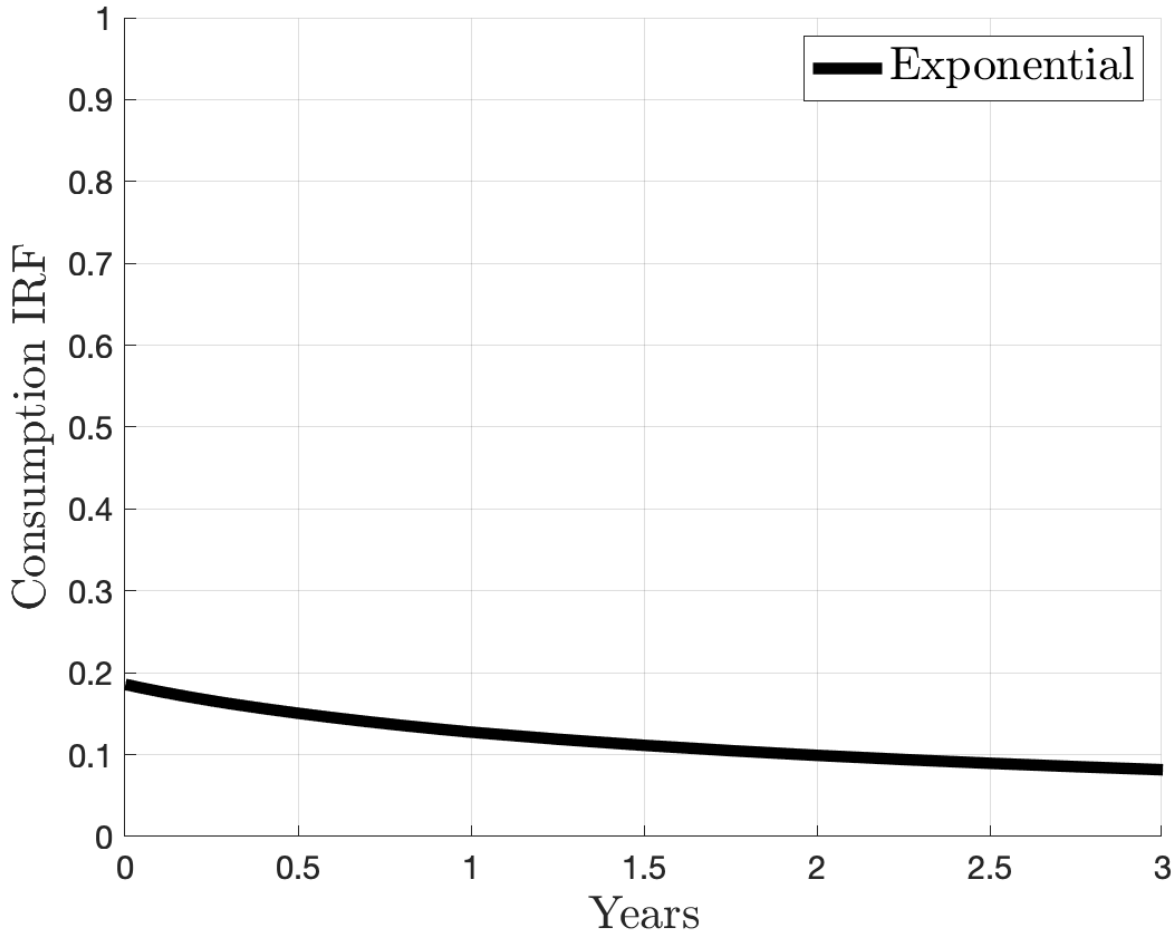
Discount Function

- Calibrate discount function to match empirical wealth moments
- 2016 SCF wave of home owners who don't move:
  - Average LTV = 0.54
  - Average credit card debt to income ratio = 0.09

	Data	Exponential Benchmark	Intermediate Case	Present-Bias Benchmark
Discount Function				
β	-	1	0.7	0.83
ρ	-	1.65%	0.66%	1.08%
Calibration Targets				
LTV	0.54	**0.54**	**0.54**	**0.54**
Avg. CC Debt	0.09	0.04	**0.09**	**0.09**
Share CC Debt $>$ 0	60%	27%	51%	46%

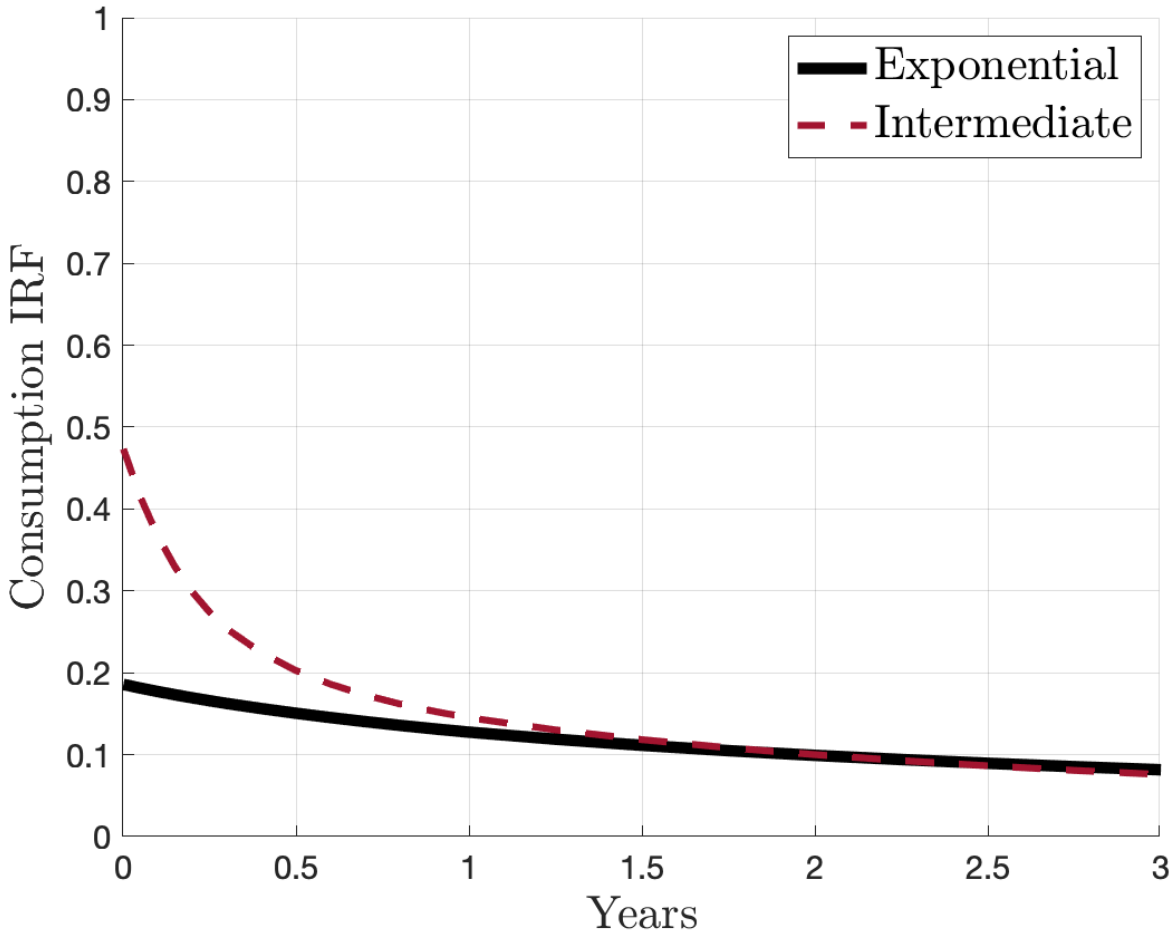
▸ SCF Details ▸ Calibration Details

Fiscal Policy: $1000 Helicopter Drop



- Present bias $\beta < 1$ robustly amplifies potency of fiscal policy

Fiscal Policy: $1000 Helicopter Drop



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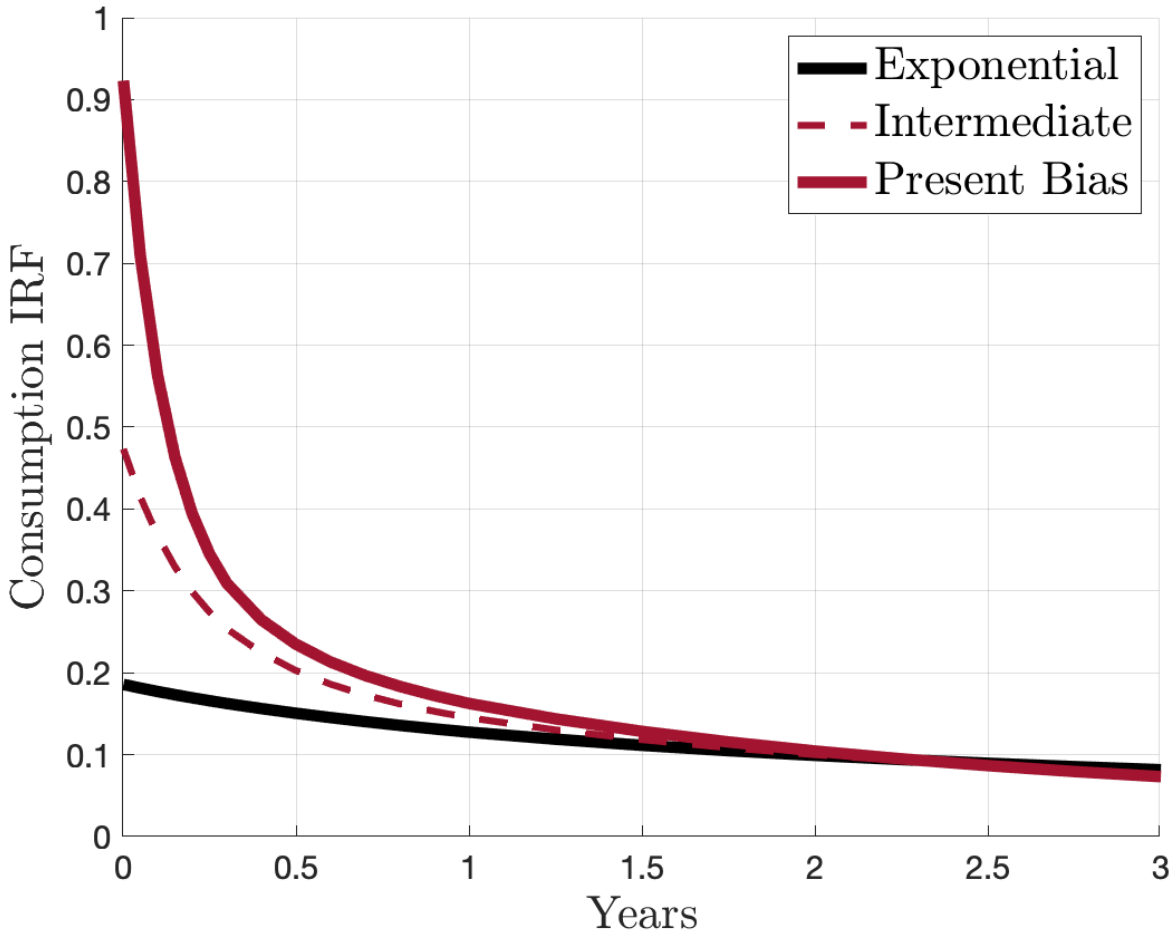
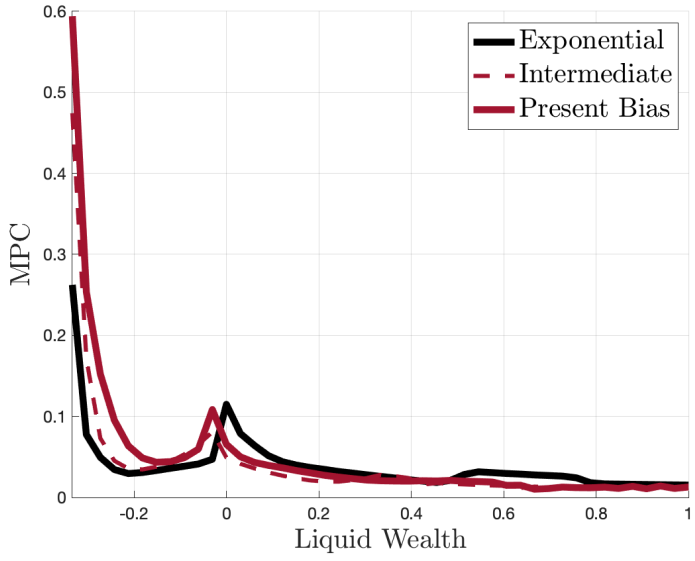
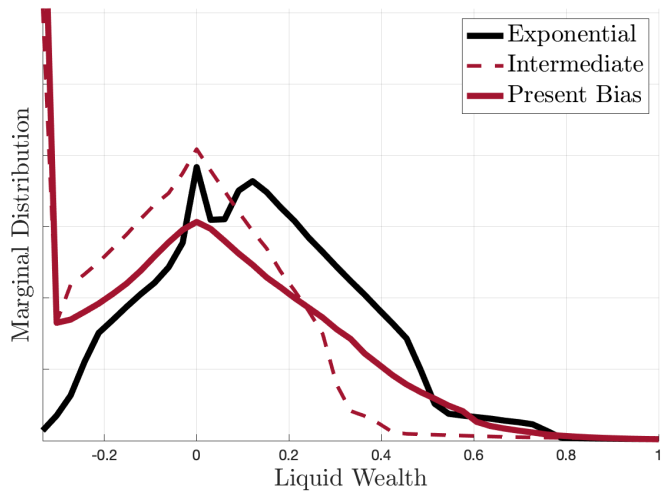


- Present bias $\beta < 1$ robustly amplifies potency of fiscal policy

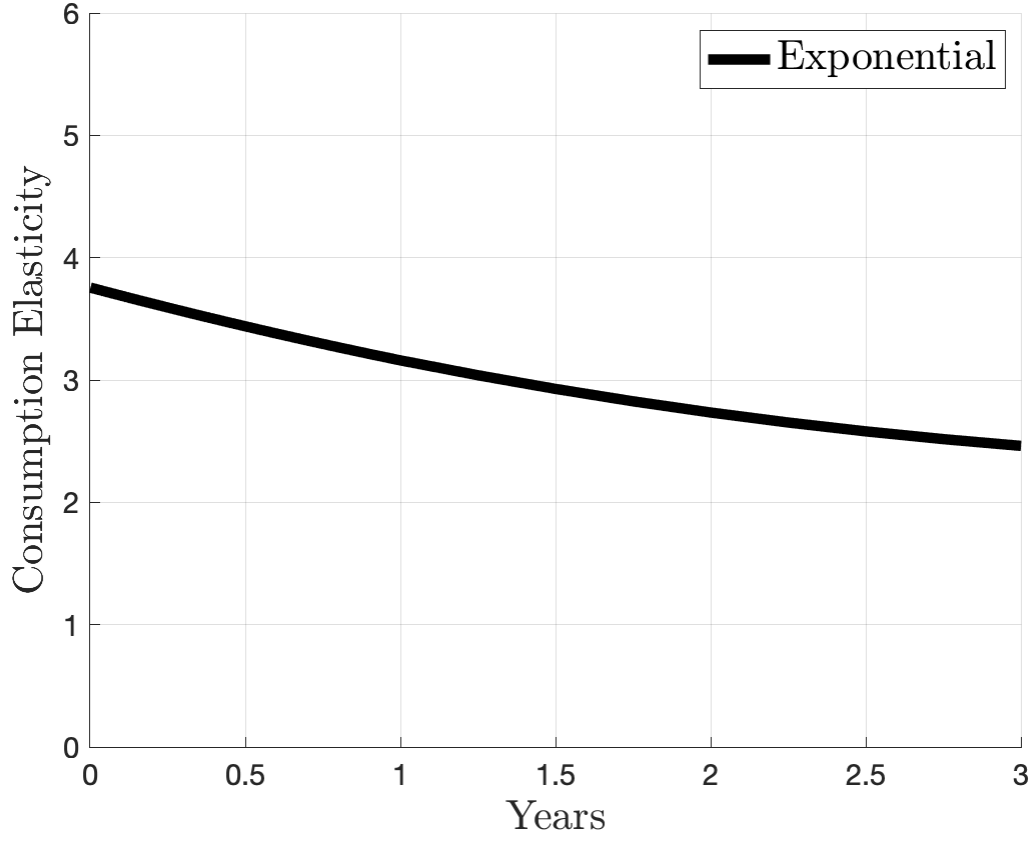
Present bias amplifies potency of fiscal policy: intuition





- $\beta < 1$ creates large MPCs + large mass of households at $\underline{b}$

Monetary Policy: 1% Interest-Rate Cut



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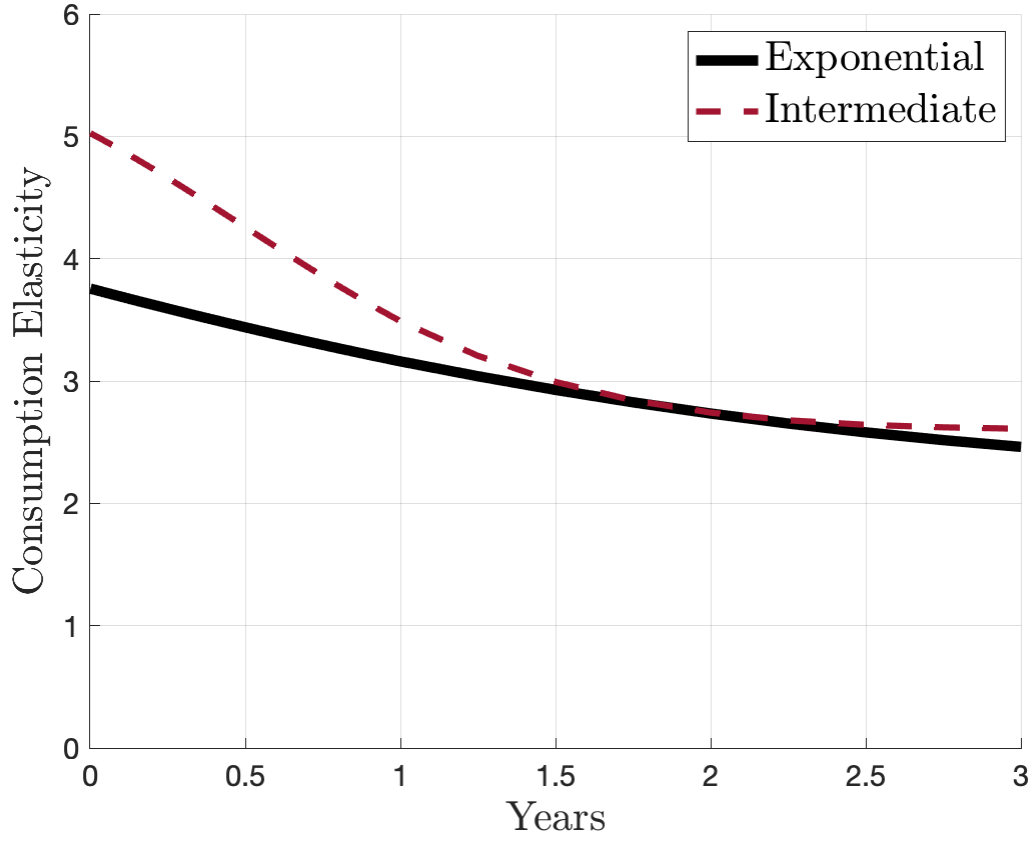
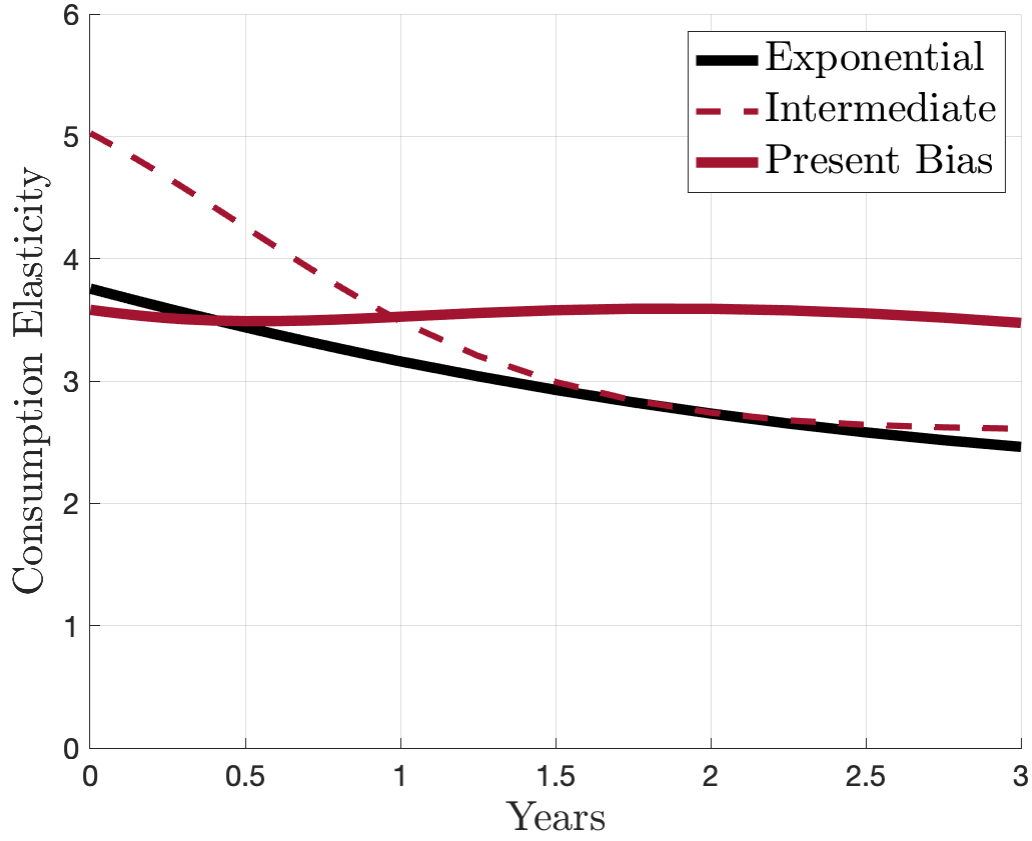


- Present bias $\beta < 1$ amplifies potency of monetary policy ...
  - cash-out refis imitate liquidity-injection of fiscal policy

Monetary Policy: 1% Interest-Rate Cut

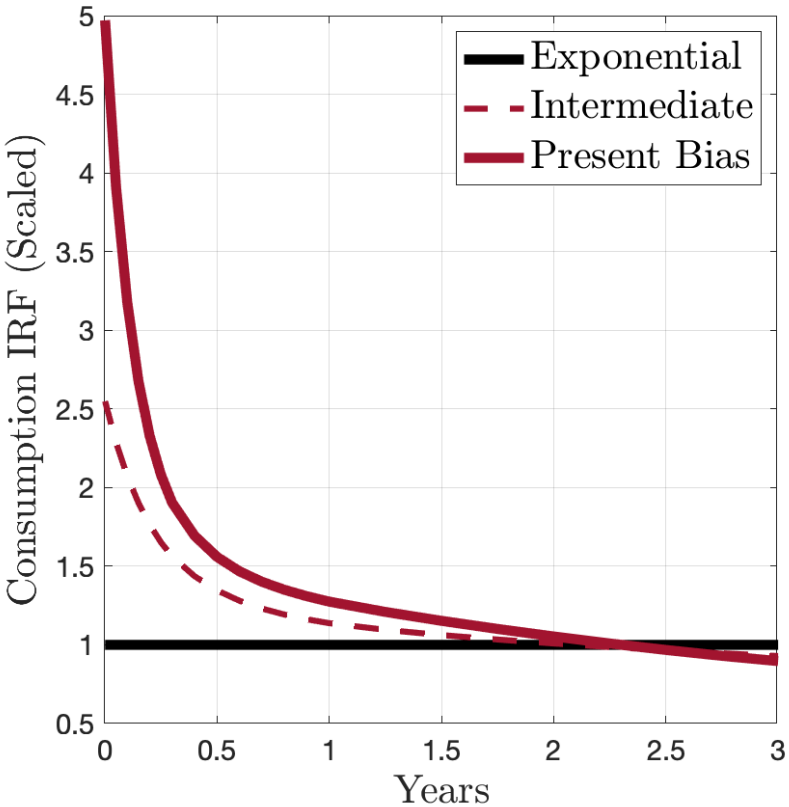


- Present bias $\beta < 1$ amplifies potency of monetary policy ...
- ... but slows transmission speed
  - refi procrastination $\Rightarrow$ "dry powder" ignited more slowly

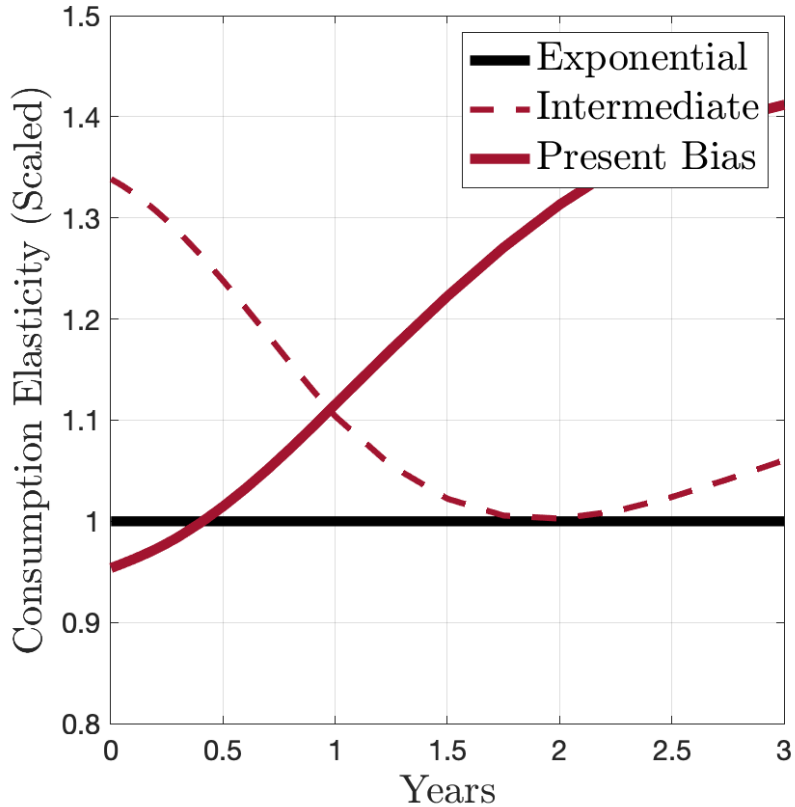
Summary: Effect of $\beta < 1$ on Magnitude and Timing

- Fiscal and Monetary Policy scaled to impact of $\beta = 1$ case

(a) Fiscal policy



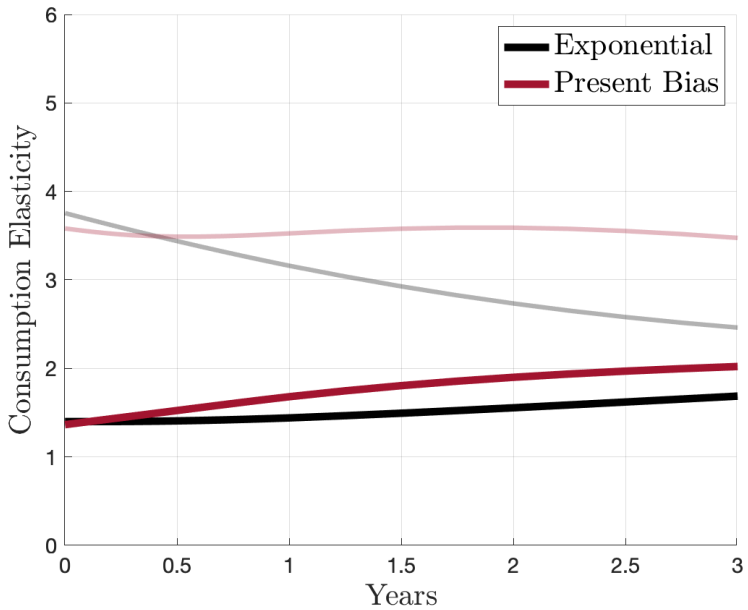
(b) Monetary policy



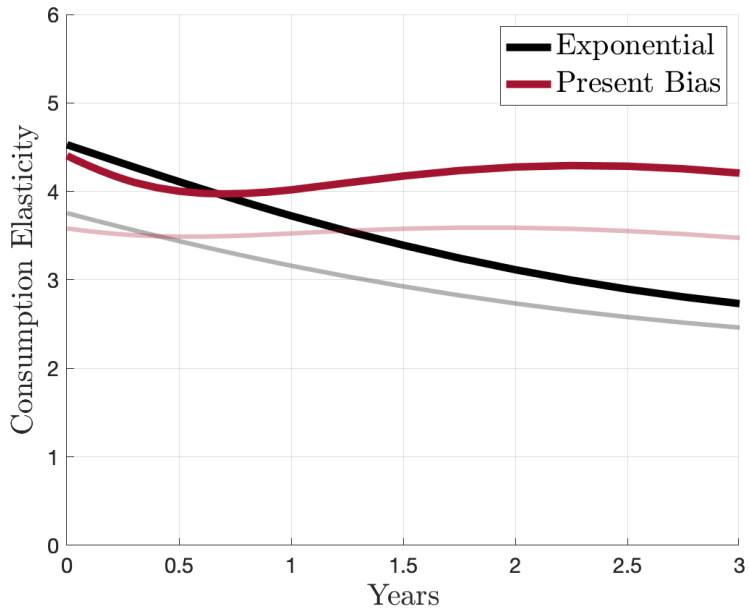
- Fiscal Policy: $\beta < 1$ amplifies potency
- Monetary Policy:$\beta < 1$ amplifies potency but slows transmission

Monetary policy and house price shocks

(a) -25% House Price Shock



(b) +25% House Price Shock



Our main result – that present bias amplifies consumption response to monetary policy – still holds in both cases

Conclusion

Present bias amplifies household balance-sheet channels of macroeconomic policy

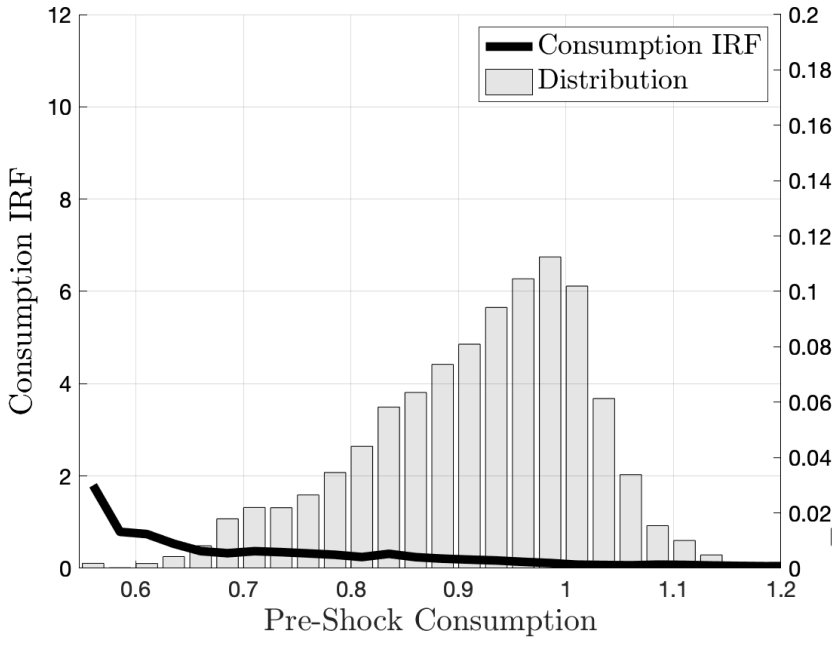
1. Fiscal policy
   - present bias amplifies potency
   - generically increases economy's average MPC
2. Monetary policy
   - present bias amplifies potency but...
   - ... at same time slows down speed of monetary transmission

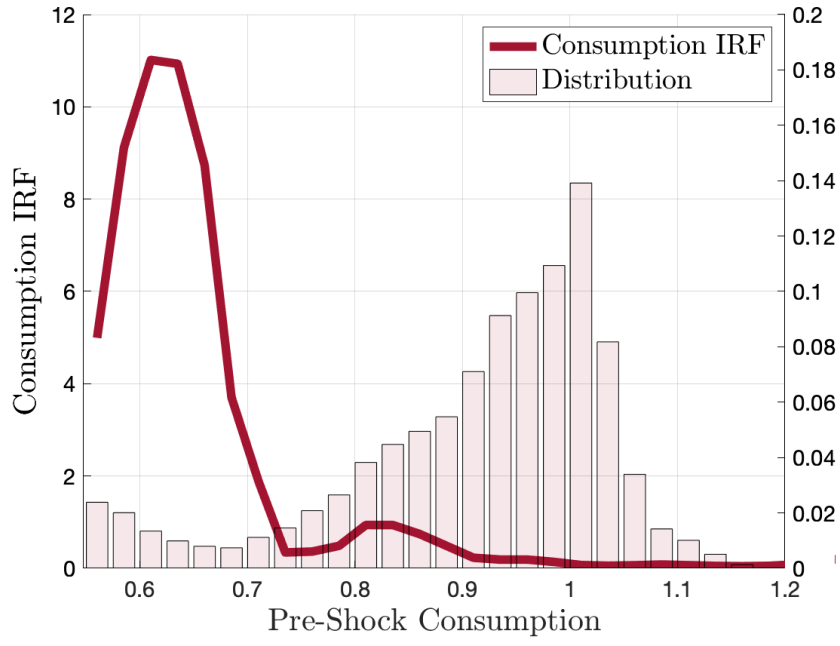
Heterogeneous-agent macro as a gateway to behavioral macro

- bottom-up rather than top-down
- for more see `https://benjaminmoll.com/research_agenda_2020/`
- virtual seminar series `https://micro-macro-household-finance.co.uk/`

Thanks!

Fiscal Policy: Distributional Effects

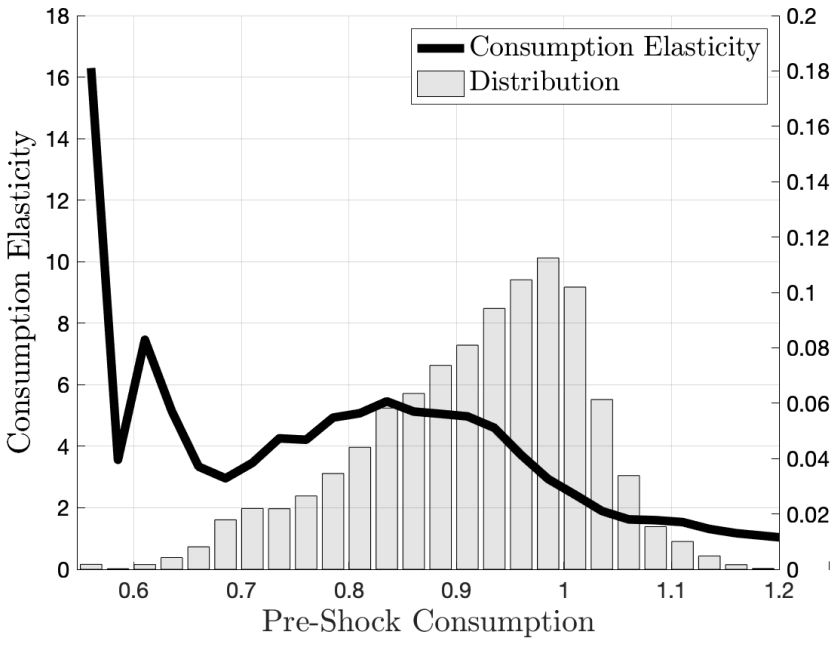


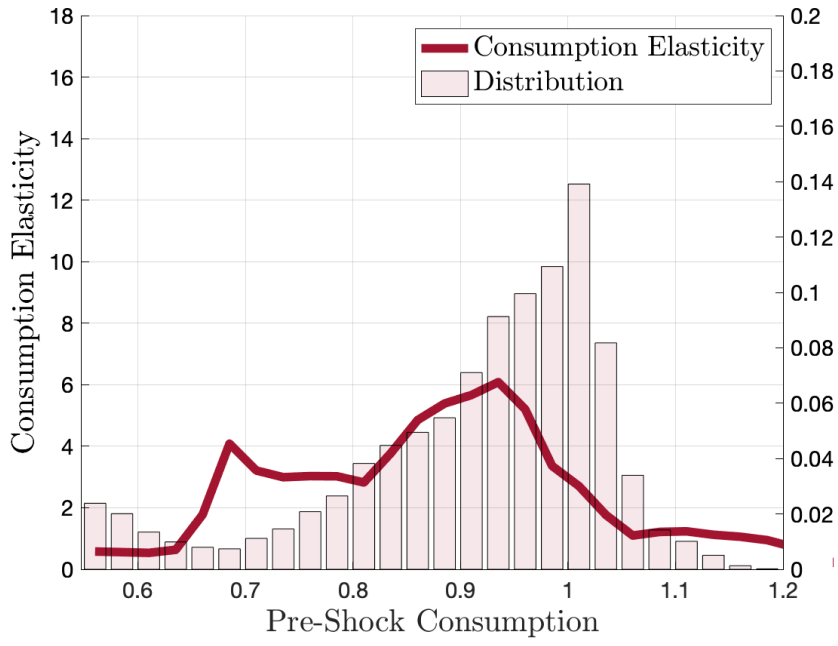


- For $\beta < 1$, fiscal policy driven by low-c households
  - Low-c households are constrained, have high MPCs

▸ With CDFs

Monetary Policy: Distributional Effects

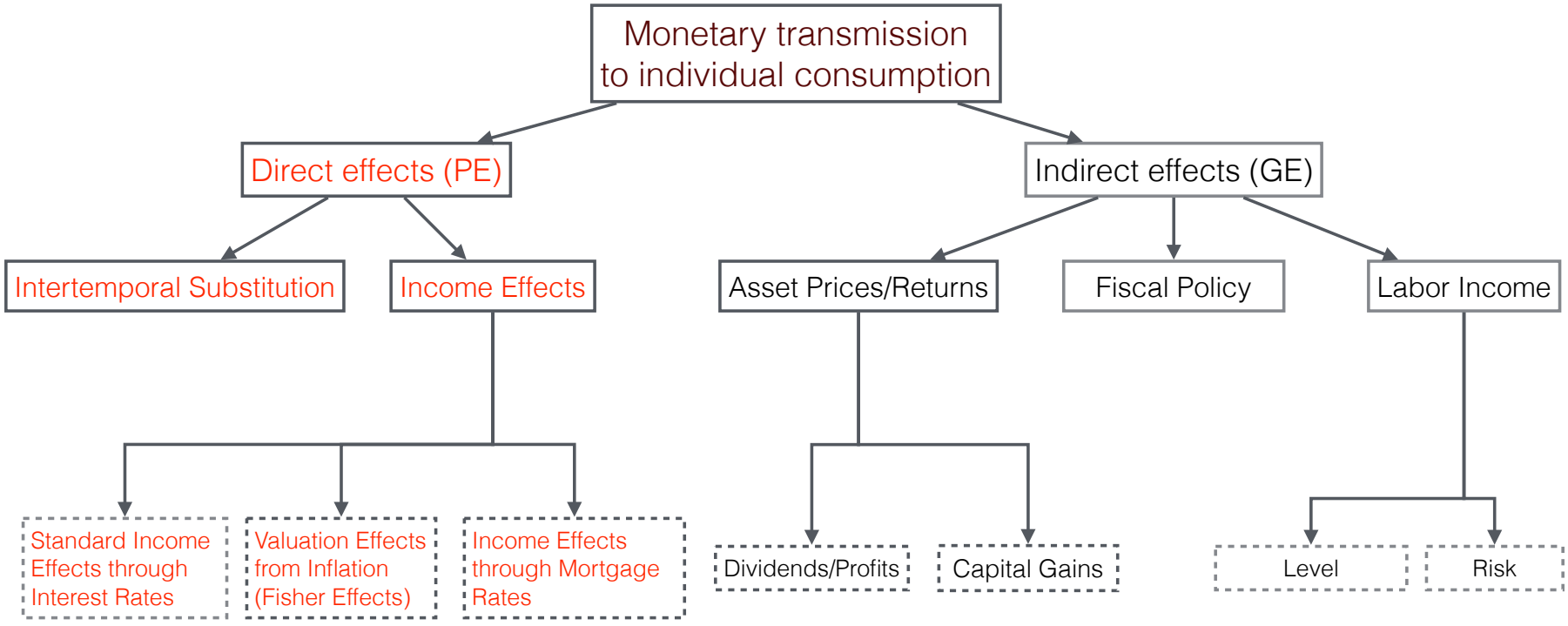




- For $\beta < 1$, low-consumption households left out of MP on impact
  - Low-c households constrained, procrastinate refinancing
- β critical for the distributional effects of stabilization policy
  - $\beta = 1$: monetary policy promotes c of low-c households
  - $\beta < 1$: fiscal policy promotes c of low-c households

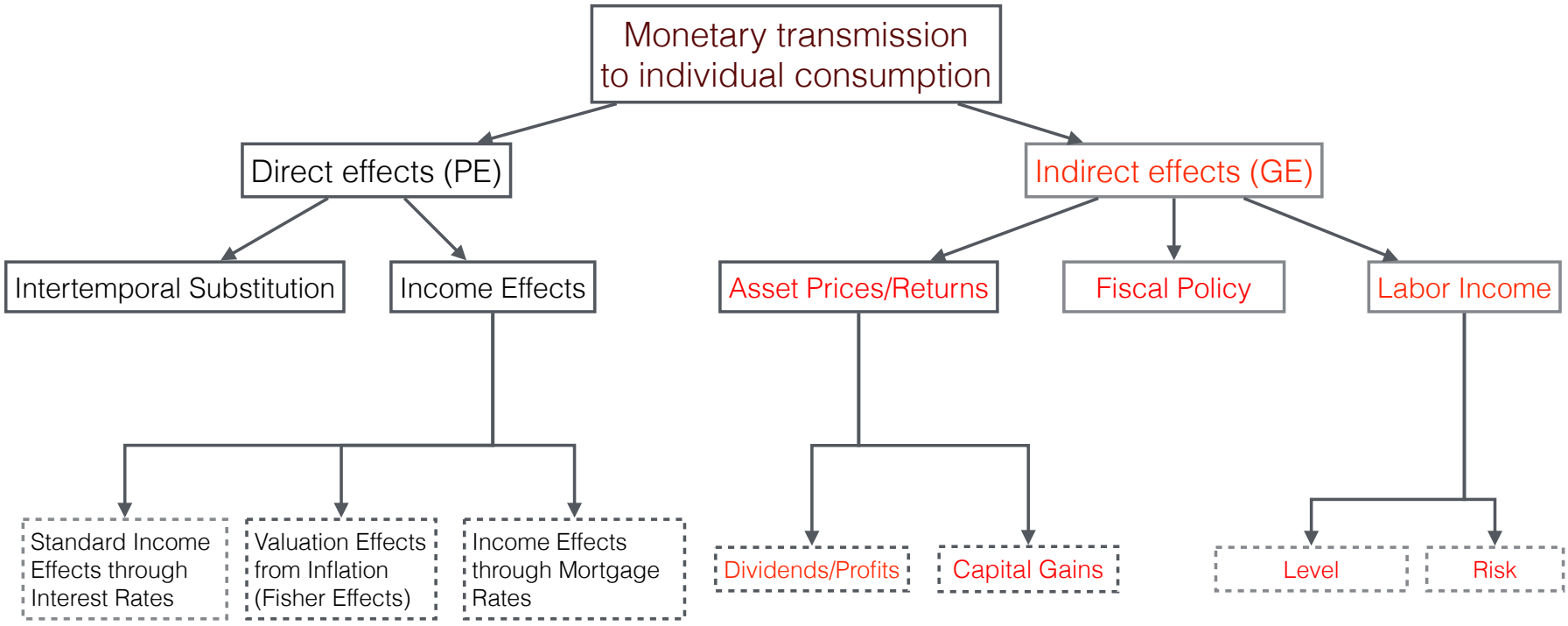
Discussion: General Equilibrium

So far: partial equilibrium analysis



Raises question: how would present bias affect transmission of monetary and fiscal policy in full GE analysis?

GE effects through lens of HANK literature



Next: brief speculative discussion of this question

GE effects through lens of HANK literature

Fiscal policy:

- primary GE effect through labor income
- size depends primarily on MPCs
- present bias amplifies MPCs $\Rightarrow$ likely amplifies overall response

Monetary policy:

- as for fiscal policy, GE effects through labor income
- additional GE effects through stock prices / returns, house prices also move but at much lower frequencies
- size depends on MPCs out of labor income and stock capital gains
- present bias amplifies MPCs $\Rightarrow$ likely amplifies overall response