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

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

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 investment

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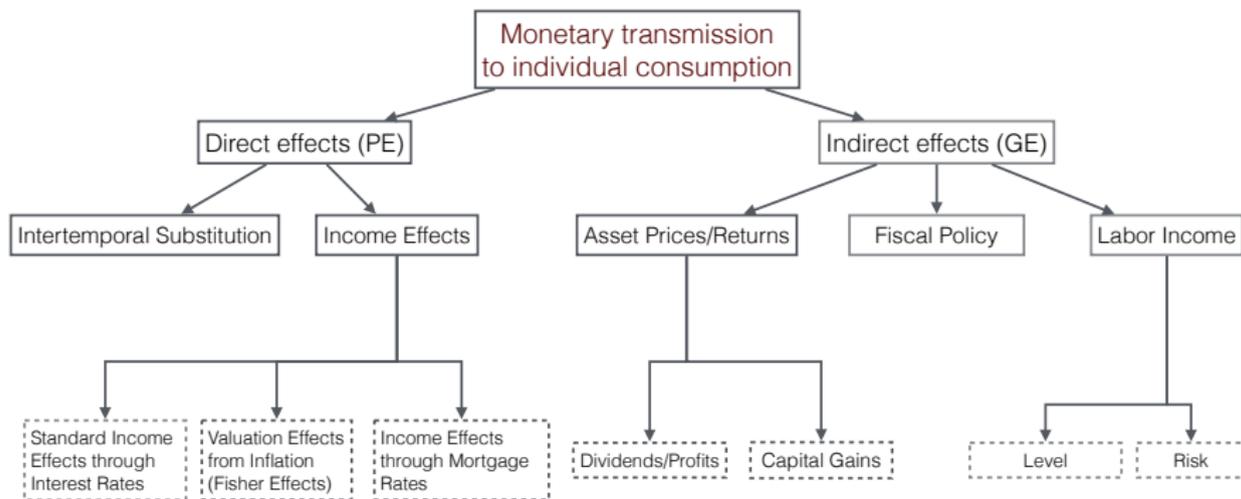
Important: today $\neq$ GE analysis, want to first understand PE

Paper: speculative discussion through lens of HANK literature

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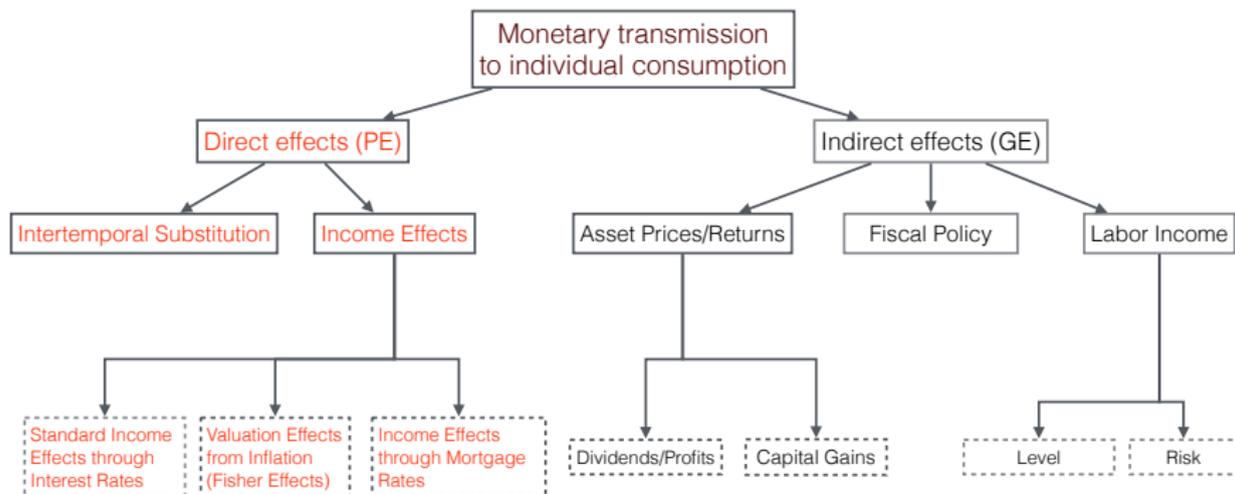
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What We Find

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 $D(s) = \begin{cases} 1 & \text{if } s = 0 \\ \beta e^{-\rho s} & \text{if } s > 0 \end{cases}$
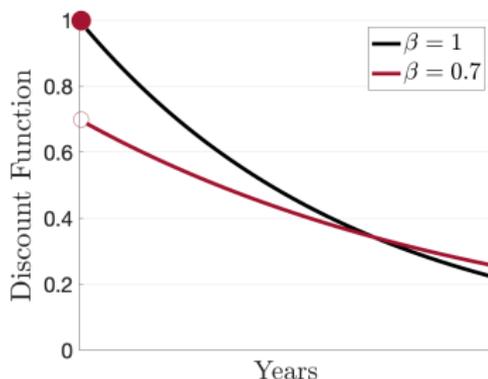
Why continuous time? Tractable approx. of daily/weekly time-steps

(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. Why? Effect on u-flow over next hrs of:
  - \$10k payment $\Rightarrow$ small effect (via c)
  - 10 hours of pain $\Rightarrow$ large effect

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 $\underline{\varepsilon}, \bar{\varepsilon} \to 0$

Model Summary

- Aim: analyze monetary and fiscal policy in heterogeneous-household model with present-biased preferences

- Household problem has 6 state variables:

  1. b: liquid wealth / credit card debt
  2. m: mortgage (illiquid home equity)
  3. y: stochastic labor income
  4. r: liquid rate
  5. r^m: mortgage rate

  Notation: $x = (b, m, y, r, r^m)$ = household state variables

- Households make two decisions:

  1. consumption
  2. mortgage refinancing and prepayment

Effect of $\beta < 1$ on Policy Functions

Effect of present bias on consumption

Warmup: continuous-time FOC and Euler equation with $\beta = 1$

1. **FOC for today vs future:**

$$u'(c) = \frac{\partial v(x)}{\partial b}$$

2. **Euler equation:**

$$\frac{\mathbb{E}_t[du'(c_t)]/dt}{u'(c_t)} = \rho - r_t(b_t)$$

where $x = (b, m, y, r, r^m)$ = household state variables

Note: no discounting in FOC, unlike discrete-time $u'(c) = \delta \mathbb{E}\left[\frac{\partial}{\partial b}v(x')\right]$
(Comes from HJB equation $\rho v(x) = \max_c u(c) + \frac{\partial v(x)}{\partial b}(y + rb + ... - c)$)

Effect of present bias on consumption

Continuous-time FOC and Euler equation with present bias, $\beta < 1$

1. **FOC for today vs future:**

$$u'(c) = \beta \frac{\partial v(x)}{\partial b}$$

and naïveté $\Rightarrow v(x) =$ time-consistent value function ($\beta = 1$)

2. **Euler equation:**

$$\frac{\mathbb{E}_t[d u'(c_t)]/dt}{u'(c_t)} = \left[\rho + \gamma \left(1 - \beta^{\frac{1}{\gamma}} \right) \frac{\partial c(x_t)}{\partial b} \right] - r_t(b_t)$$

3. When unconstrained, households overconsume by $\beta^{-1/\gamma} > 1$

$$c(x) = \beta^{-1/\gamma} \hat{c}(x) \quad \text{where} \quad \hat{c}(x) = \text{time-consistent policy fn} \quad (*)$$

Observation: interaction of $\beta < 1$ with liquidity constraint is critical.
Otherwise $(*) \Rightarrow \beta < 1$ and $\beta = 1$ observationally equivalent

Effect of present bias on refinancing and prepayment

Proposition

Mortgage adjustment policy function independent of β, i.e. only depend on long-run discount rate ρ (and other model parameters)

β < 1 affects refinancing decision only through procrastination

Calibration and Results

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%

Results: how does $\beta < 1$ affect transmission of monetary and fiscal policy?

Always show results for 3 cases

1. Rational Benchmark: $\beta = 1$, ~~Procrastination~~

2. Intermediate Case: $\beta < 1$, ~~Procrastination~~

3. Behavioral Benchmark: $\beta < 1$, Procrastination

Fiscal Policy: $1000 Helicopter Drop
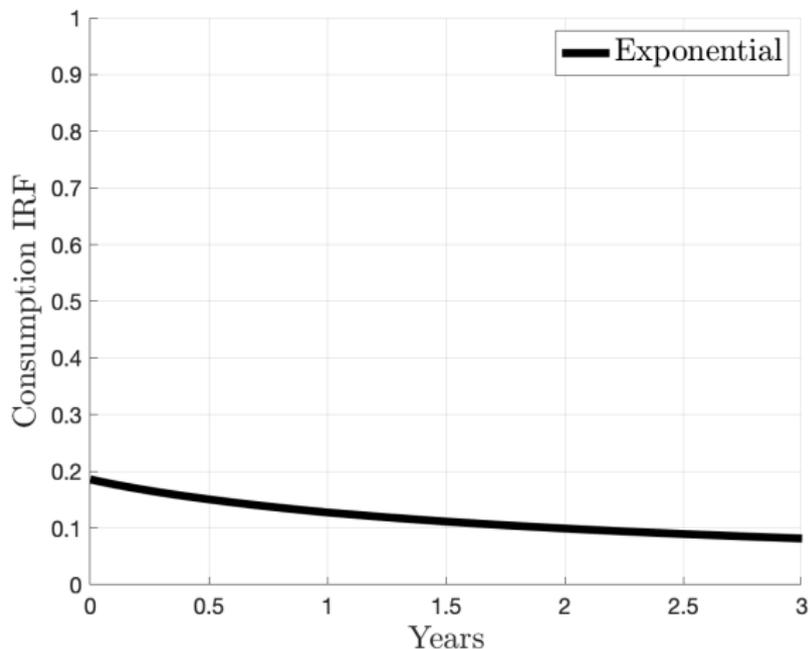
- Present bias $\beta < 1$ robustly amplifies potency of fiscal policy

Fiscal Policy: $1000 Helicopter Drop
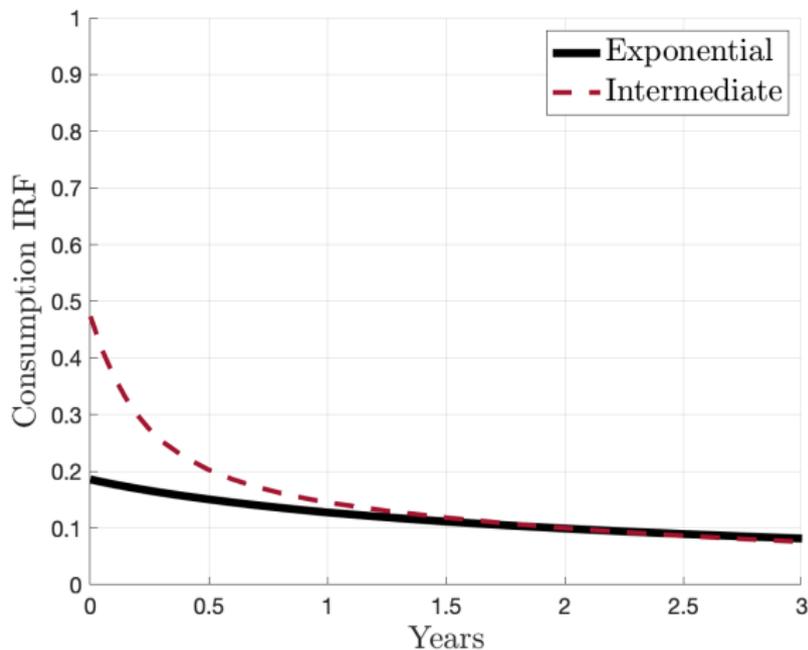
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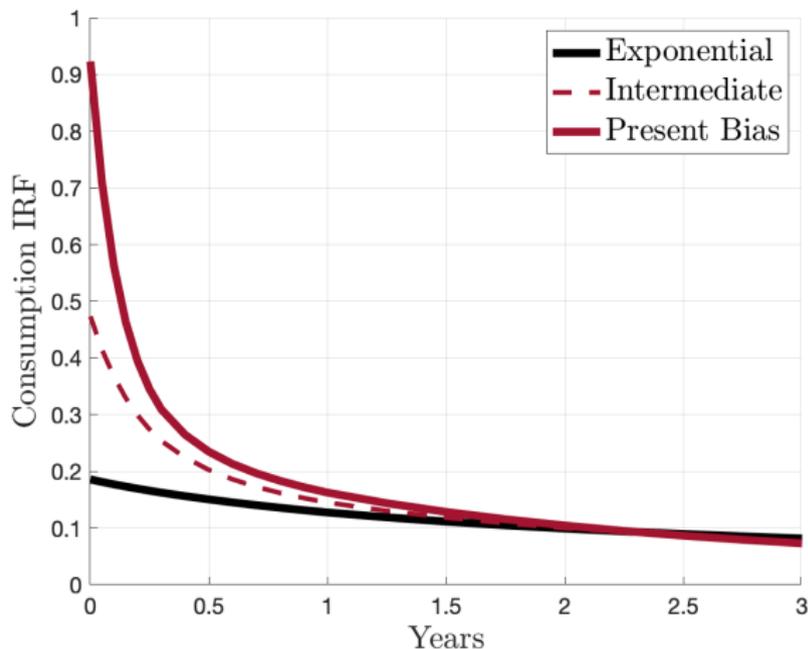
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Present bias amplifies potency of fiscal policy: intuition
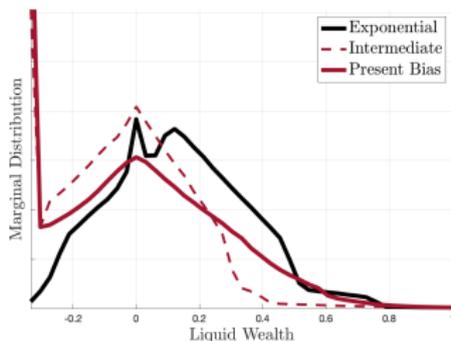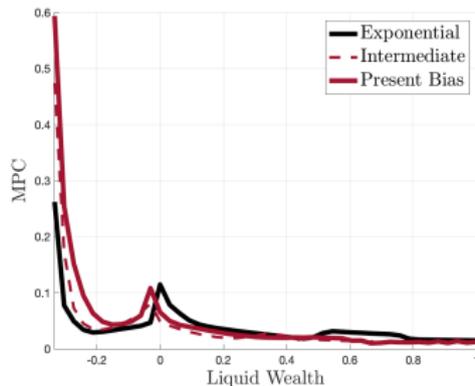
- $\beta < 1$ creates large MPCs + large mass of households at $\underline{b}$

Monetary Policy: 1% Interest-Rate Cut
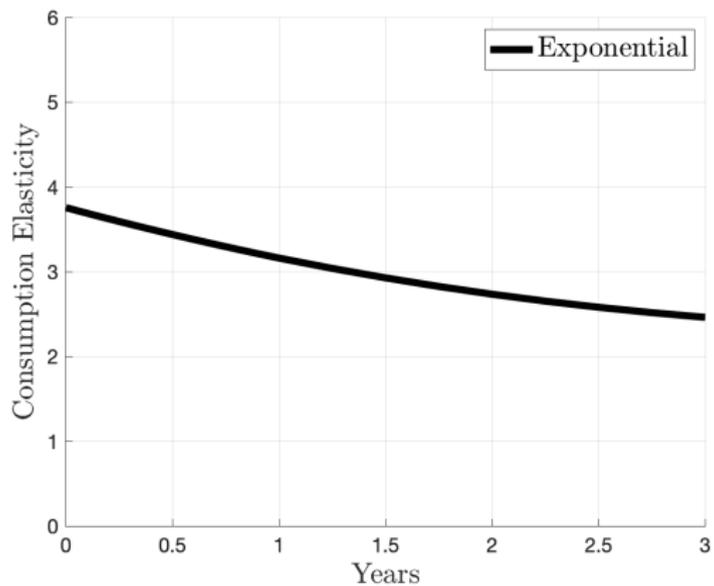
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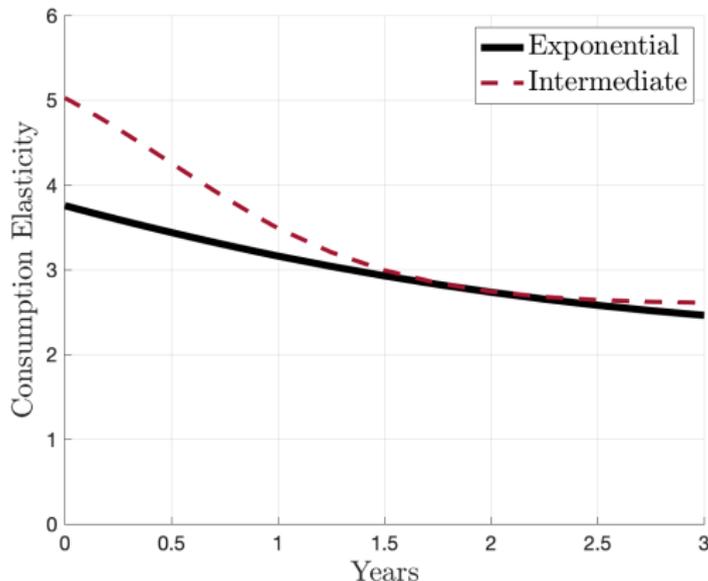
- Present bias $\beta < 1$ amplifies potency of monetary policy ...
  - cash-out refis imitate liquidity-injection of fiscal policy

Monetary Policy: 1% Interest-Rate Cut
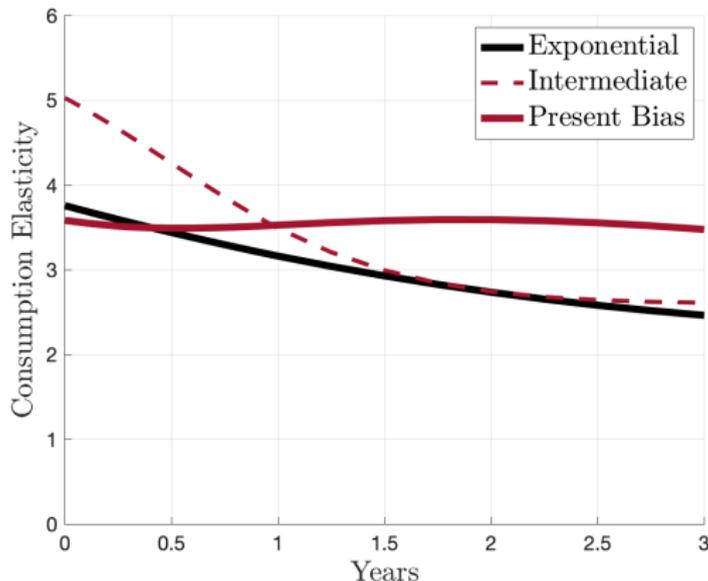
- Present bias $\beta < 1$ amplifies potency of monetary policy ...

- ... 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
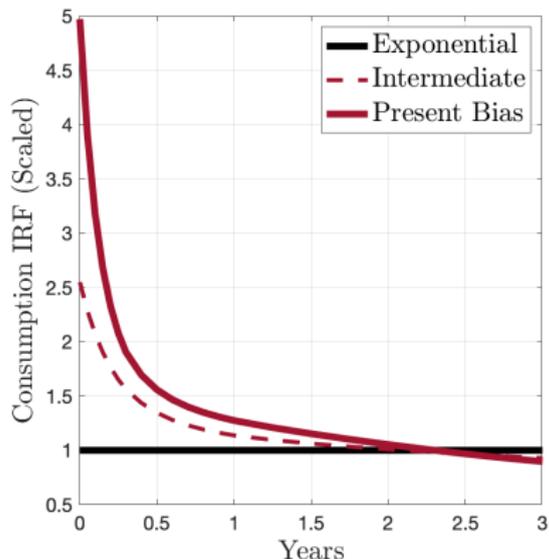
(b) Monetary policy
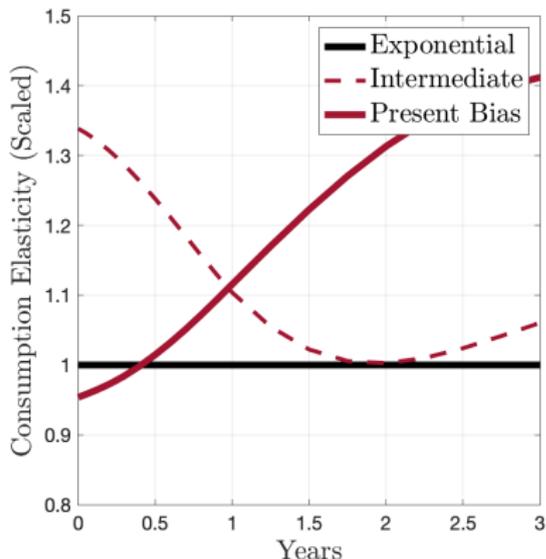
- Fiscal Policy: $\beta < 1$ amplifies potency
- Monetary Policy: $\beta < 1$ amplifies potency but slows transmission

Monetary policy and house price shocks

(a) -25% House Price Shock
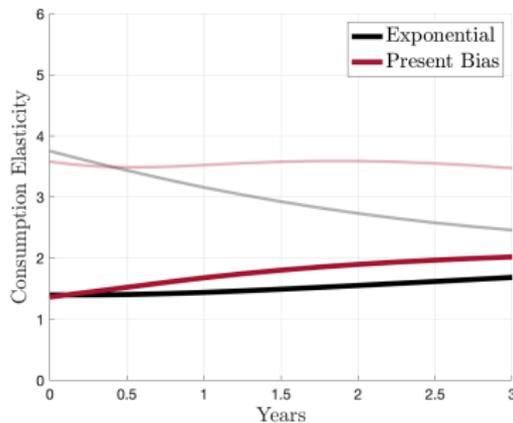
(b) +25% House Price Shock
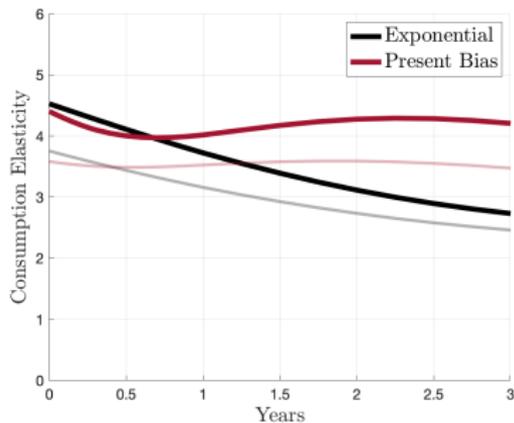
Our main result – that present bias amplifies consumption response to monetary policy – still holds in both cases

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

Final thought: het. agent macro as gateway to behavioral macro

- all about building things "from the ground up"

- for more see `https://benjaminmoll.com/research_agenda_2020/`

Thanks!

Fiscal Policy: Distributional Effects
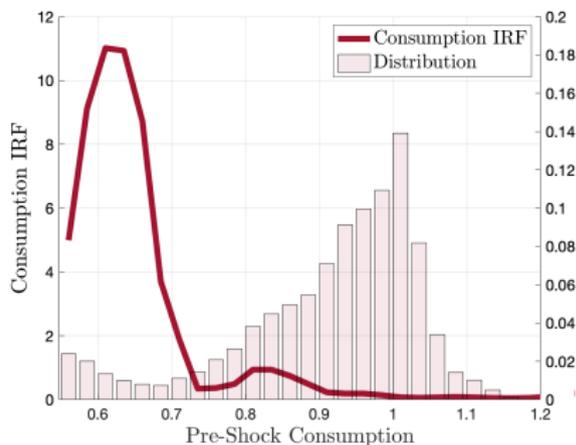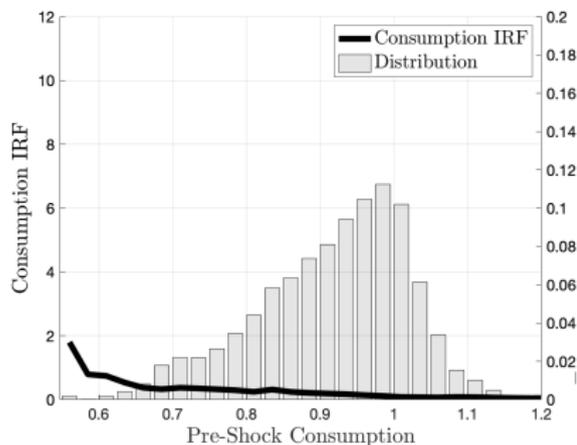
- For $\beta < 1$, fiscal policy driven by low-c households

  - Low-c households are constrained, have high MPCs

▸ With CDFs

Monetary Policy: Distributional Effects
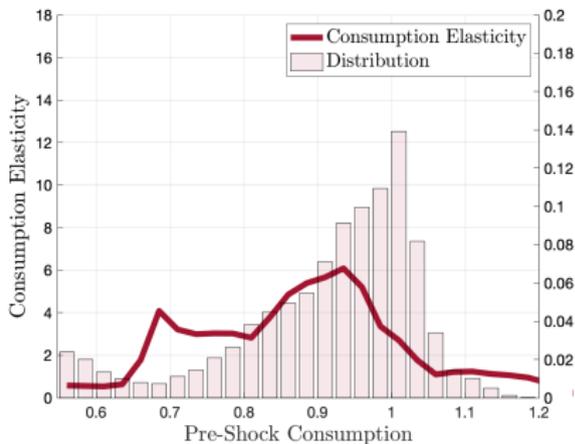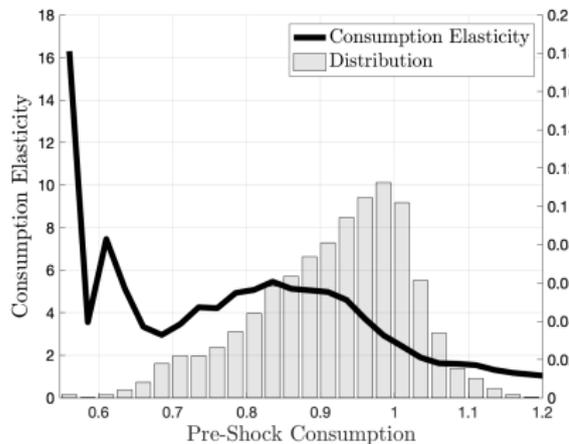
- For $\beta < 1$, low-consumption households left out of MP on impact
  - Low-c households constrained, procrastinate refinancing

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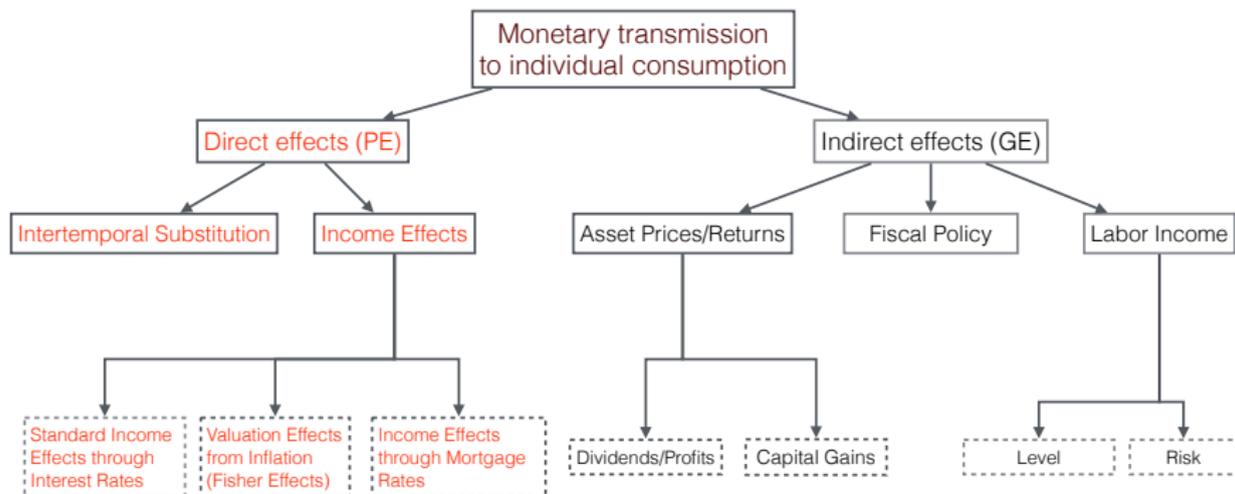
Raises question: how would present bias affect transmission of monetary and fiscal policy in full GE analysis?

GE effects through lens of HANK literature
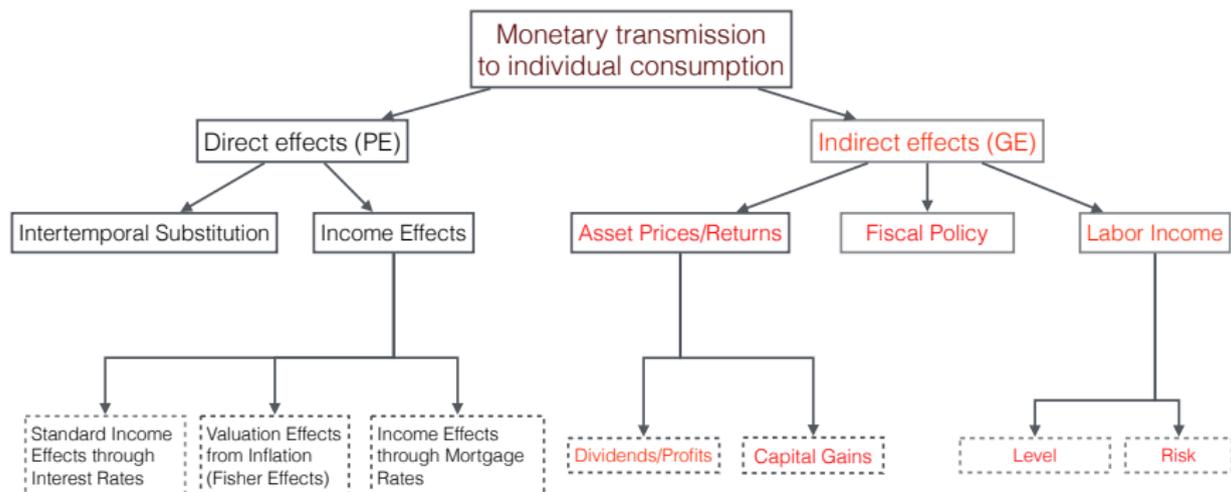
Next: brief speculative discussion of this question

GE effects through lens of HANK literature

Fiscal policy:

- primary GE effect through labor income

- size depends primarily on MPCs

- present bias amplifies MPCs ⇒ 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 ⇒ likely amplifies overall response