SELECTIVE INATTENTION TO INTEREST RATES

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- Households' macro expectations suggest they are very uninformed on **average**

  - Level of expectations is often systematically biased Weber et al. 22
  - Substantial dispersion in expectations across people Mankiw et al. 04
  - Errors in their expectations are predictable ex-ante Bordalo et al. 20

- Motivated macro models with info. frictions Auclert et al. 20, McKay-Wieland 21, Beraja-Wolf 22

  ⇒ **Average** expectation is slow-moving and under-reacts Coibion-Gorodnichenko 12, 15

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- Introspection: macro expectations much more important for "**big**" decisions
    - These **big** decisions also tend to occur less frequently
    - Example: interest rates important when **buying a house**, but less so for groceries

MOTIVATION

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- **Question**: Do HHs **select** into paying attention based on **types** of decisions?

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- **Question**: Do HHs **select** into paying attention based on **types** of decisions?

- **If yes**, how does this **selection** affect the transmission of shocks?

  - Belief heterogeneity $\Rightarrow$ **average** may not be the relevant object Miller 77, Afrouzi et al. 24

Is there selective inattention to interest rates based on **durables purchases**?

"decision-making" (DM)

1. Use existing surveys to study how interest rate expectations differ based on DM
   - Benefit: high-quality data on expectations
   - Cost: hard to identify **DM status** + hard to isolate attention

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"decision-making" (DM)

1. Use existing surveys to study how interest rate expectations differ based on DM

2. Conduct a new survey to identify how macro attention changes based on DM
   - Benefit: better identify **DM status** + elicit information acquisition directly
   - Cost: hard to study accuracy in expectations given one cross-section

~~Is there selective inattention to interest rates based on durables purchases?~~ ✓

How does selective inattention affect **aggregate responses** to interest rates?

1. Use existing surveys to study how interest rate expectations differ based on DM

2. Conduct a new survey to identify how macro attention changes based on DM

   DM in model

3. Develop a PE incomplete markets model with $\overbrace{\text{durables}}$ + dynamic IA about rates
   - Use patterns in IA from survey to discipline information cost parameter(s)
   - Compare **model IRFs** to level and volatility of rates with $\underbrace{\text{exogenous inattention}}$

     DM ⊥ beliefs ⇒ no selection

Is there selective inattention to interest rates based on durables purchases?

1 Interest rate expectations of decision-makers are **more accurate**
- Nowcast and forecast errors of interest rates are 50% lower
- Dispersion of beliefs is 70% lower and subjective uncertainty decreases

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2 Information acquisition is **concentrated** prior to purchases

- Purchase in $\leq$ 6 months $\Rightarrow$ twice as likely to acquire information
- Information acquisition focuses on current values of decision-relevant rates

How does selective inattention affect **aggregate responses** to interest rates?

3 **Like** exogenous inattention, selection dampens some responses
- Aggregate beliefs are slow-moving and underreact
- Non-durable consumption responds sluggishly to rate changes

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- Faster increases in durables spending that are closer to rational expectations
- Increases in durables $+$ non-durables that are non-linear in the size of shock

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5 **Unlike** exogenous inattention, selection implies that **more volatility** causes:
- Aggregate beliefs to update twice as frequently
- Total spending to fall by much less, closer to the data
- Consumption to become more (not less) sensitive to rates

- **Sample**: $\sim$ 8K respondents between 2014 and 2022 from annual housing module

- Variables of interest:

  1. **Nowcasts** of current average 30-year fixed mortgage rate
  2. **Forecasts** of one-year ahead average 30-year fixed mortgage rate
  3. **DM status** based on distance from past or (expected) future home purchase

- Construct errors using average 30-year fixed rate in Freddie Mac PMMS

- Run the following regression:

$$\log |\text{Error}_{it}| = \sum_s \beta_s \cdot \mathbf{1}\left(\text{DM Status}_{it} = s\right) + \text{Controls}_{it} + \delta_t + \epsilon_{it}$$
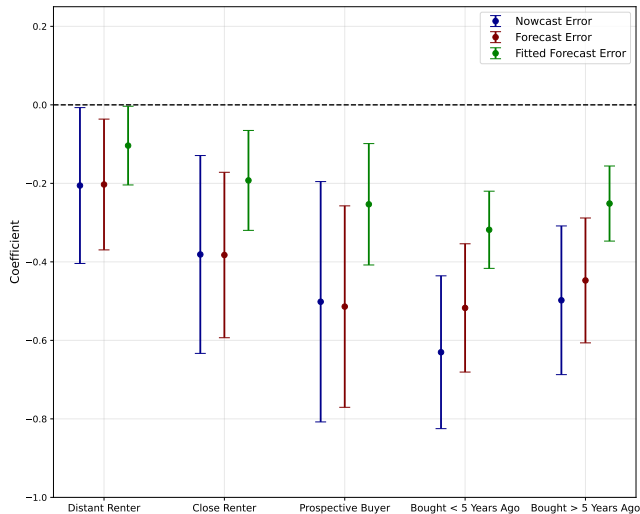
Errors of prospective buyers ≈ **50% lower** than those with no purchase plan
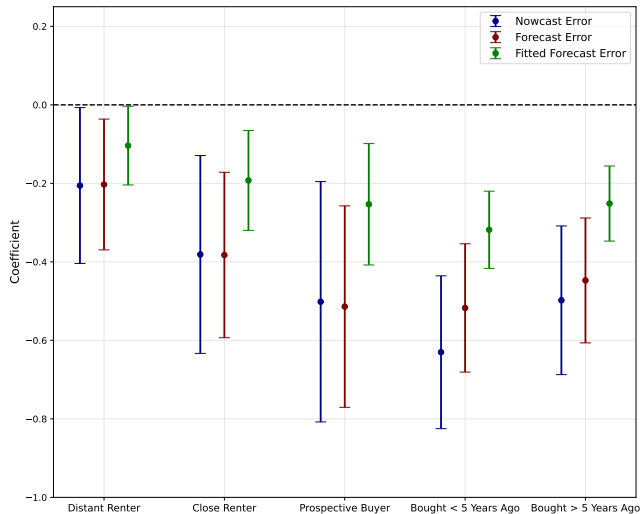
Over **half** of forecasting gain comes from nowcasting improvement
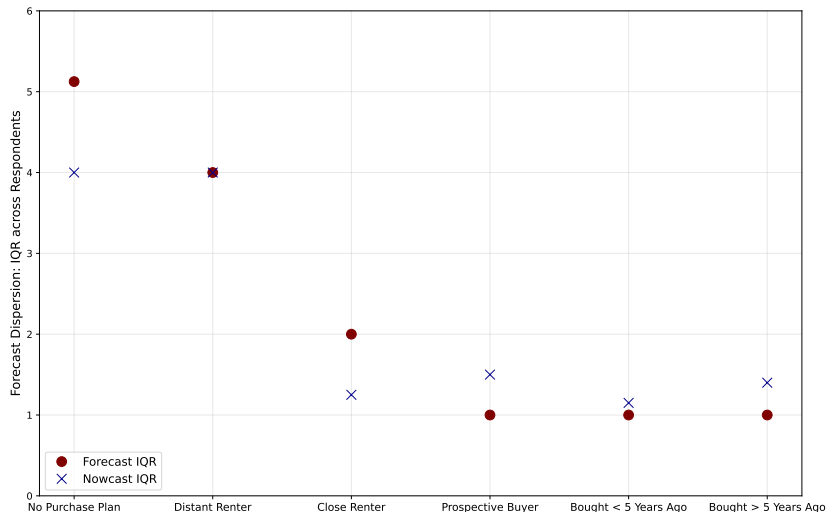
Disagreement of prospective buyers ≈ **70% lower** than those with no purchase plan
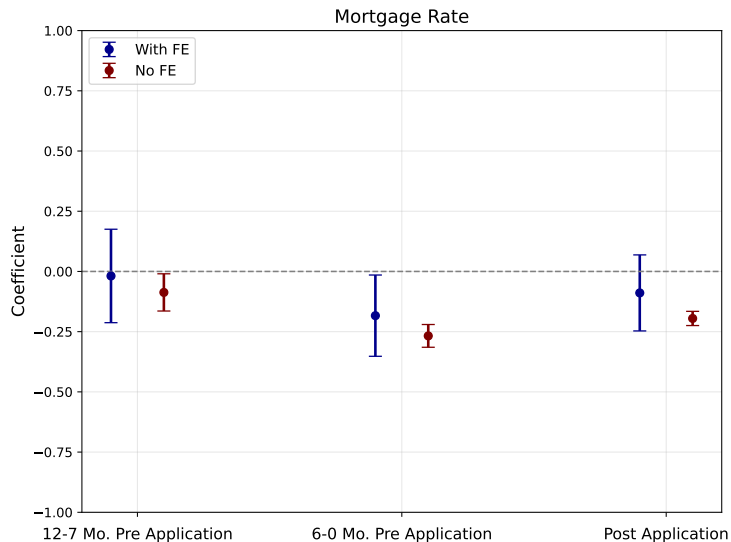
Mortgage Rate

GDP

Unemployment Rate
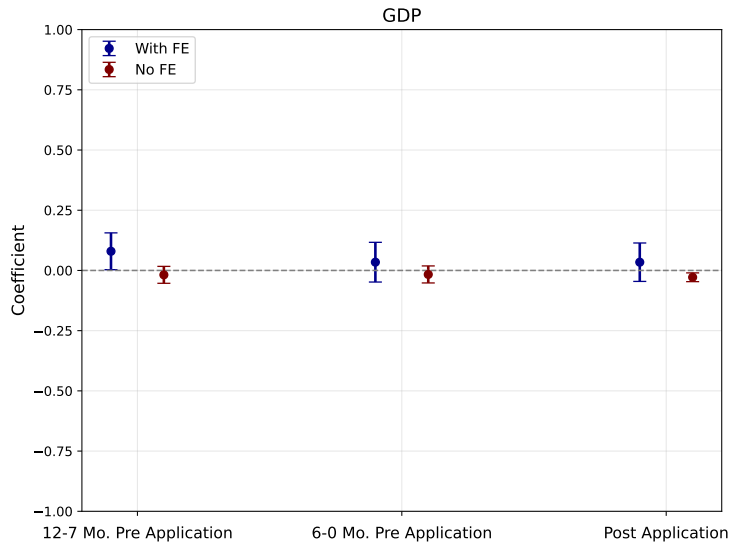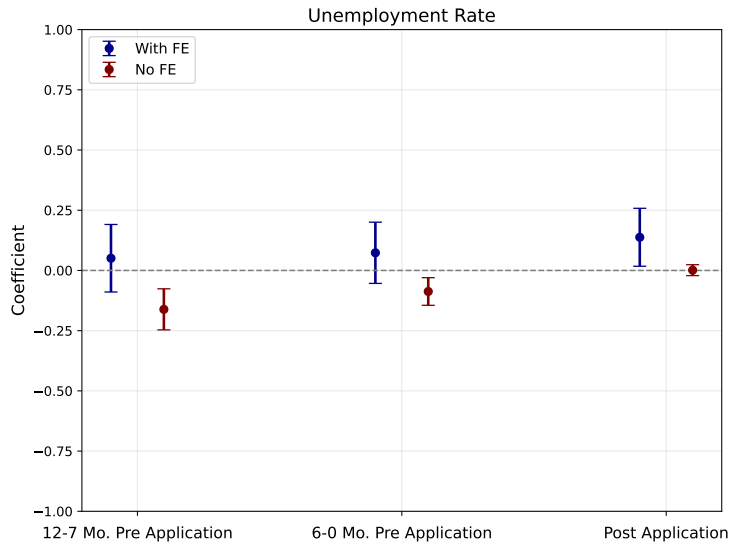
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Survey Innovations

- Direct measure of distance from durable adjustments

    - Primary home purchase
    - Car purchases

- Measures of information acquisition other than forecasting performance

    - Last active search for information about key variables

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Main Blocks

1. Home decision-making: distance from primary home purchase

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Main Blocks

1. Home decision-making

2. Other decisions: distance from car purchase + other major financial decisions

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Main Blocks

1. Home decision-making
2. Other decisions
3. Information acquisition: time since last search + type/source of info searched

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Main Blocks

1. Home decision-making
2. Other decisions
3. Information acquisition
4. Macro expectations: beliefs about mortgage rates, T-Bill rates, and inflation

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Main Blocks

1. Home decision-making
2. Other decisions
3. Information acquisition
4. Macro expectations
5. Background & financial situation: info on household's balance-sheet using SCF format, demographics, job relocations

All Respondents
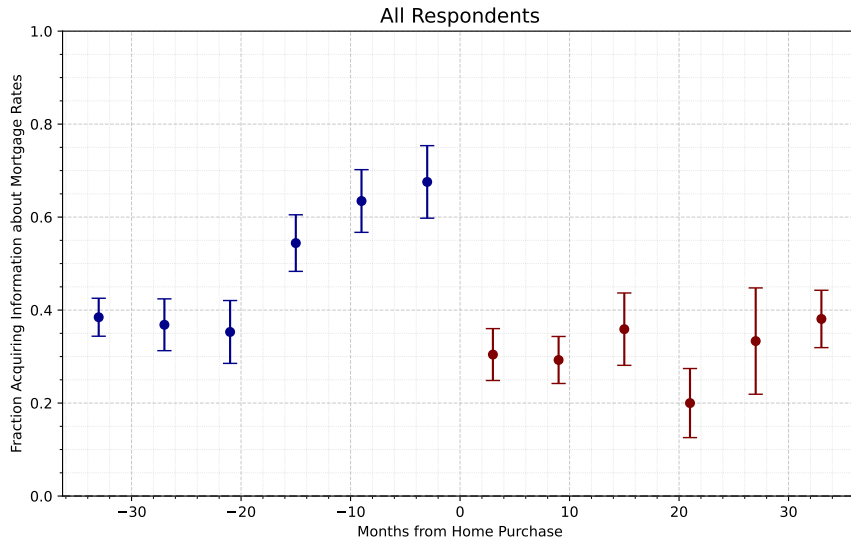
▸ Sources   ▸ Heterogeneity   ▸ Owners   ▸ Values

Respondents using Credit

$$\text{Info. Acquisition}_i = \sum_d \beta_d \cdot \mathbf{1}\left(\text{Home Distance}_i = d\right) + \text{Controls}_i + \text{Other Distances}_i + \epsilon_i$$
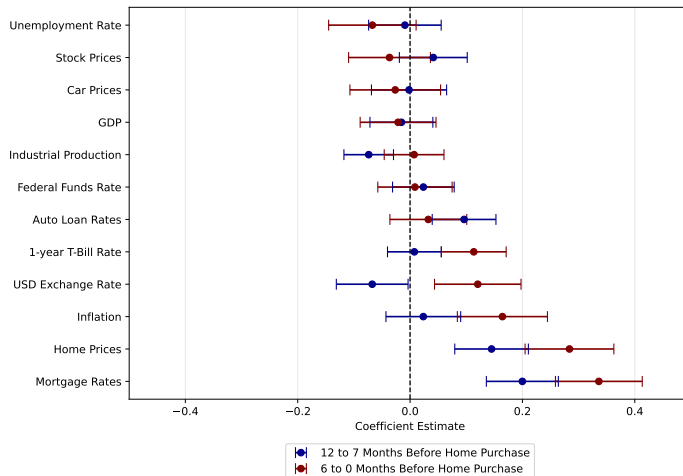
Legend:
- 12 to 7 Months Before Home Purchase
- 6 to 0 Months Before Home Purchase

Coefficient Estimate

● 12 to 7 Months Before Car Purchase   ● 6 to 0 Months Before Car Purchase
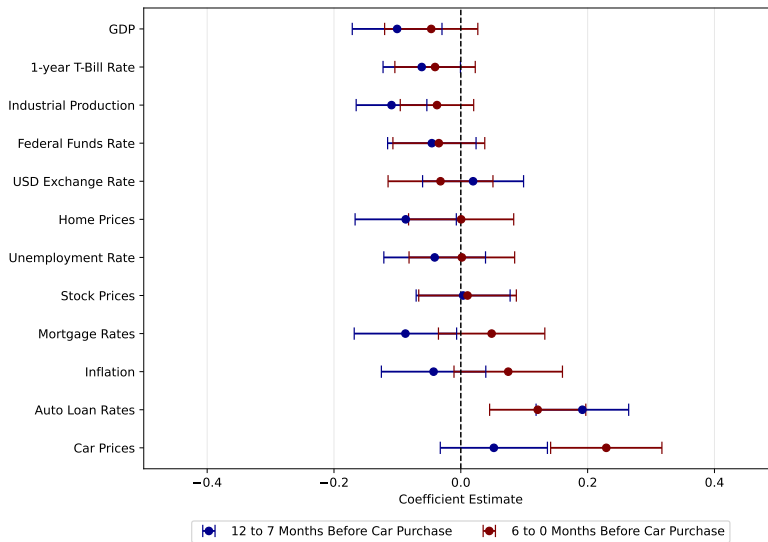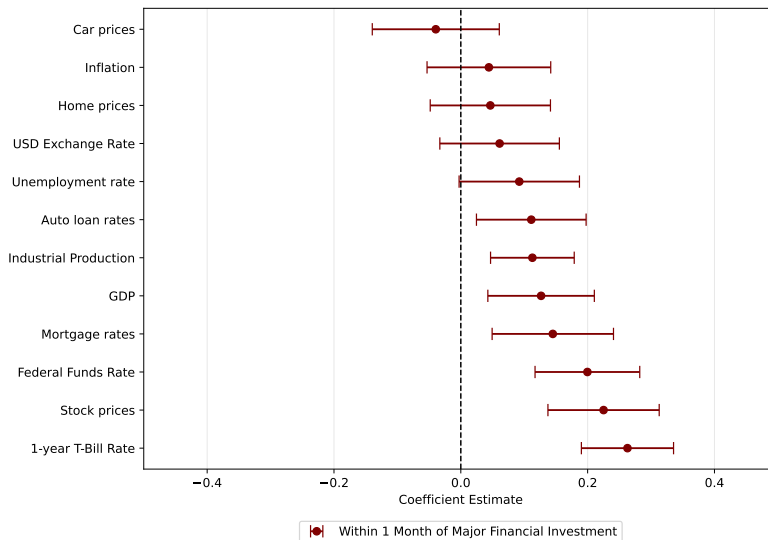
ENDOGENEITY OF DECISION-MAKING

- Concern: decision-making is **endogenous** to information acquisition and beliefs

- Solution: **IV** = anticipated moves due to job relocations

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Dependent Variable: Information Acquisition

Variable	OLS	First Stage	IV	OLS	First Stage	IV
Home Decision-Maker	0.33***		0.83***	0.32***		0.88***
	(0.07)		(0.29)	(0.07)		(0.29)
Job Relocation		0.28***			0.28***	
		(0.08)			(0.08)	
N	749	749	749	749	749	749
Controls				✓	✓	✓
F-stat		12.14			4.43	

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$$\Downarrow$$

Information is acquired more frequently...

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?

Partial equilibrium incomplete markets model $+$ durables $+$ dynamic info. acquisition

household block of McKay-Wieland 2021

$\approx$ rational inattention

MODEL OVERVIEW

Partial equilibrium incomplete markets model $+$ durables $+$ dynamic info. acquisition

Decision-Making

Given beliefs, HHs choose non-durables **c**
and durables **d**$'$ subject to:

- Income risk $+$ collaterized borrowing
- Stochastic interest rate r
- Depreciation of durables stock
- Durables adjustment costs
- Operating $+$ maintenance costs
- Match-quality shocks (e.g. job change)

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Rich model of how beliefs about $r \longrightarrow$ **c**, **d**$'$

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Information Acquisition

HHs receive signals of endogenous precision about current r

- Cost of signals $= \omega \times$ mutual info.

- Benefit of signals $=$ better choice of **c**, **d**$'$

- Interest rate is persistent $\Rightarrow$ prior beliefs are state variables

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Endogenous beliefs about r that come from dynamic information acquisition

- Define belief errors about next period states:

$$\Delta_r = \rho \left[\widehat{\mathbf{E}}(r) - r \right], \quad \Delta_b = b \left[\exp \widehat{\mathbf{E}}(r) - \exp(r) \right]$$

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- Given beliefs, households solve at state $\mathbf{x} = (b, d, r, y, \xi, \text{beliefs})$:

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$$\mathbf{c}(\mathbf{x}), \mathbf{d}'(\mathbf{x}) = \arg\max_{c, d'} U(c, m(d')) + \beta \cdot \mathbf{E} V \left(b' + \Delta_b, d', r' + \Delta_r, y', \xi', \text{beliefs}' \right)$$

DECISION-MAKING PROBLEM, GIVEN BELIEFS

- Define belief errors about next period states: Δ_r, Δ_b

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$$c + b' + d' = y + [\exp(r) + \tau_b \mathbf{1}_{b<0}]\, b + (1 - \delta)\, d - A(d, d'),$$

DECISION-MAKING PROBLEM, GIVEN BELIEFS

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$$\mathbf{A(d, d')} = \begin{cases} \underbrace{\nu \cdot d}_{\text{op. costs}} & \text{if } d' = \underbrace{(1 - \delta)d}_{\text{depreciation}} + \underbrace{\delta \cdot \chi \cdot d}_{\text{maint. costs}} \\ \underbrace{\nu \cdot d}_{\text{op. costs}} + \underbrace{f \cdot (1 - \delta)d}_{\text{fixed adj. cost}} & \text{else} \end{cases}$$

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$$\mathbf{m}(d') = d' \times \max\left\{\xi, \mathbf{1}_{d' \neq (1-\delta+\delta \cdot \chi)d}\right\}, \quad \xi \sim \text{Bern}(\overline{\xi}) = \text{match-quality shock}$$

$\xi = 0 \Rightarrow$ have to adjust for **exogenous** reasons (e.g. job relocation)

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- log y follows AR1 + observed by households

- r follows an AR1 + HHs know DGP, but do not observe **current rate**

- Simplifying assumption: HHs can only acquire **Gaussian** signals about **current** r
  - $\Rightarrow$ Prior beliefs in each period can be summarized by: $r \sim N(\mu, \Sigma)$

- Simplifying assumption: HHs can only acquire **Gaussian** signals about **current** r

- Households choose signal variance Σ_e, anticipating choices of **c** and **d**$'$:

$$V(\mathbf{x}) = \max_{\Sigma_e} \mathbf{E}\Big[U(\mathbf{c}, m(\mathbf{d}')) + \beta V\left(\mathbf{x}'\right) \Big]$$

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$$G = \frac{\Sigma}{\Sigma + \Sigma_e}$$

$$\widehat{\mathbf{E}}(r) = (1 - G)\mu + G\left(r + e\right), \quad e \sim N(0, \Sigma_e)$$

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- **c**, **d**' maximize objective with **belief errors**
  - Lower $\Sigma_e \Rightarrow \widehat{\mathbf{E}}(r) \longrightarrow r \Rightarrow$ **errors** $\longrightarrow 0 \Rightarrow$ smaller utility loss from **c**, **d**'

CALIBRATED PARAMETERS

Parameter	Description	Value	Source
Internally-Calibrated			
β	Discount factor	0.9829	Asset-to-GDP ratio
ψ	Non-durables exponent	0.627	Durable-to-nondurable consumption ratio
f	Fixed cost	0.11	Adjustment probability
$1 - \overline{\xi}$	Match-quality shock probability	0.034	Share of adjustments from MQ shocks
ω	Marginal information cost	$10^{-3.627}$	Concentration in information acquisition
Externally-Calibrated			
γ	RRA (and inverse EIS)	2	Standard value
ε	Durables elasticity of substitution	0.5	McKay & Wieland (2021)
$1 - \lambda$	Required downpayment	0.2	McKay & Wieland (2021)
δ	Depreciation rate	0.017	McKay & Wieland (2021)
χ	Maintenance share	0.35	McKay & Wieland (2021)
ν	Operating cost	0.012	McKay & Wieland (2021)
ρ_y	Income persistence	0.977	Flodén and Lindé (2001)
σ_ϵ	Income shock std. dev.	0.058	Flodén and Lindé (2001)
$\overline{r}$	Real rate mean	0.0143	10-Year Treasury Rate: 1961-2024
ρ	Real rate persistence	0.979	10-Year Treasury Rate: 1961-2024
σ	Real rate shock std. dev.	0.0014	10-Year Treasury Rate: 1961-2024
τ_b	Borrowing spread	0.004156	30-Year Fixed Mortgage Rate: 1971-2024
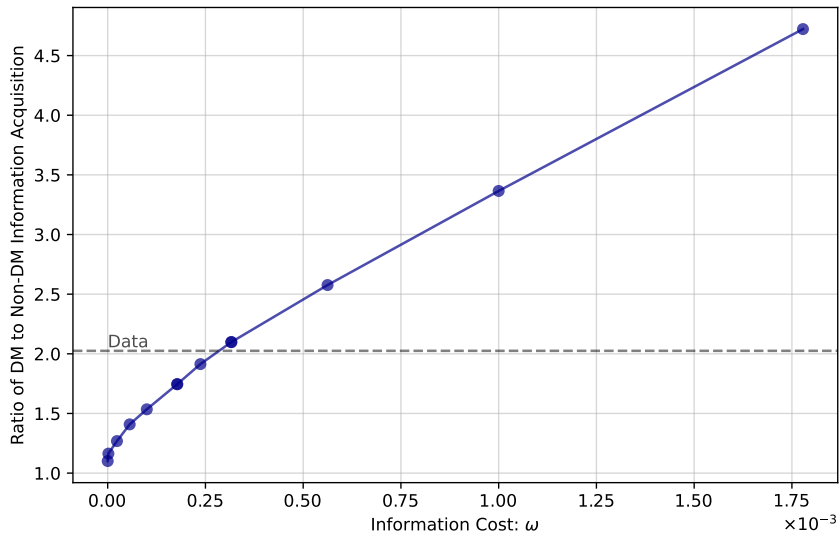
▸ Summary Stats   ▸ Durables Adjustment Hazard

SELECTIVE INATTENTION AT THE MICRO-LEVEL
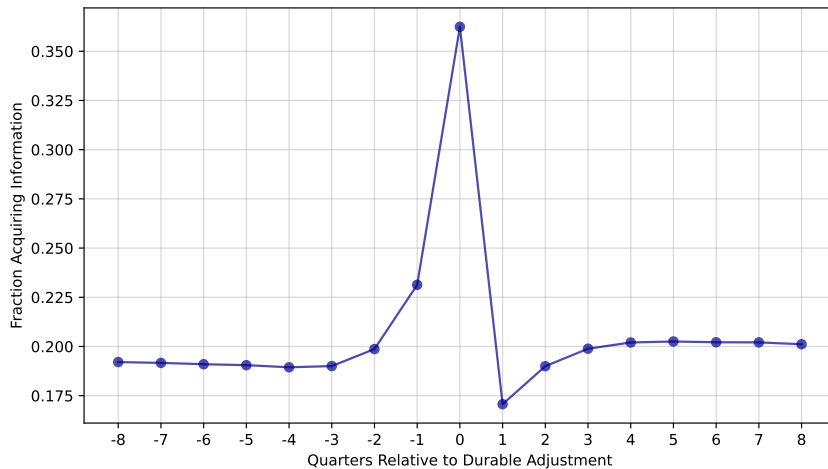
Households acquire information in **all** periods...

▸ Durables Share   ▸ Information Acquisition sS
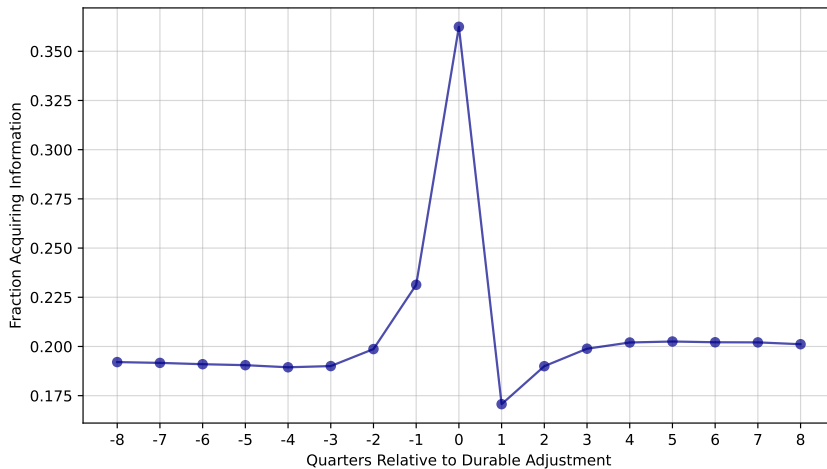
... but this information acquisition is **concentrated** around durables adjustments

▶ Durables Share ▶ Information Acquisition sS
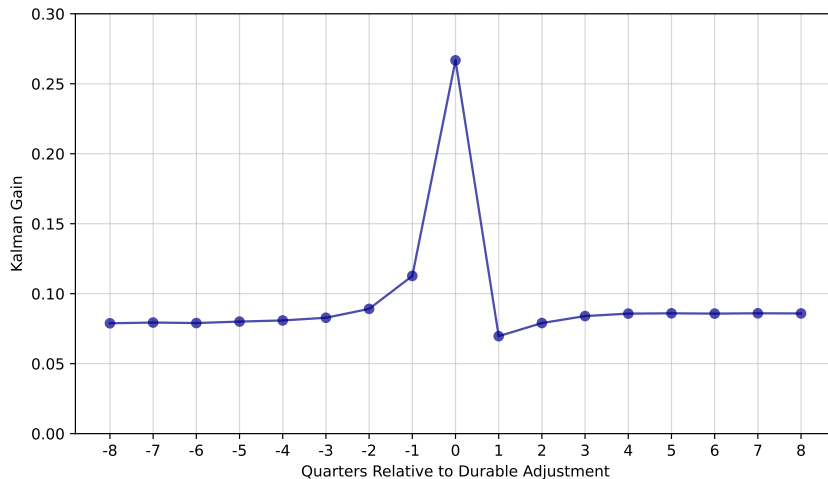
Increase in information acquisition is even larger on **intensive** margin

▶ Durables Share   ▶ Information Acquisition sS
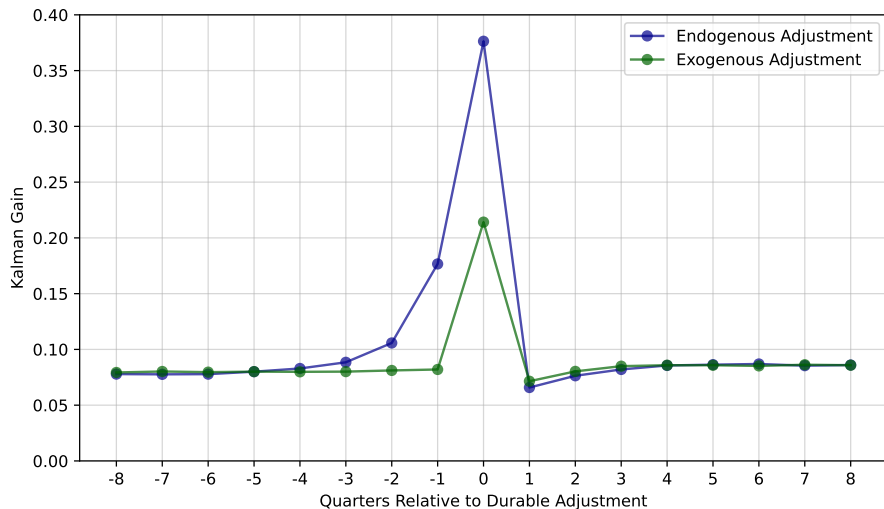
Information acquisition increases in anticipation of **state-dependent** adjustments...
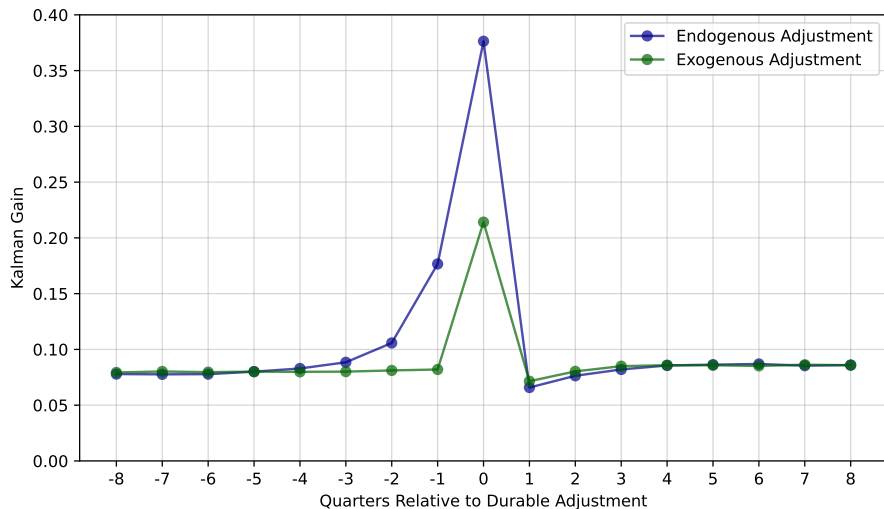
... but is concentrated around the choice for **time-dependent** adjustments Afrouzi et al. 24
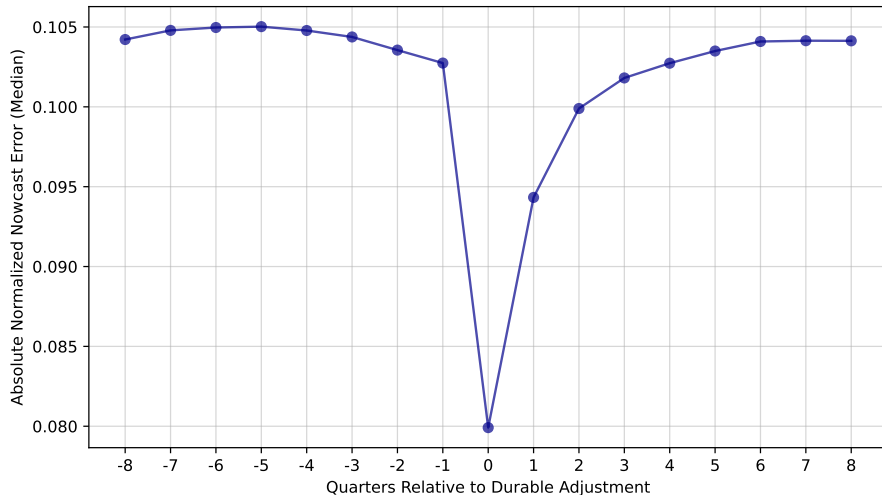
Forecast errors remain lower **post-choice** because beliefs are a "stock" not "flow"

- Natural question: how large are welfare losses from selective inattention?

- Compute two welfare metrics in **basis points** of lifetime consumption
  1. **Static**: loss from not having full-information in **current** period, ignoring info. cost
  2. **Dynamic**: loss from not having full-information in **all** periods, ignoring info. cost

▸ CG Coefficients

WELFARE LOSS FROM INATTENTION

- Natural question: how large are welfare losses from selective inattention?

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- Losses are **small**, but still have aggregate effects (next)!

Akerlof-Yellen 85

Maćkowiak-Wiederholt 15

	Static	Dynamic
Mean	0.04	1.94
Median	0.03	1.56

▸ CG Coefficients

RESPONSES TO INTEREST RATE CUTS

Interest Rate Nowcast
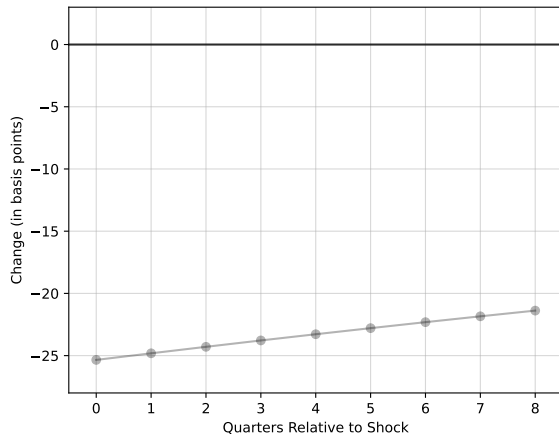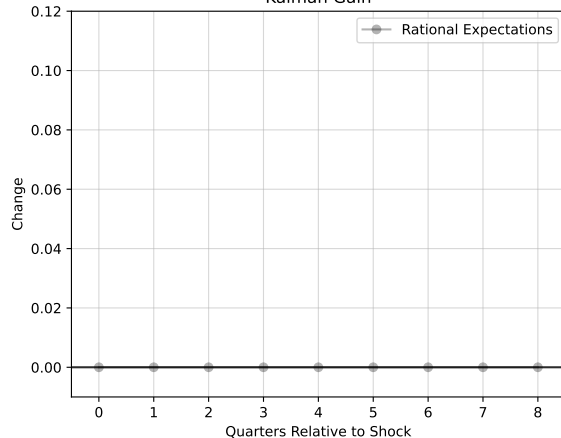
Kalman Gain

Rational Expectations: $\omega = 0 \Rightarrow \widehat{\mathbf{E}}(r) = r$

▶ Decomposition
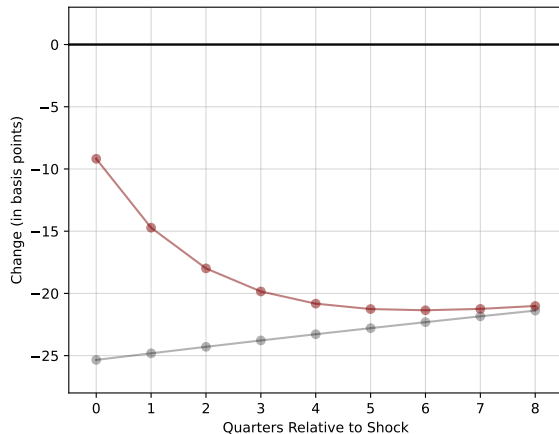
Interest Rate Nowcast · Kalman Gain
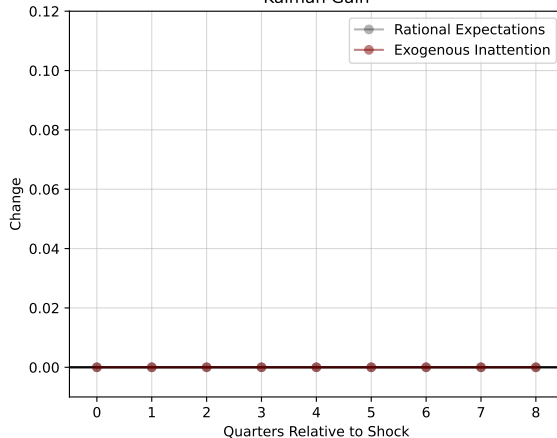
Exogenous Inattention: constant *G* set to match CG 15 coefficient in baseline model

▸ Decomposition

Interest Rate Nowcast

Kalman Gain

- Rational Expectations
- Exogenous Inattention
- Selective Inattention
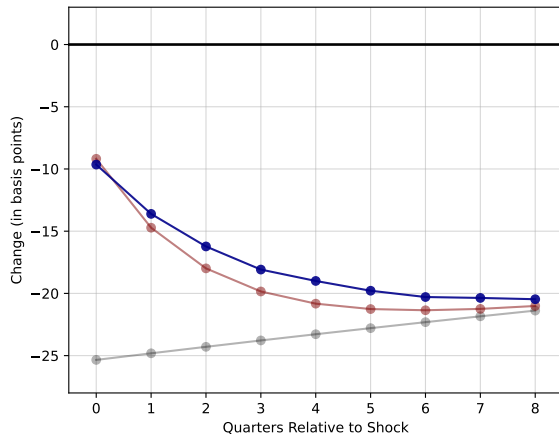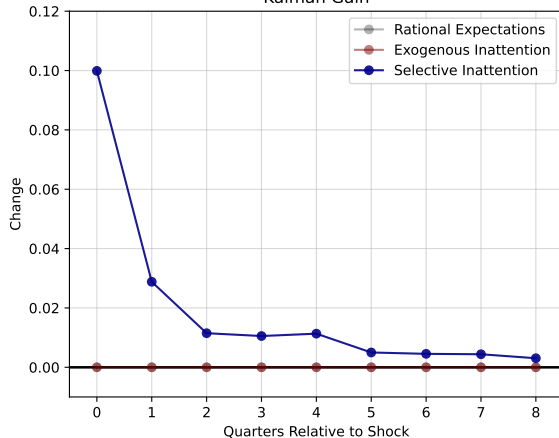
Selective Inattention: baseline model with endogenous information acquisition

▸ Decomposition
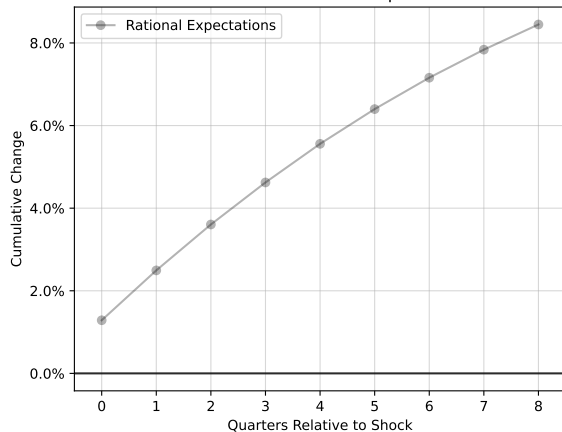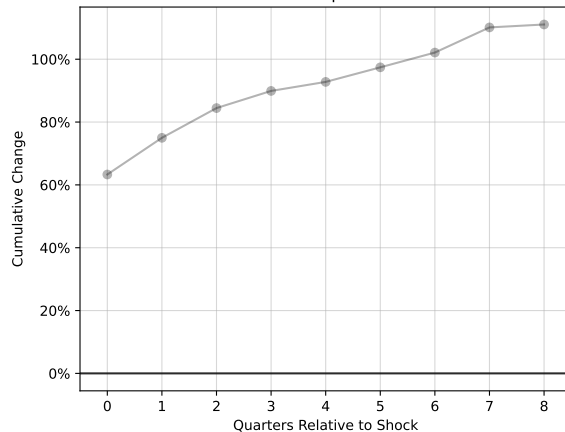
Non-Durable Consumption / Durable Expenditure — Cumulative Change vs Quarters Relative to Shock (Rational Expectations)
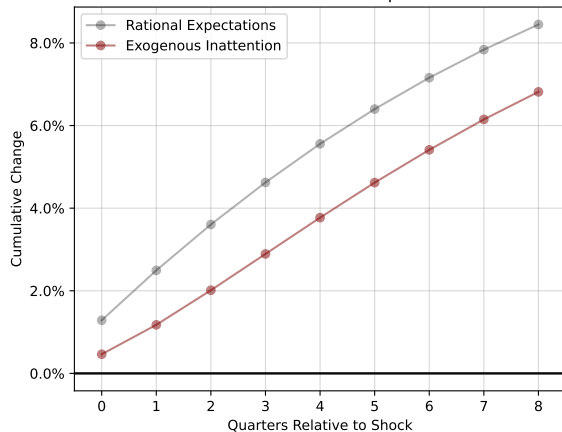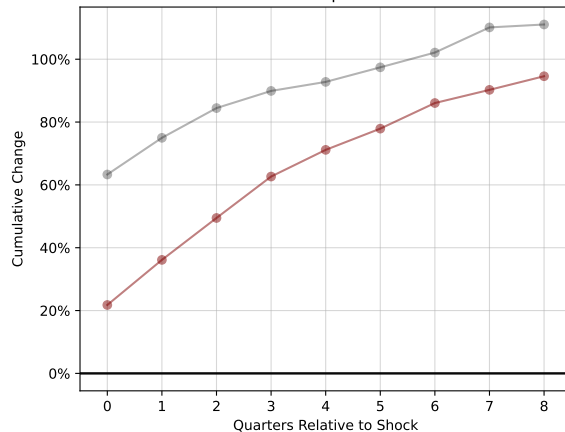
▸ Aggregate Expenditure   ▸ Incorporating GE Effects   ▸ Non-Linearity

▸ Aggregate Expenditure ▸ Incorporating GE Effects ▸ Non-Linearity
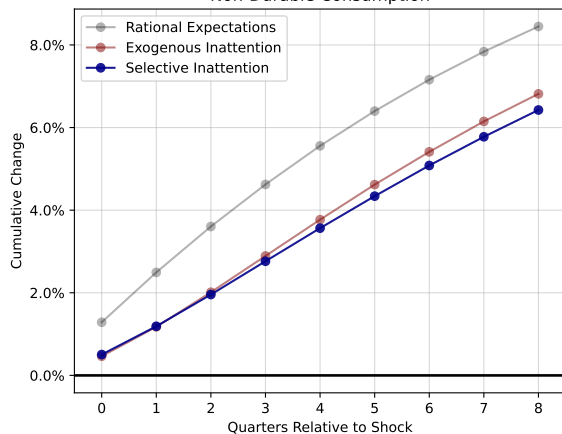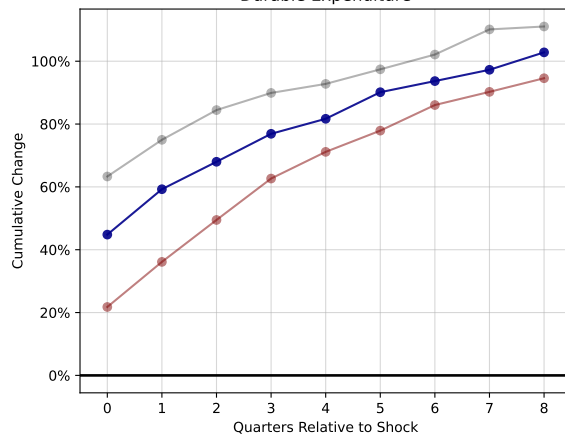
Non-durable consumption response ≈ exogenous inattention...

▸ Aggregate Expenditure   ▸ Incorporating GE Effects   ▸ Non-Linearity
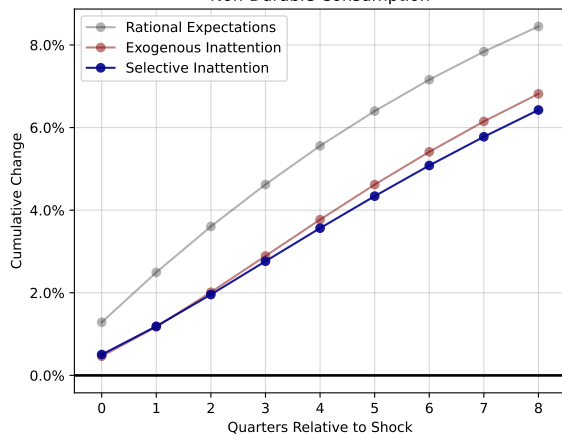
Non-Durable Consumption / Durable Expenditure
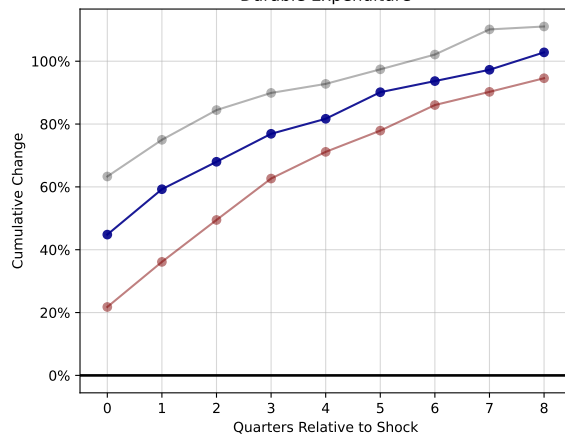
... but **durable** responses is closer to **rational expectations** in **short-run**!

▸ Aggregate Expenditure   ▸ Incorporating GE Effects   ▸ Non-Linearity

EFFECTS OF CHANGES IN INTEREST RATE VOLATILITY
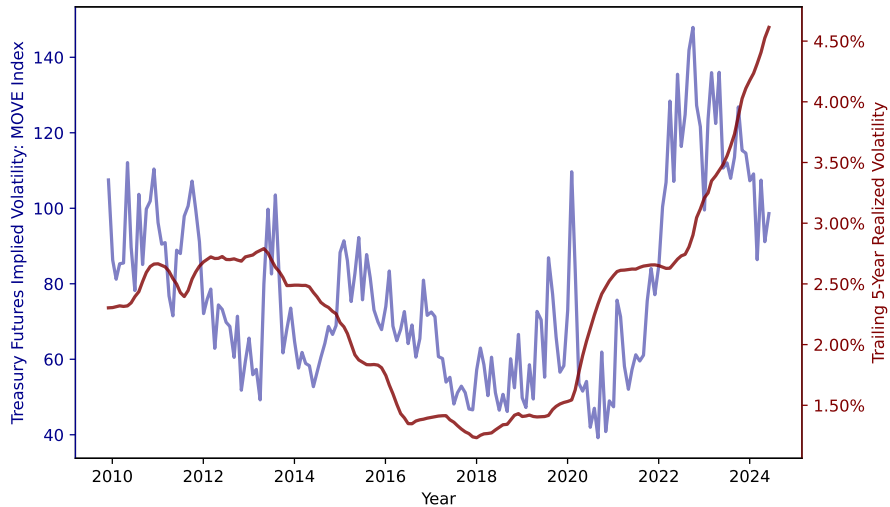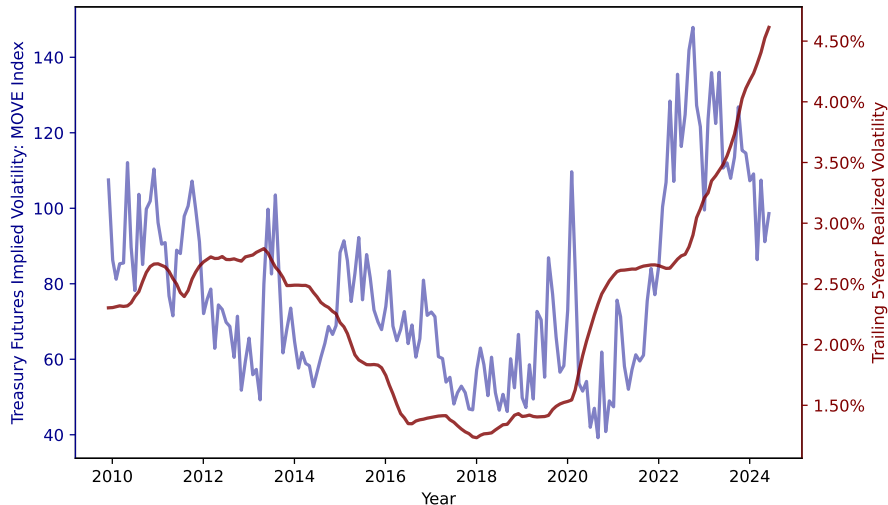
⇒ **Next counterfactual**: **double** interest rate volatility
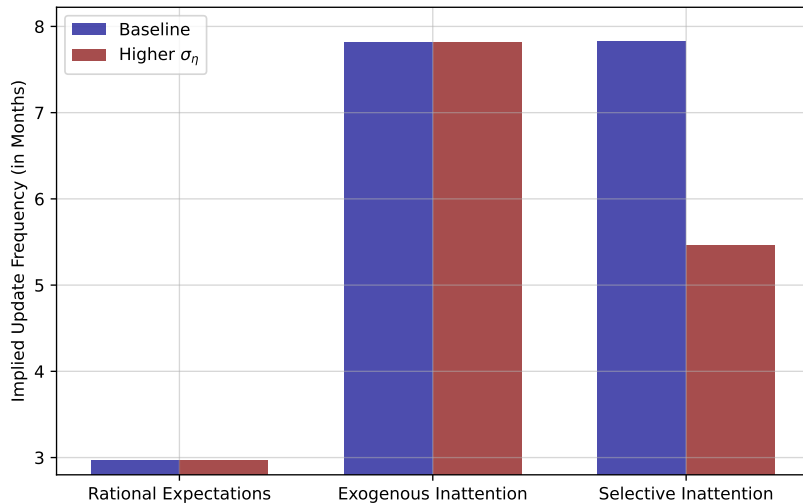
Increase in volatility $\Rightarrow$ more information acquisition $\Rightarrow$ less belief rigidity

Non-Durable Consumption

Durable Expenditure
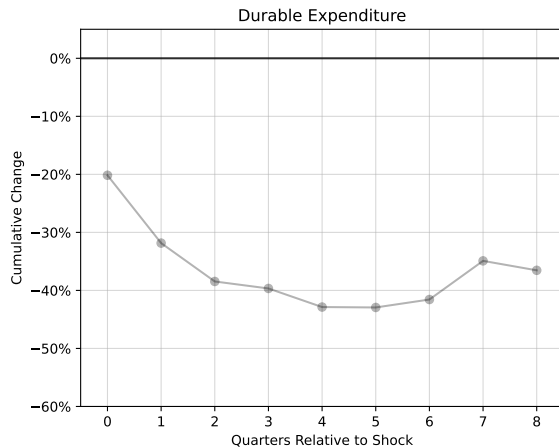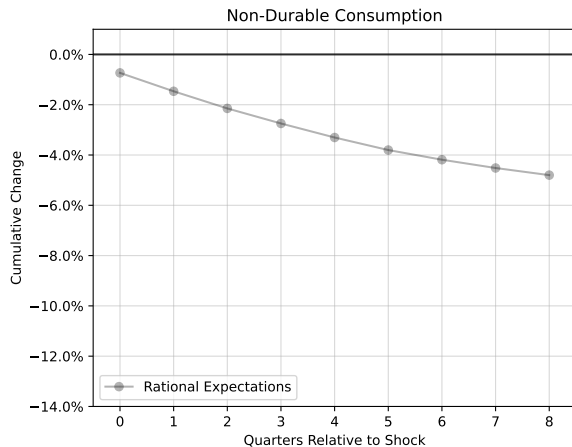
Increase in volatility $\Rightarrow$ spending falls due to precautionary motives... Sandmo 70
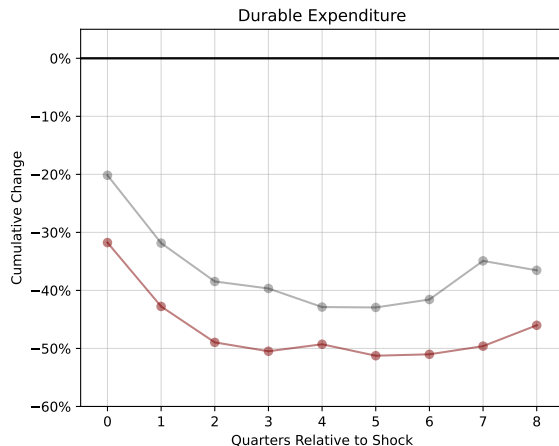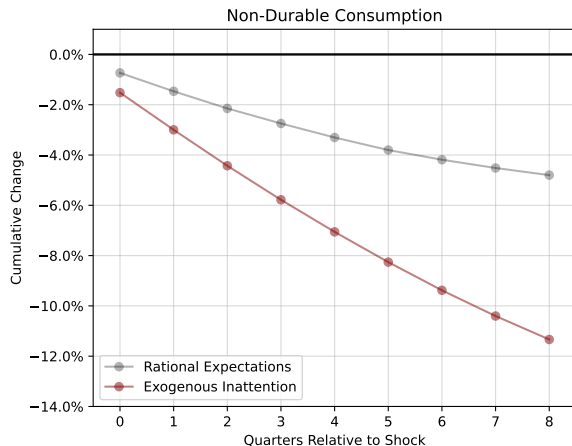
... which is stronger with **exogenous inattention** because of additional uncertainty
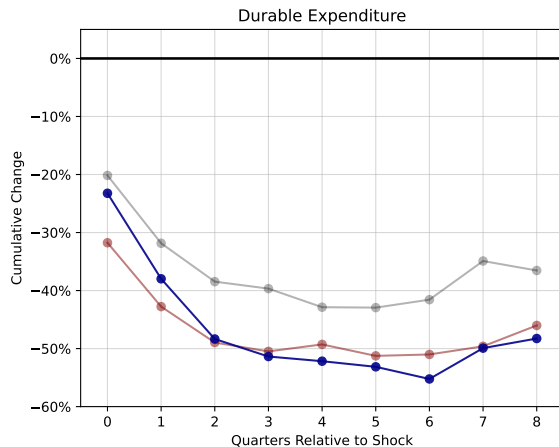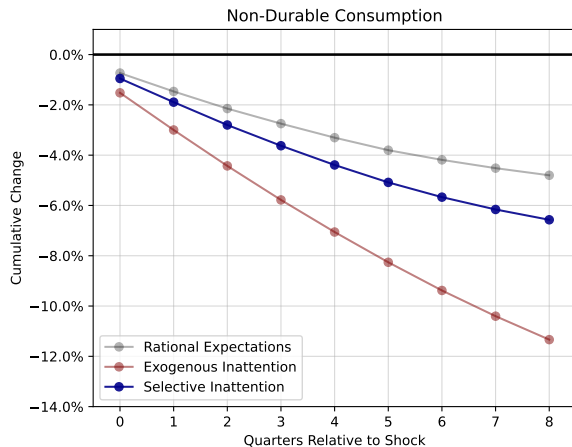
Selective inattention undoes over 50% of this fall due to ↑ info. acquisition!
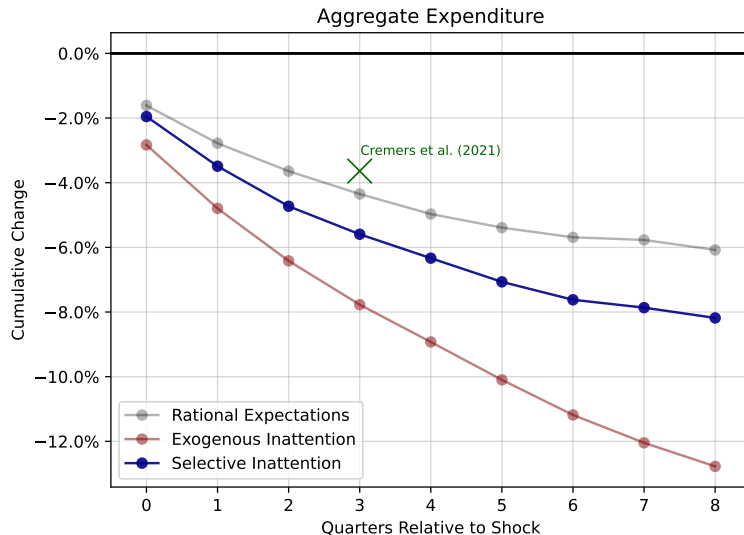
Aggregate Expenditure

Cremers et al. (2021)

Legend:
- Rational Expectations
- Exogenous Inattention
- Selective Inattention

X-axis: Quarters Relative to Shock
Y-axis: Cumulative Change

▸ State-Dependence of Rate Cuts

- Households are selectively inattentive to interest rates
  - IA is concentrated around durables purchases, where beliefs are more accurate

- **Both** exogenous and selective inattention $\Rightarrow$ slow-moving aggregate beliefs

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- But **unlike** exogenous inattention, selective inattention implies:
  1. Larger short-run responses of durables spending to rate cuts
  2. Non-linear responses of durables and non-durables to rate cuts
  3. Increases in volatility have smaller effects because of increased info. acquisition

CONCLUSION

- Households are selectively inattentive to interest rates
  - IA is concentrated around durables purchases, where beliefs are more accurate

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- **Takeaways**:
  - **Micro-level** patterns in attention are useful identifying moments
  - **Endogenizing HH (in)attention** is important, especially for changes in volatility

THANK YOU!

tdesilva@stanford.edu

- Eliciting our main measure of information acquisition

  Step 1: In the last 3 years, did you actively search for information about any of the following economic variables in the U.S.?

  By "active search" we mean a deliberate effort to find information which could include searching online, reading news articles or reports, talking to a financial advisor or broker, or any other intentional effort to gather information.

  Step 2: How many months ago did you last actively search for information about mortgage rates?

- Eliciting households' distance from the primary home purchase

  Owners: How many months ago did you finalize the purchase of your current primary residence?

  Renters: How many months from now do you expect the closing on your primary residence purchase?

  By "closing", we mean signing the final documents to officialize the purchase.
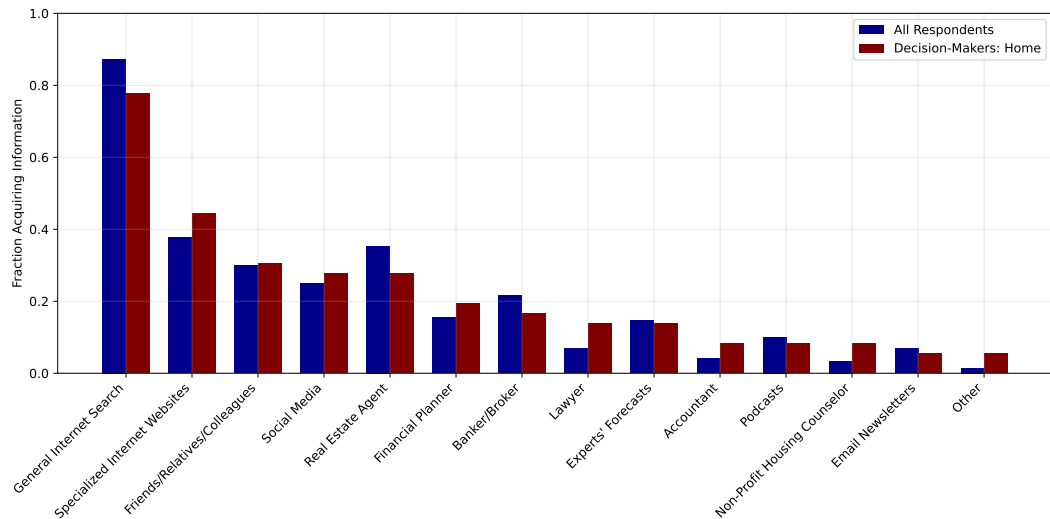
◀ Back

Legend:
- All Respondents
- Decision-Makers: Home

Y-axis: Fraction Acquiring Information (0.0 to 1.0)

X-axis categories: General Internet Search, Specialized Internet Websites, Friends/Relatives/Colleagues, Social Media, Real Estate Agent, Financial Planner, Banker/Broker, Lawyer, Experts' Forecasts, Accountant, Podcasts, Non-Profit Housing Counselor, Email Newsletters, Other

◀ Back

Treasury Bill Rates
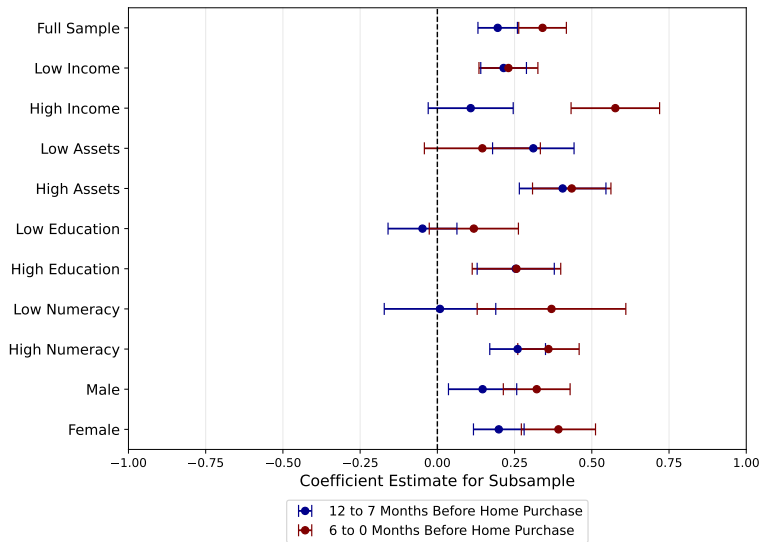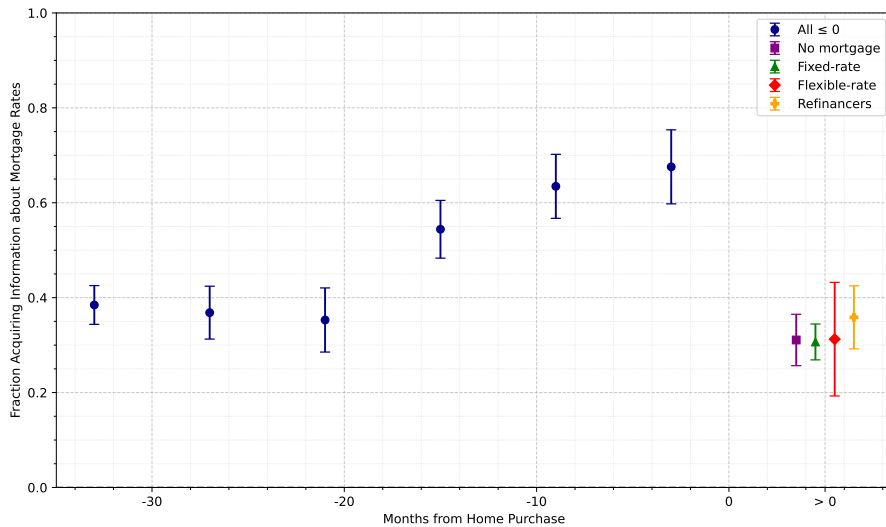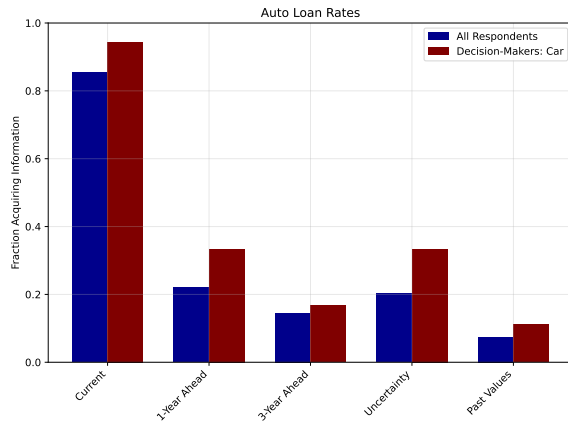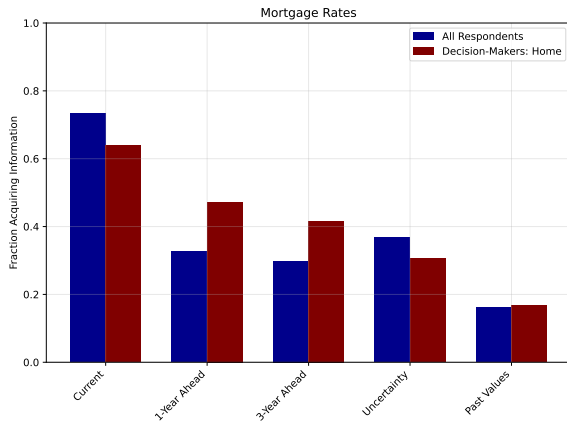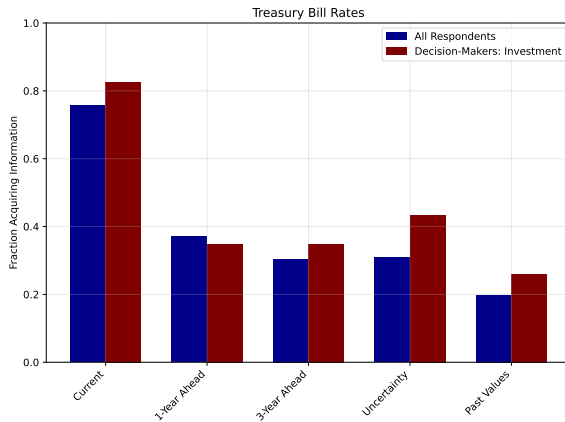
◂ Back

	Mean	SD	P10	P50	P90
Assets/Income: b/y	3.51	4.93	-0.91	1.90	10.25
Durable/Non-Durables: d'/c	2.55	0.40	1.99	2.58	3.01
Durables Gap	0.14	0.17	-0.05	0.11	0.38
Acquired Information	0.20	0.40	0.00	0.00	1.00
Kalman Gain: G	0.09	0.20	0.00	0.00	0.40
Kalman Gain Conditional on IA	0.44	0.20	0.30	0.40	0.80
Normalized Nowcast Error: $|\hat{\mathbb{E}}(r) - r|/|r|$	0.30	7.84	0.02	0.10	0.34
Normalized Prior Variance: Σ/σ_r^2	0.36	0.19	0.15	0.34	0.64

◂ Back
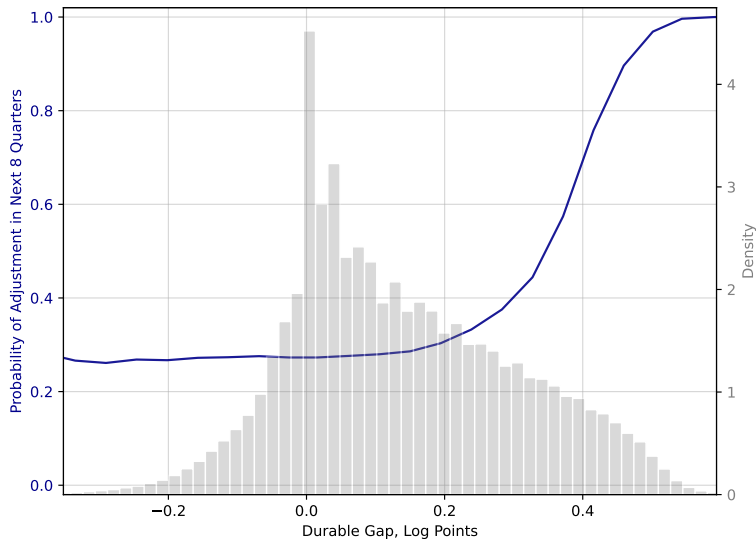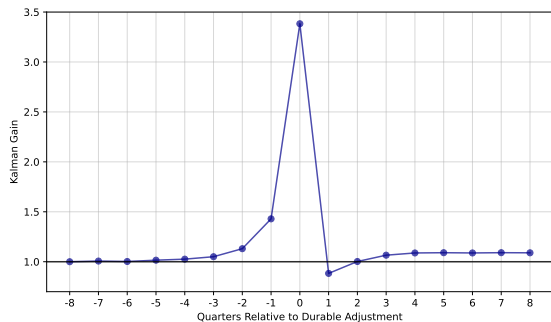
Baseline: $\psi = 0.63$ **Low Durables Share:** $\psi = 0.99$
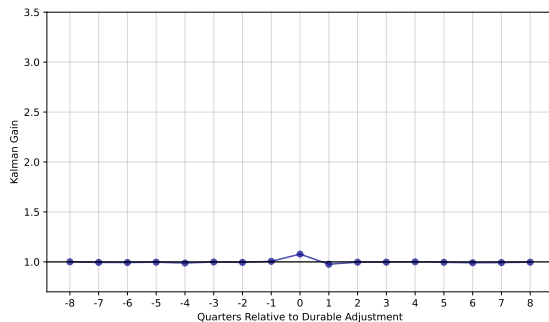
◂ Back
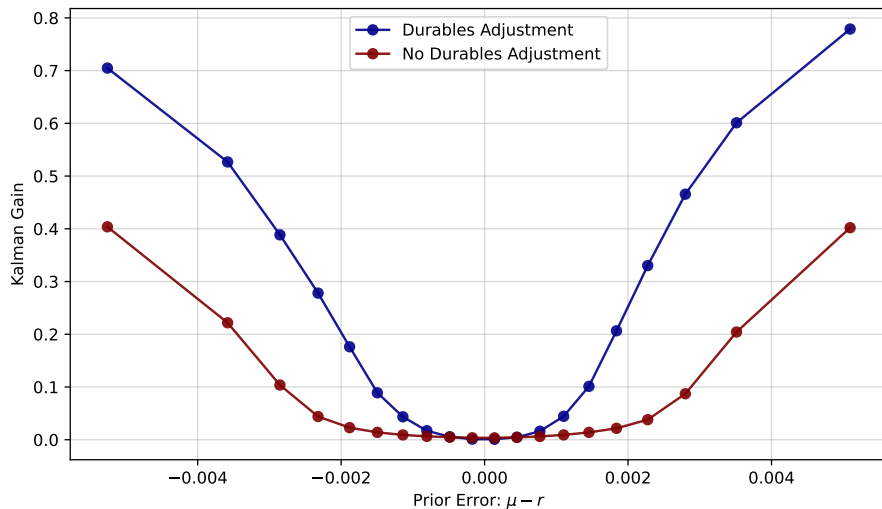
- Direct evidence of information-rigidity = CG (2015) regression

$$\underbrace{r_{t+3} - \overline{F}_t r_{t+3}}_{\text{forecast error}} = \alpha + \beta_{CG} \underbrace{\left(\overline{F}_t r_{t+3} - \overline{F}_{t-1} r_{t+3}\right)}_{\text{forecast revision}} + \epsilon_t$$

- Common finding: $\beta_{CG} > 0 \Rightarrow$ aggregate expectations are **sluggish**

- In a sticky-information model (constant probability of updating expectations),

$$\text{Implied Update Frequency} = 3\left(1 + \beta_{CG}\right) \text{ Months}$$

  $\Rightarrow$ Common target for calibrating sticky information models (e.g. McKay-Wieland 2021)

Implied Update Frequency $= 3\left(1 + \beta_{CG}\right)$ Months

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Implied Update Frequency $= 3\,(1 + \beta_{CG})$ Months
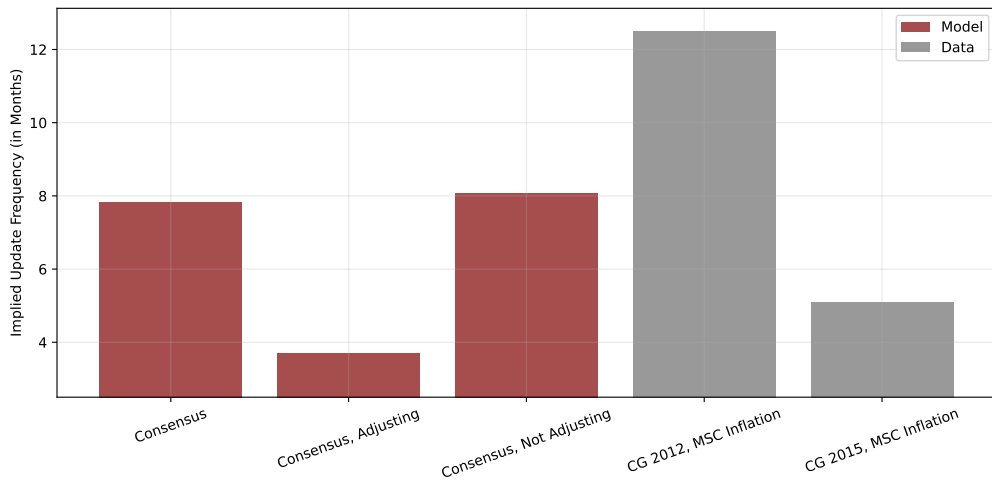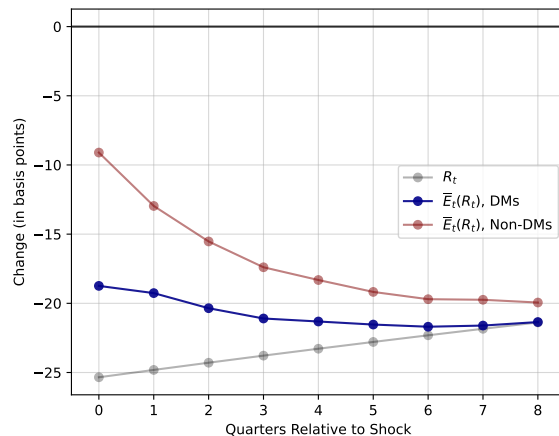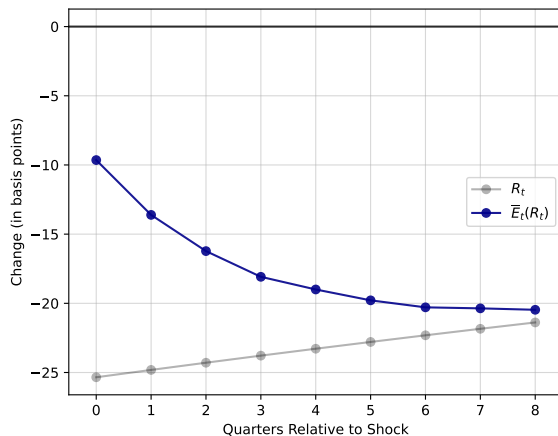
◂ Back

Beliefs of **decision-makers** respond $\geq$ 2 times as fast
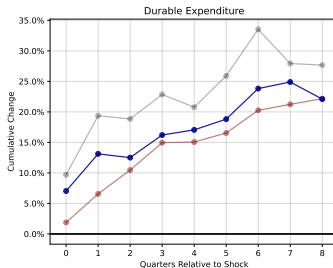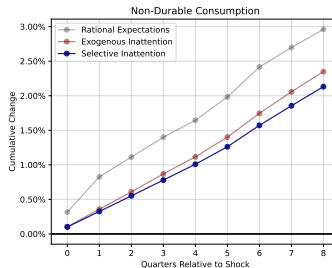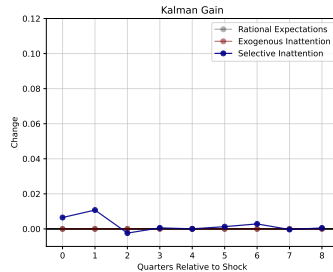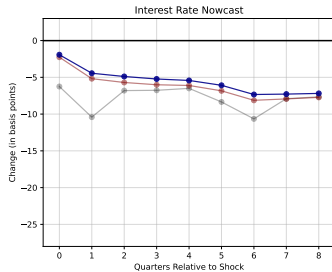
◂ Back

◀ Back

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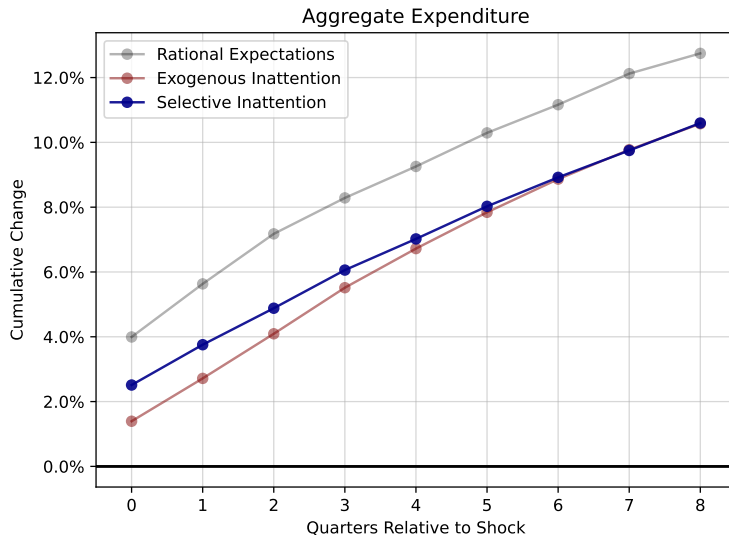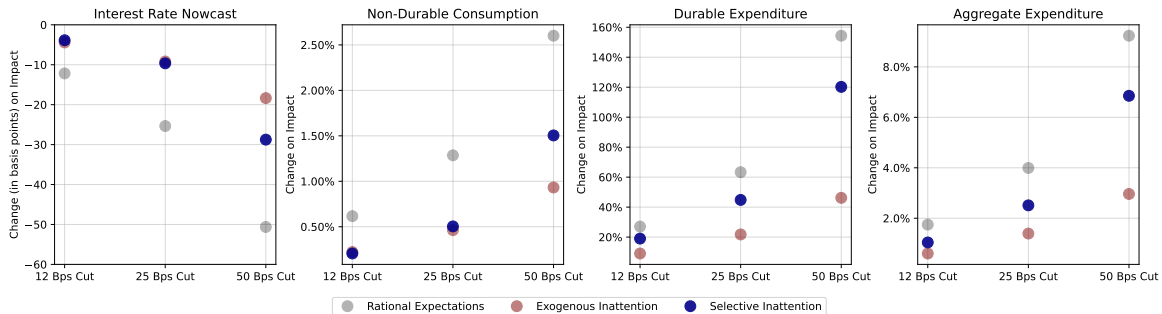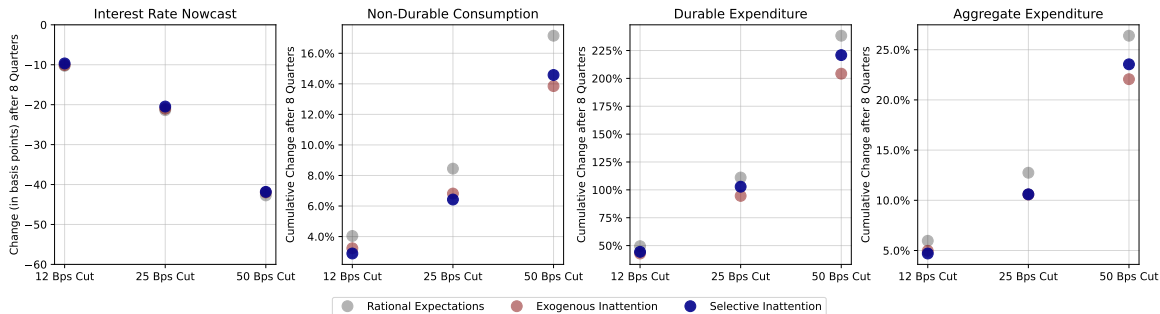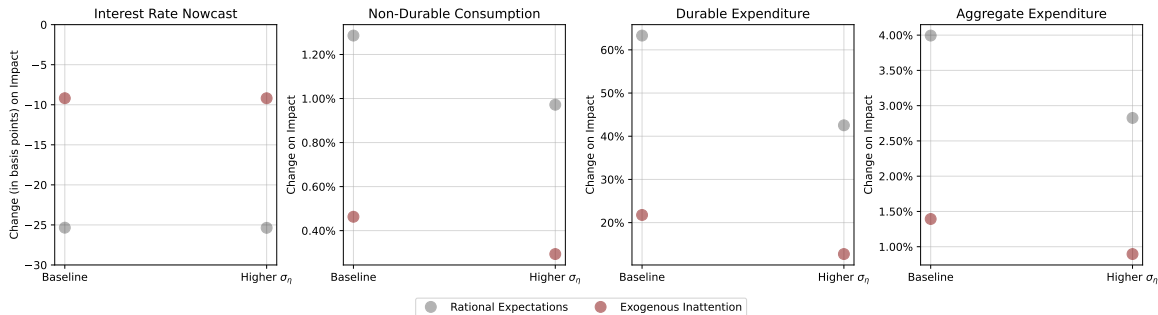
◄ Back

$\uparrow$ volatility $\Rightarrow$ consumption is less response to interest rates

◄ Back
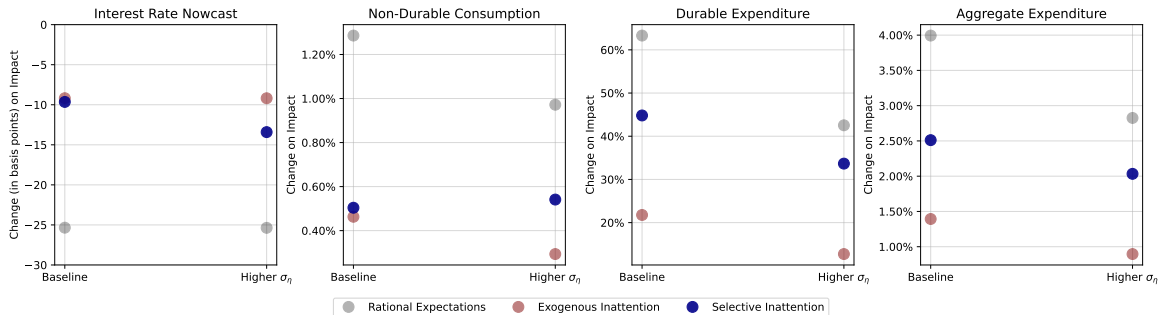
... but not with **selective inattention** because of increased info. acquisition!

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