

How Do Interest Rates Affect Consumption? Household Debt and the Role of Asset Prices*

NBER SI: Monetary Economics

Angus Foulis¹ Jonathon Hazell² Atif Mian³ Belinda Tracey¹

July 16th 2026

¹Bank of England ²London School of Economics ³Princeton

*The views expressed in this paper are those of the authors and not necessarily those of the Bank of England or its committees. Preliminary draft. Please do not quote without the permission of the authors.

How do Interest Rate Cuts Affect Consumption?

Household debt channel:

- Rate cuts raise consumption by lowering debt service + encouraging borrowing

How do Interest Rate Cuts Affect Consumption?

Household debt channel:

- Rate cuts raise consumption by lowering debt service + encouraging borrowing

Many alternative reasons why rates could affect consumption, e.g. HANK

- Rate cuts raise consumption via higher income [e.g. Kaplan et al '18; Auclert '19]

How do Interest Rate Cuts Affect Consumption?

Household debt channel:

- Rate cuts raise consumption by lowering debt service + encouraging borrowing

Many alternative reasons why rates could affect consumption, e.g. HANK

- Rate cuts raise consumption via higher income [e.g. Kaplan et al '18; Auclert '19]

Us: natural experiments + consumption/mortgage microdata to isolate household debt channel

- Focus on UK mortgagors: account for 40% of consumption
- Find an important role for asset prices:
 - Rates $\downarrow \implies$ house prices $\uparrow \implies$ borrowing $\uparrow \implies$ consumption $\uparrow$

A Natural Experiment for Changing Interest Rates

Natural experiment: UK mortgage market [Cloyne et al '19]

- Households choose mortgage “deal” for 2, 3 or 5 years
- Strong financial incentive to refinance exactly when deal expires

A Natural Experiment for Changing Interest Rates

Natural experiment: UK mortgage market [Cloyne et al '19]

Data: linked monthly mortgage + consumption micro data for 2015-2024

A Natural Experiment for Changing Interest Rates

Natural experiment: UK mortgage market [Cloyne et al '19]

Data: linked monthly mortgage + consumption micro data for 2015-2024

Approach: exploit natural experiments

1. Estimate household debt channel of interest rates holding fixed income [vs. HANK]
 - e.g. compare two households: deals of different length expiring at same time
 - Different rate cuts, same income shocks
2. Measure importance of asset prices for household debt channel
 - Across regions: regional variation in house price responsiveness to rates
 - Within regions: variation in duration of housing

A Natural Experiment for Changing Interest Rates

Natural experiment: UK mortgage market [Cloyne et al '19]

Data: linked monthly mortgage + consumption micro data for 2015-2024

Approach: exploit natural experiments

Results:

1. Household debt channel powerful—in 12 months after rate 1pp rate cut:
 - Raises cash-on-hand [= borrowing - debt service] by 2000 pounds
 - Raises consumption by 1500 pounds [MPC of 0.7 @ 12 months]
 - Affects borrowing more than debt service
2. Asset prices: high share of borrowing response, small share of debt service response
 - £1 increase in house value due to rates $\implies$ borrowing, consumption increase by £0.04

Microdata: interest rates → consumption. [Di Maggio et al '17, Cloyne et al '20, Holm et al '21, Berger, Milbradt, Tourre & Vavra '21, Eichenbaum et al, '22, Ahn et al '25 ...]

- **Previous:** “cashflow effects” (debt service).
- **This paper:** borrowing driven by asset prices
- Direct measures of durable + non-durable consumption

Monetary policy → consumption. [Romer & Romer '04, Gertler & Karadi '15 ...]

- This paper provides a new empirical methodology with millions of natural experiments

Asset prices in transmission to firms [Bernanke, Gertler & Gilchrist '95; Kiyotaki & Moore '97; Iacoviello '05; Bahaj, Foulis & Pinter '20 ...]

- This paper directly estimates role of asset prices in transmission to households

Merged Mortgage & Consumption Data

1. **Mortgage** dataset (Product Sales Database)
 - Administrative data collected by UK Financial Conduct Authority
 - Universe of outstanding mortgages in UK, for 2015-2024

1. Mortgage dataset (Product Sales Database)

- Administrative data collected by UK Financial Conduct Authority
- Universe of outstanding mortgages in UK, for 2015-2024

2. Consumption dataset

- Two personal finance apps: Money Dashboard (2015-2021), ClearScore (2018-2024)
- Transaction-level data from bank accounts, 1 700 000 individuals total
- Classify transactions with machine learning → aggregate to durables + non-durables
- Data on credit card debt + personal loan repayment, liquid assets
- Expenditure similar to official sources [Details](#)

1. Mortgage dataset (Product Sales Database)

- Administrative data collected by UK Financial Conduct Authority
- Universe of outstanding mortgages in UK, for 2015-2024

2. Consumption dataset

- Two personal finance apps: Money Dashboard (2015-2021), ClearScore (2018-2024)
- Transaction-level data from bank accounts, 1 700 000 individuals total
- Classify transactions with machine learning → aggregate to durables + non-durables
- Data on credit card debt + personal loan repayment, liquid assets
- Expenditure similar to official sources [Details](#)

Study both: mortgage dataset, merged mortgage + consumption dataset

- Reweight merged mortgage + consumption dataset on observables
- Where possible: show similar outcomes in both datasets

1. Mortgage dataset (Product Sales Database)

- Administrative data collected by UK Financial Conduct Authority
- Universe of outstanding mortgages in UK, for 2015-2024

2. Consumption dataset

- Two personal finance apps: Money Dashboard (2015-2021), ClearScore (2018-2024)
- Transaction-level data from bank accounts, 1 700 000 individuals total
- Classify transactions with machine learning → aggregate to durables + non-durables
- Data on credit card debt + personal loan repayment, liquid assets
- Expenditure similar to official sources [Details](#)

Study both: mortgage dataset, merged mortgage + consumption dataset

- Reweight merged mortgage + consumption dataset on observables
- Where possible: show similar outcomes in both datasets

Convert both datasets to monthly frequency

Setting: Mortgage Deals in the UK

Mortgage Deals + Refinancing in the United Kingdom

Households choose mortgage deals for 2, 3 or 5 years: [Cloyne, Huber, Ilzetzki & Kleven '19]

- Interest rate typically fixed over deal at low teaser rate [floating rates uncommon]
- Rate determined by conditions at start of deal

Mortgage Deals + Refinancing in the United Kingdom

Households choose mortgage deals for 2, 3 or 5 years: [Cloyne, Huber, Ilzetzki & Kleven '19]

- Interest rate typically fixed over deal at low teaser rate [floating rates uncommon]
- Rate determined by conditions at start of deal

During deal, strong incentive not to refinance: early repayment charge $\approx 3\%$ of principal

Mortgage Deals + Refinancing in the United Kingdom

Households choose mortgage deals for 2, 3 or 5 years: [Cloyne, Huber, Ilzetzki & Kleven '19]

- Interest rate typically fixed over deal at low teaser rate [floating rates uncommon]
- Rate determined by conditions at start of deal

During deal, strong incentive not to refinance: early repayment charge $\approx 3\%$ of principal

When deal expires, strong incentive to start new deal:

- If no new deal: households pay significantly higher penalty rate [200-300 bps increase]
- Or pay fixed cost to start new deal [≈ 1000 pounds]

Mortgage Deals + Refinancing in the United Kingdom

Households choose mortgage deals for 2, 3 or 5 years: [Cloyne, Huber, Ilzetzki & Kleven '19]

- Interest rate typically fixed over deal at low teaser rate [floating rates uncommon]
- Rate determined by conditions at start of deal

During deal, strong incentive not to refinance: early repayment charge $\approx 3\%$ of principal

When deal expires, strong incentive to start new deal:

- If no new deal: households pay significantly higher penalty rate [200-300 bps increase]
 - Or pay fixed cost to start new deal [≈ 1000 pounds]
- + Households typically reminded by bank to refinance ≈ 3 months before deal expiry
- + No additional cost to mortgage borrowing when new deal starts

Mortgage Deals + Refinancing in the United Kingdom

Households choose mortgage deals for 2, 3 or 5 years: [Cloyne, Huber, Ilzetzki & Kleven '19]

- Interest rate typically fixed over deal at low teaser rate [floating rates uncommon]
- Rate determined by conditions at start of deal

During deal, strong incentive not to refinance: early repayment charge $\approx 3\%$ of principal

When deal expires, strong incentive to start new deal:

- If no new deal: households pay significantly higher penalty rate [200-300 bps increase]
- Or pay fixed cost to start new deal [≈ 1000 pounds]

+ Households typically reminded by bank to refinance ≈ 3 months before deal expiry

+ No additional cost to mortgage borrowing when new deal starts

Δ interest rate + refinancing opportunity at pre-determined, staggered, and anticipated times

Mortgage Deals + Refinancing in the United Kingdom

Households choose mortgage deals for 2, 3 or 5 years: [Cloyne, Huber, Ilzetzki & Kleven '19]

- Interest rate typically fixed over deal at low teaser rate [floating rates uncommon]
- Rate determined by conditions at start of deal

During deal, strong incentive not to refinance: early repayment charge $\approx 3\%$ of principal

When deal expires, strong incentive to start new deal:

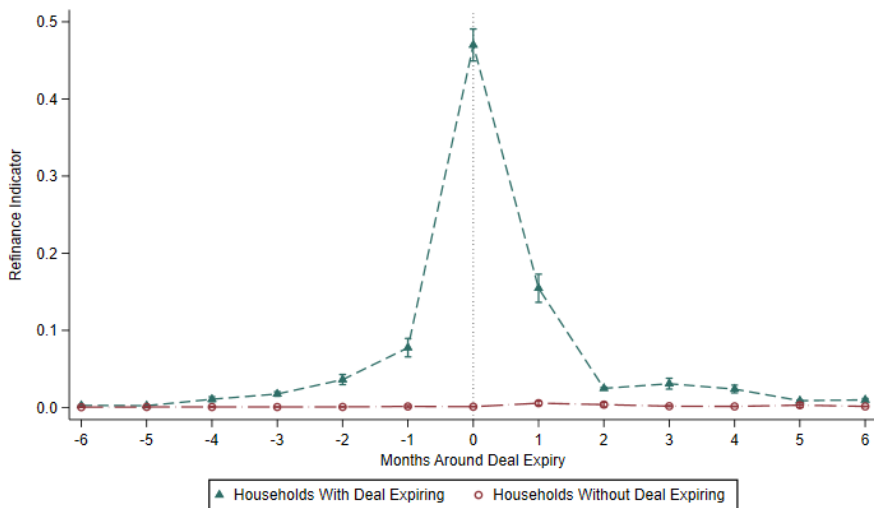
- If no new deal: households pay significantly higher penalty rate [200-300 bps increase]
 - Or pay fixed cost to start new deal [≈ 1000 pounds]
- + Households typically reminded by bank to refinance ≈ 3 months before deal expiry
- + No additional cost to mortgage borrowing when new deal starts

Δ interest rate + refinancing opportunity at pre-determined, staggered, and anticipated times

Samples:

- 6.8 million deal expirations in mortgage dataset
- 70 000 deal expirations in merged consumption + mortgage dataset
- Restrict to households who do not move around deal expiry

Household Deal Expiration: Behavior of Refinancing



Cumulatively $\approx 90\%$ of households refinance when deal expires

Borrowing

Consumption

Household Debt Channel—Simple Framework

Simple Framework: Incomplete Markets + Collateral

Standard model with mortgages [e.g. Maxted et al '24] + collateral [e.g. Bernanke et al '95; Auclert '19]

Aims:

- Define household debt channel, importance of borrowing + asset prices
- Map into natural experiment

Simple Framework: Incomplete Markets + Collateral

Household problem: old mortgage deal from $-n$ to 0, new deal from 0 to N [ignore moving]

$$\max_{\{c_t, a_t, d_t\}_{t=0}^N} E_0 \left[\sum_{t=0}^N \beta^t u(c_t) + \beta^{N+1} v(a_{N+1}, d_{N+1}) \right]$$

$$c_t + a_t - d_t = y_t + (1 + r_t^a) a_{t-1} - (1 + r_t^d) d_{t-1}$$

$$d_t - d_{t-1} = -\xi \quad t \neq 0 \quad a_t \geq \underline{a}$$

Simple Framework: Incomplete Markets + Collateral

Household problem: old mortgage deal from $-n$ to 0, new deal from 0 to N [ignore moving]

$$\max_{\{c_t, a_t, d_t\}_{t=0}^N} E_0 \left[\sum_{t=0}^N \beta^t u(c_t) + \beta^{N+1} v(a_{N+1}, d_{N+1}) \right]$$

$$c_t + a_t - d_t = y_t + (1 + r_t^a) a_{t-1} - (1 + r_t^d) d_{t-1}$$

$$d_t - d_{t-1} = -\xi \quad t \neq 0 \quad a_t \geq \underline{a}$$

Mortgage rate increasing in loan-to-value at start of deal

$$r_t^d = \begin{cases} r_0 + \omega_0 & t \geq 0 \\ r_{-n} + \omega_{-n} & t < 0 \end{cases} \quad \omega_t = \omega \left(\frac{d_t}{p(r_t) h} \right)$$

“Soft” collateral constraint, nests “hard” constraint ($\omega' \rightarrow \infty$ at max. LTV)

UK rate schedule

[Bernanke et al '95; Kiyotaki & Moore '97; Iacoviello '05; Auclert '19]

Defining the Household Debt Channel

Household debt channel of interest rates on consumption:

$$\Delta c_0 \approx \overbrace{\text{MPC} \left(\frac{\partial \text{cash on hand}_0}{\partial r} \right)}^{\text{household debt channel}} (r_0 - r_{-n}) + \underbrace{\mathcal{Y} \Delta y}_{\text{income}} + \underbrace{\mathcal{A} \Delta r^a}_{\text{liquid asset}}$$

$$\frac{\partial \text{cash on hand}_0}{\partial r} = \frac{\partial \text{borrowing}_0}{\partial r} - \frac{\partial \text{debt service}_0}{\partial r} \quad \text{MPC out of cash on hand}$$

- Cf. HANK: household debt channel vs. indirect effect of income [Kaplan et al '18; Auclert '19]
- Previous: debt service / “cashflow effects”. But: borrowing also important
- Role of asset prices— $\partial \text{borrowing} / \partial r$ depends on:
 - Intertemporal substitution
 - Wealth effects (change in future payments)
 - Response of house prices to rates ($p'(r)$)

Main Regression Specification—Estimating Household Debt Channel (1/2)

Now: estimate household debt channel with natural experiment

Later: importance of borrowing + asset prices

Main Regression Specification—Estimating Household Debt Channel (1/2)

Consumption response

$$\Delta c_{it} = \left(\frac{\partial \text{cash on hand}}{\partial r} \right) (r_t - r_{t-N_i}) + \mathcal{Y} \Delta y_{it} + \mathcal{A} \Delta r_{it}^a$$

Main Regression Specification—Estimating Household Debt Channel (1/2)

Consumption response as a regression

$$\Delta c_{it} = \text{MPC} \left(\frac{\partial \text{cash on hand}}{\partial r} \right) (r_t - r_{t-N_i}) + \alpha_t + \varepsilon_{it}$$

- α_t = time fixed effect, ε_{it} = idiosyncratic income [+ other GE shocks]

Main Regression Specification—Estimating Household Debt Channel (1/2)

Consumption response as a regression

$$\Delta c_{it} = \text{MPC} \left(\frac{\partial \text{cash on hand}}{\partial r} \right) (r_t - r_{t-N_i}) + \alpha_t + \varepsilon_{it}$$

- α_t = time fixed effect, ε_{it} = idiosyncratic income [+ other GE shocks]

Identification assumption: (Δ interest rate over past deal) $\perp$ (future idiosyncratic income)

- Natural experiment “differences out” general equilibrium movements in income

Main Regression Specification—Estimating Household Debt Channel (1/2)

Consumption response as a regression

$$\Delta c_{it} = \text{MPC} \left(\frac{\partial \text{cash on hand}}{\partial r} \right) (r_t - r_{t-N_i}) + \alpha_t + \varepsilon_{it}$$

- α_t = time fixed effect, ε_{it} = idiosyncratic income [+ other GE shocks]

Identification assumption: (Δ interest rate over past deal) $\perp$ (future idiosyncratic income)

- Natural experiment “differences out” general equilibrium movements in income

Comparison to US: regression always biased because refinancing is endogenous

Regression Specification—Estimating Direct Effect (2/2)

Main specification for household i and month t

$$\sum_{j=-6}^h [Y_{i,t+j} - Y_{i,t_0}] = \alpha_t^h + \beta^h (r_t - r_{t-N_i}) + \text{fixed effects}_{it}^h + \varepsilon_{ith}$$

Key outcomes Y_{it} :

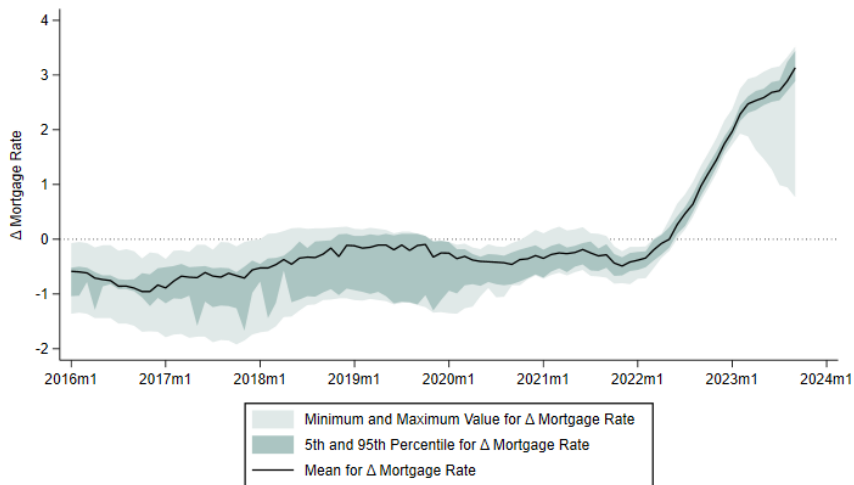
- **Cash-on-hand** + split between debt service and borrowing
 - **Consumption expenditure** + split between durables and non-durables
- Response of **consumption** relative to **cash-on-hand** identifies MPC

Pre-period measures **anticipation effects**

Sample: households with expiring deals

≈ **3.5 million** expiries for households shocked at least twice → can add **household FEs**

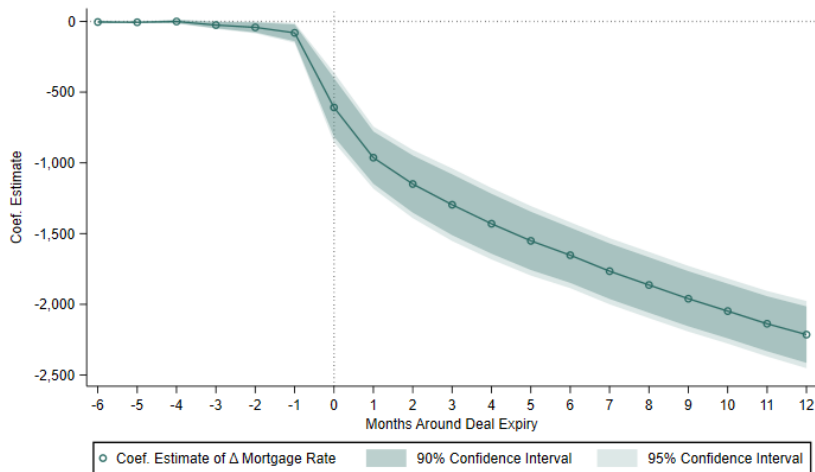
Interest Rate Variation Corresponding to Main Regression



From 6.8 million natural experiments

Estimates:
Direct Effect of Interest Rates on
Consumption

Impulse Response of Cash on Hand



- Response shown to a 100bps increase in aggregate mortgage rates over expiring deal

Impulse Response of Cash on Hand—Sources of Variation

	6-month response of cash on hand
Coefficient	-1 818*** (105)
Observations	6 796 488
Year FE	✓
Age FE	✓

Impulse Response of Cash on Hand—Sources of Variation

	6-month response of cash on hand	
Coefficient	-1 818*** (105)	-1 773*** (140)
Observations	6 796 488	6 796 488
Year FE	✓	
Age FE	✓	✓
Deal length × year FE		✓

Sources of variation:

- Deal length × year FE: deals same length, expiring different times within year Histogram

Impulse Response of Cash on Hand—Sources of Variation

	6-month response of cash on hand		
Coefficient	-1 818*** (105)	-1 773*** (140)	-2 273*** (214)
Observations	6 796 488	6 796 488	3 681 291
Year FE	✓		✓
Age FE	✓	✓	
Deal length × year FE		✓	
Household FE			✓

Sources of variation:

- Deal length × year FE: deals same length, expiring different times within year Histogram
- Household FE: same household experiencing rate changes at different points in time

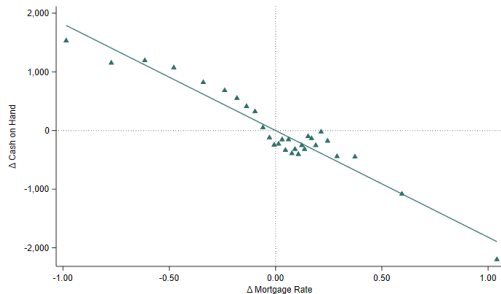
Impulse Response of Cash on Hand—Sources of Variation

	6-month response of cash on hand			
Coefficient	-1 818*** (105)	-1 773*** (140)	-2 273*** (214)	-1 817*** (115)
Observations	6 796 488	6 796 488	3 681 291	6 796 488
Year FE	✓		✓	
Age FE	✓	✓		✓
Deal length $\times$ year FE		✓		
Household FE			✓	
Month FE				✓

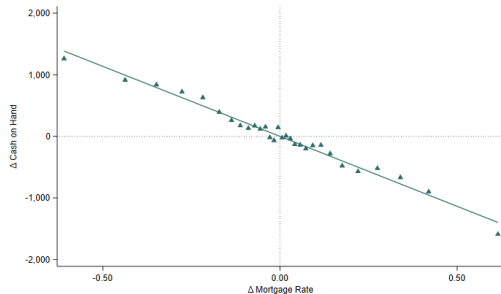
Sources of variation:

- Deal length $\times$ year FE: deals same length, expiring different times within year Histogram
- Household FE: same household experiencing rate changes at different points in time
- Month FE: deals of different length expiring in same month

Binscatter for Cash on Hand



Without Household Fixed Effects



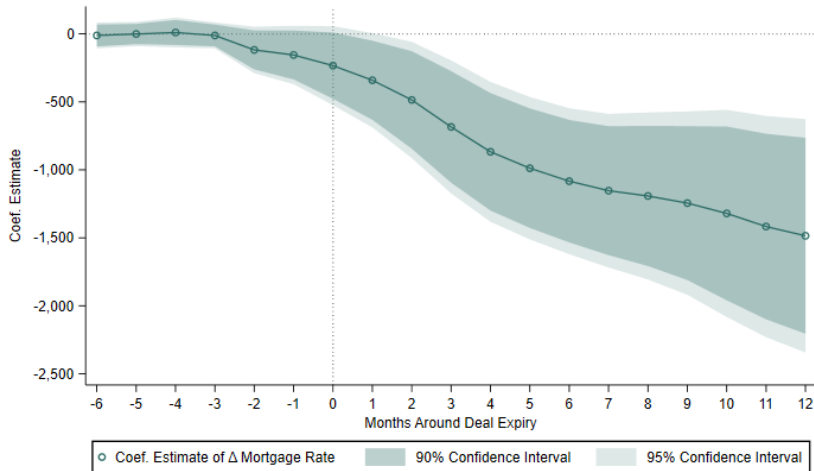
With Household Fixed Effects

Dropping Pandemic

Different Rates Measures

Asymmetry

Impulse Response of Consumption



After 12 months cumulative consumption falls 5%

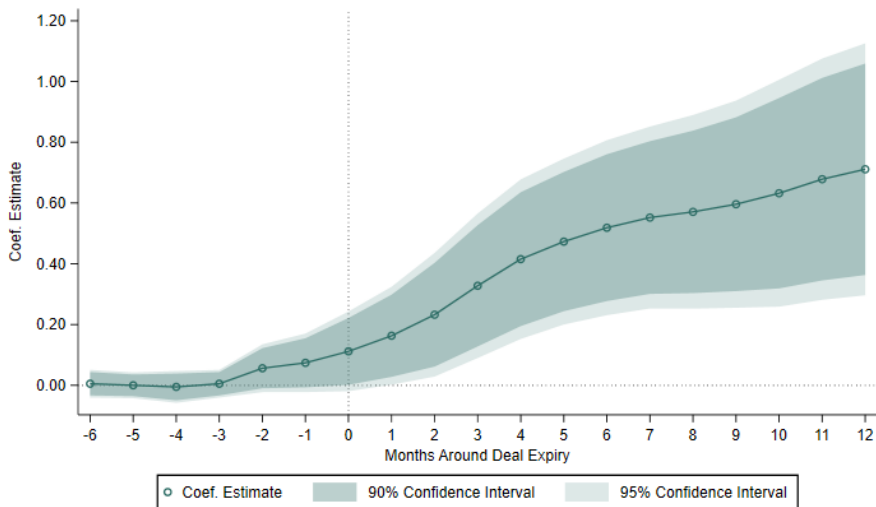
Table

Scatters

Consumption Flows

Components

Marginal Propensity to Consume out of Cash on Hand



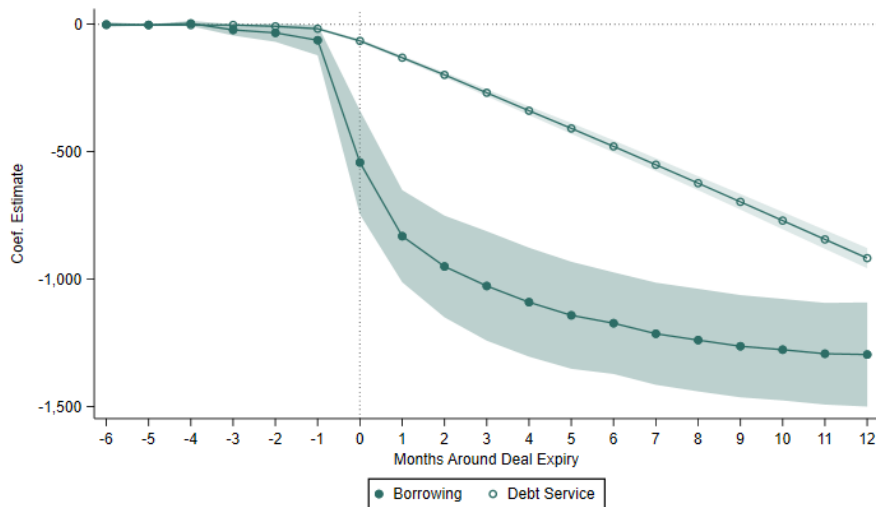
Response to a **persistent** change in mortgage rates

Additional Results

1. Mortgage rates instrumented by high frequency monetary policy shocks Monetary Policy IV
2. Responses in mortgage and consumption sample similar Mortgage vs. consumption sample
3. Labour income **increases** in response to increase in mortgage rates Labour Response
4. Little response of home moving to mortgage rates around deal expiry Movers
5. **Long and variable lags** in aggregated response due to staggered & variable deal expiry Aggregated

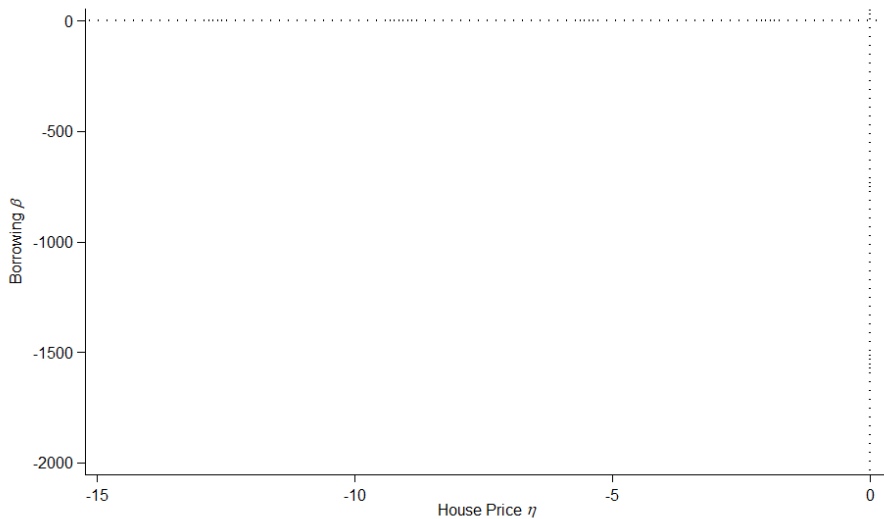
Borrowing and the Role of Asset Prices

Impulse Response of Borrowing vs. Debt Service

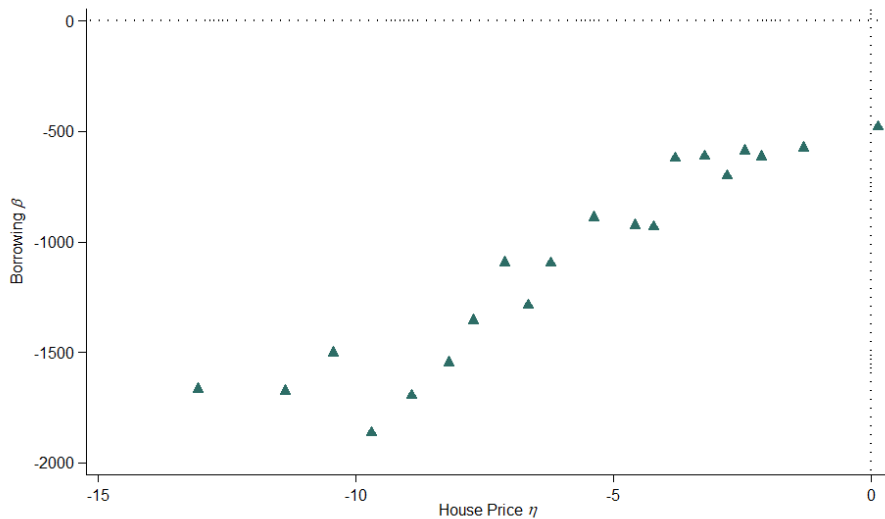


NB: extension of mortgage term included as part of changing debt service [Table](#)

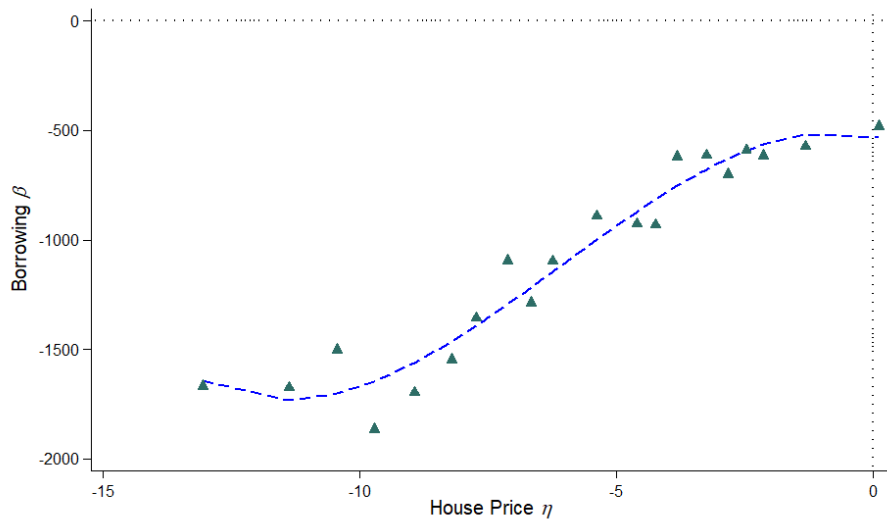
Asset Prices and Response of Borrowing to Rates



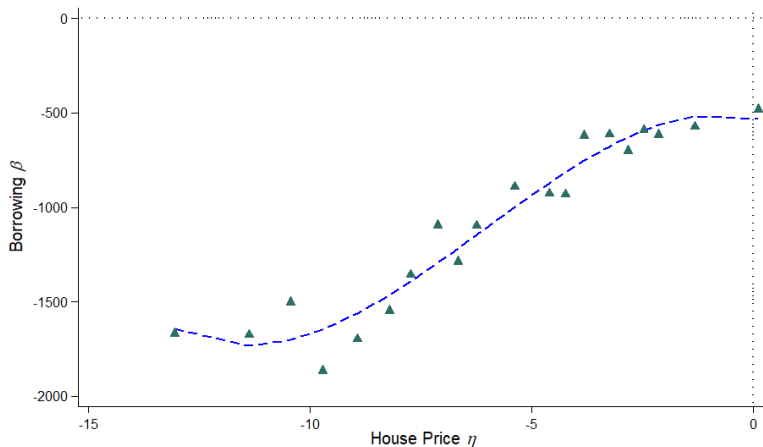
Asset Prices and Response of Borrowing to Rates



Asset Prices and Response of Borrowing to Rates



Asset Prices and Response of Borrowing to Rates



House price channel accounts for $\approx 50\%$ of borrowing response

Instruments for House Price Response

Two instruments for response of house prices to interest rates:

- **Across regions:** land supply elasticity [Guren et al '21]
- **Within regions:** duration of housing stock [Giglio et al '15; Hazell et al '25]

Asset Prices: OLS and Land Supply Instrument

	Δ Cash on Hand		Δ Principal
	(1)	(2)	IV: Land Supply
Δ Mortgage Rate $\times \mathbb{I}(\text{Bottom } 10\% \eta)$	-2798.6*** (250.4)	-3539.1*** (346.3)	
Δ Mortgage Rate $\times \mathbb{I}(\text{Middle } 80\% \eta)$	-1797.6*** (123.0)	-2245.7*** (210.0)	
Δ Mortgage Rate $\times \mathbb{I}(\text{Top } 10\% \eta)$	-983.3*** (90.8)	-1013.6*** (138.9)	
Observations	6 796 433	3 681 274	
Adjusted R^2	0.018	0.079	
Deal Length $\times$ Year $\times$ LAD FE	✓		
Age FE	✓		
Year $\times$ LAD FE		✓	
Household FE		✓	

Asset price effect on CoH using regional variation in η

Asset Prices: OLS and Land Supply Instrument

	Δ Cash on Hand		Δ Principal	
	(1)	(2)	(3)	(4)
	IV: Land Supply			
Δ Mortgage Rate $\times \mathbb{I}(\text{Bottom } 10\% \eta)$	-2798.6*** (250.4)	-3539.1*** (346.3)	-1802.4*** (290.8)	-2617.8*** (379.2)
Δ Mortgage Rate $\times \mathbb{I}(\text{Middle } 80\% \eta)$	-1797.6*** (123.0)	-2245.7*** (210.0)	-1090.0*** (141.7)	-1550.2*** (221.9)
Δ Mortgage Rate $\times \mathbb{I}(\text{Top } 10\% \eta)$	-983.3*** (90.8)	-1013.6*** (138.9)	-498.3*** (99.6)	-498.1*** (147.4)
Observations	6 796 433	3 681 274	6 796 433	3 681 274
Adjusted R^2	0.018	0.079	0.013	0.075
Deal Length $\times$ Year $\times$ LAD FE	✓		✓	
Age FE	✓		✓	
Year $\times$ LAD FE		✓		✓
Household FE		✓		✓

Asset price effect on CoH using regional variation in η

Asset price effect on Δ Principal using regional variation in η

Asset Prices: OLS and Land Supply Instrument

	Δ Cash on Hand		Δ Principal			
	(1)	(2)	(3)	(4)	IV: Land Supply (5)	(6)
Δ Mortgage Rate $\times \mathbb{I}(\text{Bottom } 10\% \eta)$	-2798.6*** (250.4)	-3539.1*** (346.3)	-1802.4*** (290.8)	-2617.8*** (379.2)	-2053.6*** (276.4)	-2033.8** (362.9)
Δ Mortgage Rate $\times \mathbb{I}(\text{Middle } 80\% \eta)$	-1797.6*** (123.0)	-2245.7*** (210.0)	-1090.0*** (141.7)	-1550.2*** (221.9)	-1051.6*** (146.4)	-1508.0*** (221.5)
Δ Mortgage Rate $\times \mathbb{I}(\text{Top } 10\% \eta)$	-983.3*** (90.8)	-1013.6*** (138.9)	-498.3*** (99.6)	-498.1*** (147.4)	-522.7*** (85.0)	-575.0*** (168.8)
Observations	6 796 433	3 681 274	6 796 433	3 681 274	6 796 433	3 681 274
Adjusted R^2	0.018	0.079	0.013	0.075	0.013	0.075
Deal Length $\times$ Year $\times$ LAD FE	✓		✓		✓	
Age FE	✓		✓		✓	
Year $\times$ LAD FE		✓		✓		✓
Household FE		✓		✓		✓

Asset price effect on CoH using regional variation in η

Asset price effect on Δ Principal using regional variation in η

Asset price effect on Δ Principal using land supply instrument for η

Effect of Asset Prices on Consumption

	Δ Consumption			
	(1)	(2)	(3)	(4)
Δ Mortgage Rate $\times \mathbb{I}(\text{Bottom } 10\% \eta)$	-1946.229** (761.825)	-2118.370** (859.724)	-1526.866 (921.325)	-2800.440 (2317.496)
Δ Mortgage Rate $\times \mathbb{I}(\text{Middle } 80\% \eta)$	-845.887*** (295.731)	-1012.382*** (368.754)	-864.150** (349.411)	-1864.016*** (613.659)
Δ Mortgage Rate $\times \mathbb{I}(\text{Top } 10\% \eta)$	-64.910 (421.604)	-234.389 (473.896)	-399.141 (490.039)	-1056.824 (1137.919)
Observations	68541	68541	67078	16942
Adjusted R^2	0.021	0.029	0.030	0.114
Year $\times$ LAD FE	✓	✓		✓
Month FE		✓		
Deal Length $\times$ Year $\times$ LAD FE			✓	
Household FE				✓
Age FE	✓	✓	✓	

Asset Prices: Duration Instrument

	Δ Principal (1)
Δ Mortgage Rate $\times \mathbb{I}(\text{F.hold})$	-804.2*** (221.5)
Δ Home Value	
Observations	4 296 642
Adjusted R^2	0.028
F-Stat	
Start M. $\times$ Trig M. $\times$ LAD FE	✓
Month $\times \mathbb{I}(\text{F.hold})$ FE	✓
Age FE	✓

Compare response of mortgagors that own their property *leasehold* vs *freehold*

RF: Compares long/short duration HHs; start-end at the *same* time; located in the *same* area

Asset Prices: Duration Instrument

	Δ Principal (1)	Δ log house price (2)
Δ Mortgage Rate $\times \mathbb{I}(\text{F.hold})$	-804.2*** (221.5)	-3.4*** (0.5)
Δ Home Value		
Observations	4 296 642	4 270 715
Adjusted R^2	0.028	0.971
F-Stat		55.301
Start M. $\times$ Trig M. $\times$ LAD FE	✓	✓
Month $\times \mathbb{I}(\text{F.hold})$ FE	✓	✓
Age FE	✓	✓

Compare response of mortgagors that own their property *leasehold* vs *freehold*

RF: Compares long/short duration HHs; start-end at the *same* time; located in the *same* area

FS: Effect of duration on house price sensitivity to interest rate

Asset Prices: Duration Instrument

	Δ Principal (1)	Δ log house price (2)	Δ Principal (3)
Δ Mortgage Rate $\times \mathbb{I}(\text{F.hold})$	-804.2*** (221.5)	-3.4*** (0.5)	
Δ Home Value			0.039*** (0.011)
Observations	4 296 642	4 270 715	4 270 557
Adjusted R^2	0.028	0.971	
F-Stat		55.301	
Start M. $\times$ Trig M. $\times$ LAD FE	✓	✓	✓
Month $\times \mathbb{I}(\text{F.hold})$ FE	✓	✓	✓
Age FE	✓	✓	✓

Compare response of mortgagors that own their property *leasehold* vs *freehold*

RF: Compares long/short duration HHs; start-end at the *same* time; located in the *same* area

FS: Effect of duration on house price sensitivity to interest rate

Marginal propensity to borrow out of housing wealth

Asset Prices: Duration Instrument

	Δ Principal (1)	Δ log house price (2)	Δ Principal (3)
Δ Mortgage Rate $\times \mathbb{I}(\text{F.hold})$	-804.2*** (221.5)	-3.4*** (0.5)	
Δ Home Value			0.039*** (0.011)
Observations	4 296 642	4 270 715	4 270 557
Adjusted R^2	0.028	0.971	
F-Stat		55.301	
Start M. $\times$ Trig M. $\times$ LAD FE	✓	✓	✓
Month $\times \mathbb{I}(\text{F.hold})$ FE	✓	✓	✓
Age FE	✓	✓	✓

Compare response of mortgagors that own their property *leasehold* vs *freehold*

RF: Compares long/short duration HHs; start-end at the *same* time; located in the *same* area

FS: Effect of duration on house price sensitivity to interest rate

Marginal propensity to borrow out of housing wealth

Effect on consumption: standard errors blow up because of lack of power

Role of Asset Prices: Summary

Asset prices have material impact on cash on hand at refinance:

- Accounts for over 50% of borrowing response
- Accounts for around 15% of monthly payment response Payments
- Monthly payment response driven by changes in individual mortgage rates

Role of Asset Prices: Summary

Asset prices have material impact on cash on hand at refinance:

- Accounts for over 50% of borrowing response
- Accounts for around 15% of monthly payment response Payments
- Monthly payment response driven by changes in individual mortgage rates

Asset prices seem particularly relevant for borrowing response

- Borrowing response to house price changes stronger for high-LTV mortgagors MPBH
- Suggestive of hard borrowing constraints in form of Kiyotaki-Moore

Conclusion

Conclusion

This paper estimates how rate cuts affect consumption via the **household debt channel**

Exploits:

- Merged **mortgage + consumption** dataset
- **Natural experiments** from (i) mortgage deal expiry and (ii) house price sensitivity to rates

Results:

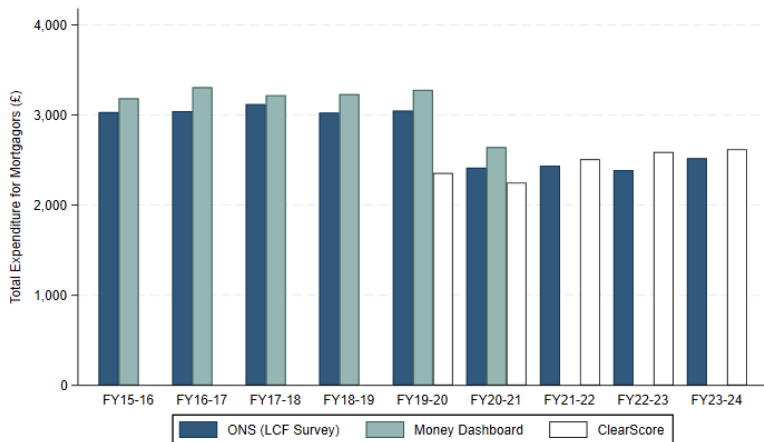
1. Household debt channel is sizeable
2. Borrowing accounts for majority of cash on hand and consumption response

Borrowing vs Payments

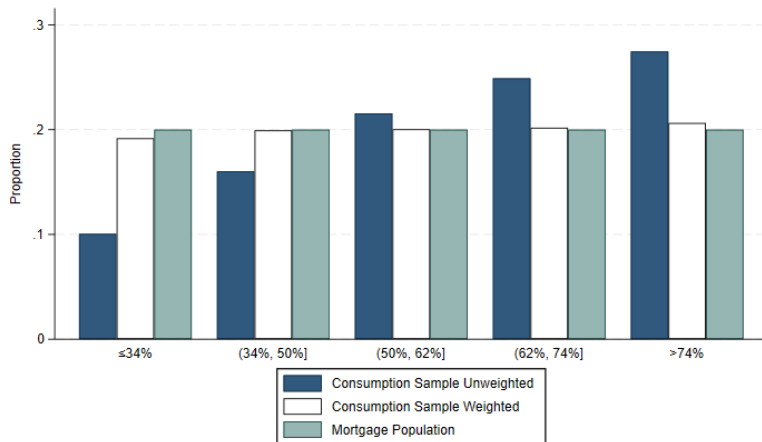
3. **Asset prices** account for large share of household debt channel on borrowing

Appendix Slides

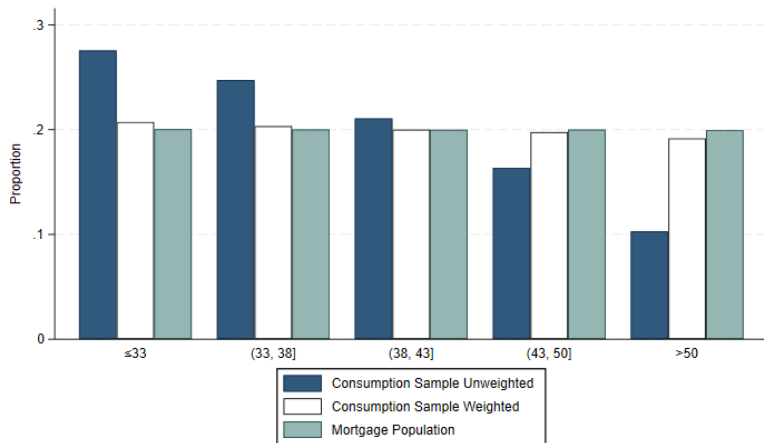
Consumption Data Validation: Overall Expenditure

[Return](#)

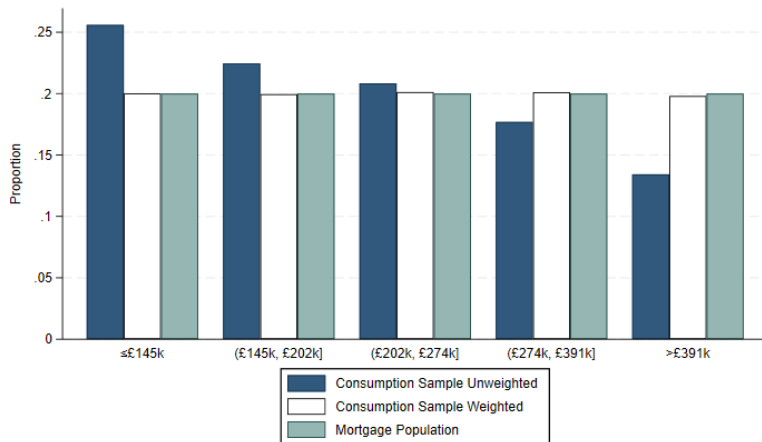
Consumption Data Validation: LTV Ratio



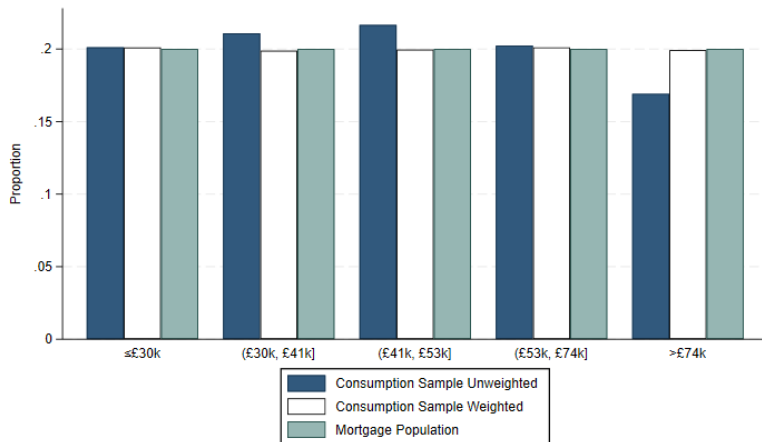
Consumption Data Validation: Household Age



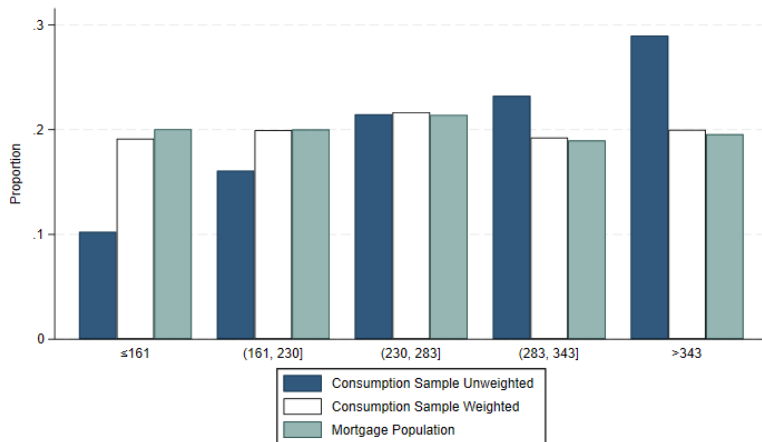
Consumption Data Validation: Home Value



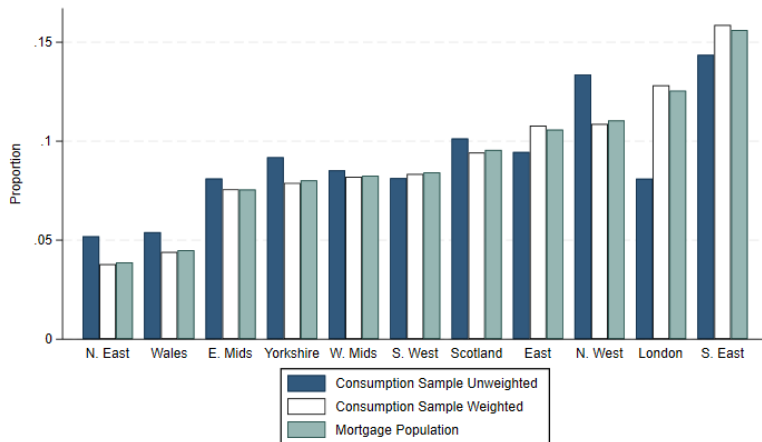
Consumption Data Validation: Income



Consumption Data Validation: Term



Consumption Data Validation: Region

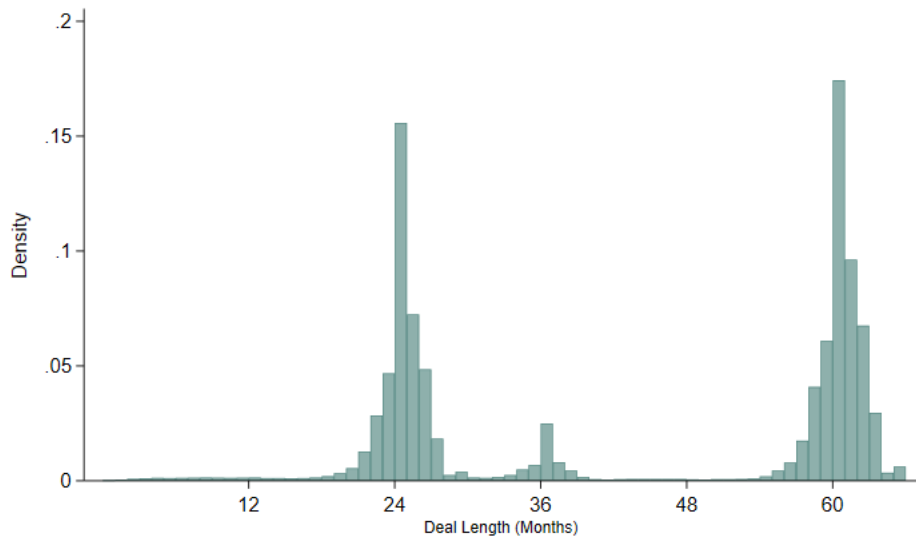


Summary Statistics for Mortgage Population and Consumption Sample

[Return](#)

	Mortgage Population		Weighted Consumption Sample		Unweighted Consumption Sample	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Mortgage Variables						
Mortgage Debt (£)	147,656.79	115,319.32	147,399.82	109,778.88	145,793.02	99,840.27
Home Value (£)	295,419.69	234,737.30	285,130.25	203,292.39	250,511.65	172,272.91
Mortgage Payment (£)	716.95	478.35	721.17	469.78	673.15	420.23
Mortgage Term (months)	252.48	99.36	256.21	97.40	286.04	90.71
Interest Rate (%)	2.34	0.82	2.32	0.81	2.40	0.84
Loan-to-Value Ratio (%)	53.80	21.20	54.51	20.87	60.64	18.74
Loan-to-Income Ratio	2.68	1.08	2.66	1.03	2.78	0.96
Income (£)	58,090.97	47,960.09	56,802.44	39,768.08	53,752.36	35,038.82
Age (Years)	41.53	9.60	41.07	9.18	38.49	8.31
London Dummy (%)	12.55	33.13	12.82	33.44	8.11	27.29
Consumption Variables						
Total Consumption (£)			2,543.39	2,553.44	2,433.75	2,378.23
Durable and Home-related (£)			131.43	401.26	126.37	377.65
Nondurables and Services excl. Home-related (£)			2,247.97	2,249.01	2,154.01	2,097.25
Observations	6,796,488	6,796,488	68,734	68,734	68,734	68,734

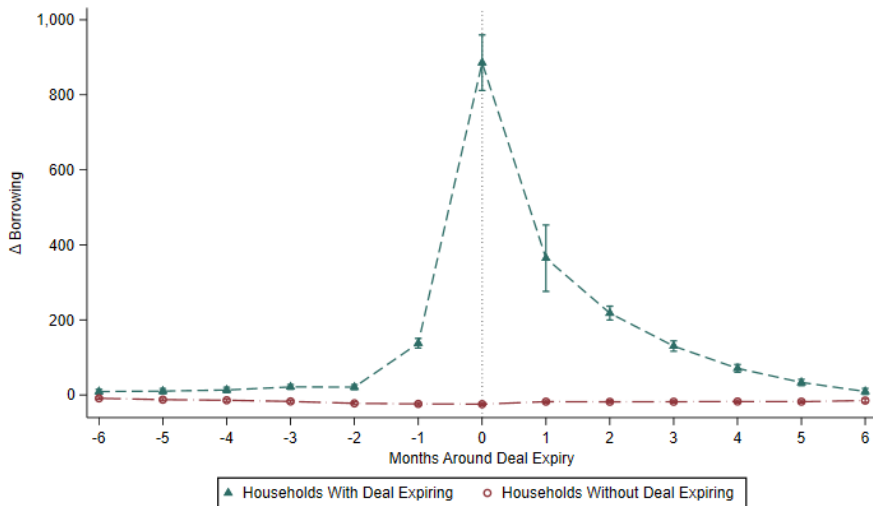
Deal Length Histogram

[Return](#)

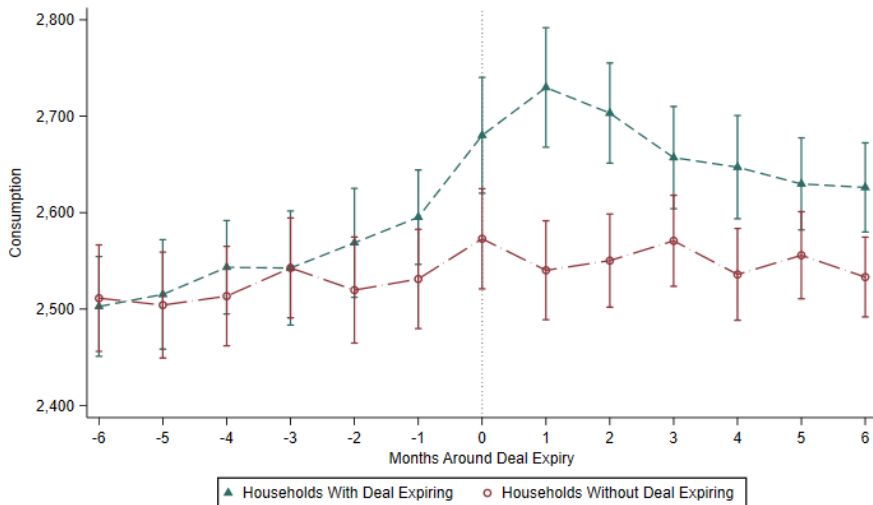
	Full Sample				Omit Pandemic (2020-2021)			
	Δ Cash on Hand	Δ Principal	$-\Delta$ Payments	Δ Consumption	Δ Cash on Hand	Δ Principal	$-\Delta$ Payments	Δ Consumption
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ Mortgage Rate	-1818.206*** (104.530)	-1100.080*** (119.383)	-718.125*** (38.187)	-937.840*** (277.453)	-1749.650*** (115.184)	-1033.995*** (131.344)	-715.655*** (40.593)	-953.621*** (290.716)
Observations	6796488	6796488	6796488	68735	4876119	4876119	4876119	39805
Adjusted R^2	0.011	0.007	0.111	0.003	0.013	0.008	0.124	0.003
Trigger Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Household Deal Expiration: Behavior of Borrowing



Household Deal Expiration: Behavior of Consumption



	Δ Cash on Hand				
	OLS		IV: Agg. Rate Change	IV: Init. Deal Rate Change	IV: Init. LTV Rate Change
	(1)	(2)	(3)	(4)	(5)
Δ Mortgage Rate	-1818.206*** (104.530)				
Δ Individual Mortgage Rate		-1825.962*** (58.729)	-1664.483*** (94.195)	-1645.488*** (92.655)	-1494.208*** (101.511)
Observations	6796488	6796488	6796488	6796488	6740237
Adjusted R^2	0.011	0.020	0.010	0.010	0.009
K-Papp F-Stat			444.975	238.655	280.483
Trigger Year FE	No	Yes	Yes	No	Yes
Age FE	No	No	Yes	Yes	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

	Δ Cash on Hand	Δ Principal	$-\Delta$ Payments	Δ Consumption
	(1)	(2)	(3)	(4)
Δ Mortgage Rate $\times \mathbb{I}(\text{Pre 2022})$	-1777.7*** (126.4)	-1163.2*** (129.4)	-614.6*** (27.6)	-1186.0** (497.4)
Δ Mortgage Rate $\times \mathbb{I}(\text{2022-})$	-1837.7*** (138.6)	-1069.6*** (169.8)	-768.1*** (60.2)	-876.2*** (330.2)
Observations	6796488	6796488	6796488	68734
Adjusted R^2	0.011	0.007	0.111	0.003
Year FE	✓	✓	✓	✓
Age FE	✓	✓	✓	✓

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Response of Cash on Hand in Consumption Sample

[Return](#)

	Δ Cash on Hand						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ Mortgage Rate	-1316.663*** (101.644)	-1885.352*** (247.679)	-1918.610*** (252.544)	-1625.445*** (259.722)	-1574.126*** (257.744)	-1981.385*** (246.974)	-1580.123** (770.878)
Observations	68735	68735	68735	68735	68735	68734	17614
Adjusted R^2	0.005	0.006	0.009	0.009	0.010	0.019	0.112
Trigger Year FE	No	Yes	Yes	Yes	No	Yes	Yes
Age FE	No	No	Yes	Yes	Yes	Yes	No
Deal Length FE	No	No	No	Yes	No	No	No
Deal Length $\times$ Year FE	No	No	No	No	Yes	No	No
Household Controls	No	No	No	No	No	Yes	No
Household FE	No	No	No	No	No	No	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Consumption Impulse Response at 6 Months

[Return](#)

	Δ Consumption						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ Mortgage Rate	-275.546* (154.020)	-914.035*** (278.201)	-937.840*** (277.453)	-914.482*** (300.098)	-834.833** (320.430)	-899.112*** (281.981)	-1814.119*** (584.802)
Observations	68735	68735	68735	68735	68735	68734	17614
Adjusted R^2	0.000	0.002	0.003	0.003	0.003	0.007	0.040
Trigger Year FE	No	Yes	Yes	Yes	No	Yes	Yes
Age FE	No	No	Yes	Yes	Yes	Yes	No
Deal Length FE	No	No	No	Yes	No	No	No
Deal Length x Year FE	No	No	No	No	Yes	No	No
Household Controls	No	No	No	No	No	Yes	No
Household FE	No	No	No	No	No	No	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

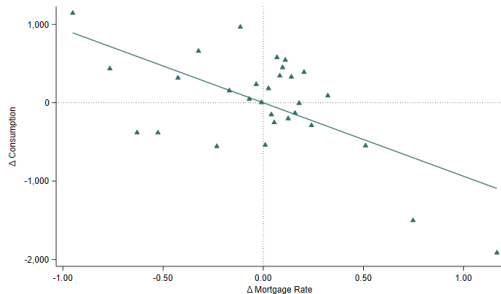
Response of Borrowing vs. Debt Service at 6 Months

[Return](#)

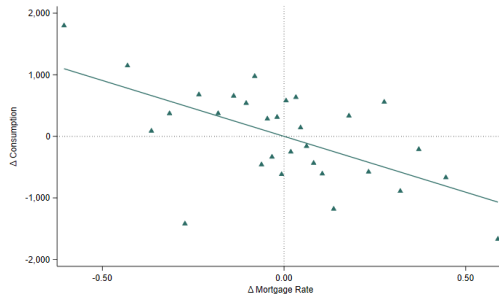
	Δ Cash on Hand	Δ Principal	$-\Delta$ Payments	Δ Cash on Hand	Δ Principal	$-\Delta$ Payments
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Mortgage Rate	-1818.206*** (104.530)	-1100.080*** (119.383)	-718.125*** (38.187)	-2272.775*** (213.965)	-1566.959*** (227.213)	-705.816*** (45.409)
Observations	6796488	6796488	6796488	3681291	3681291	3681291
Adjusted R^2	0.011	0.007	0.111	0.073	0.071	0.068
Trigger Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	No	No	No
Household FE	No	No	No	Yes	Yes	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Binscatter for Consumption

[Return](#)

Without Household Fixed Effects



With Household Fixed Effects

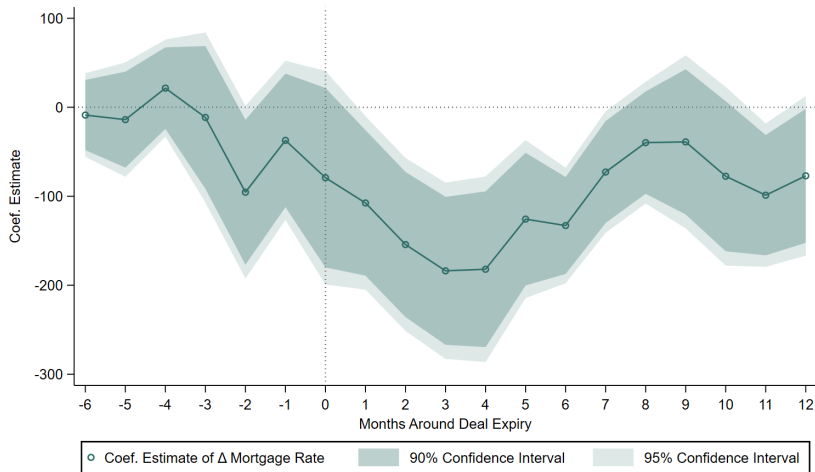
Effect of interest rate shocks on labor supply

[Return](#)

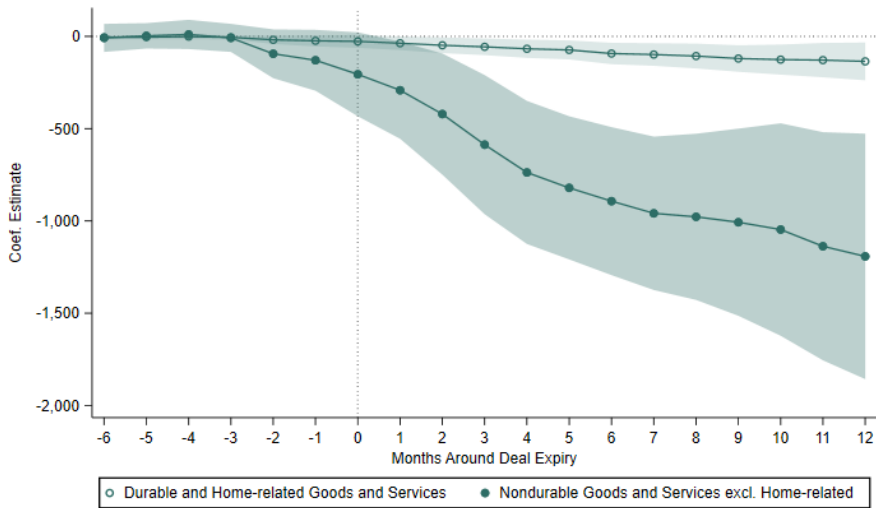
An increase in interest rates **raises** labor supply, as measured by household's "wages and salary"

Important for both theory and practice

Impulse Response of Consumption Flows

[Return](#)

Impulse Response of Consumption Components

[Return](#)

Effect of monetary policy on c-o-h and consumption: HF identification

[Return](#)

	First Stage (1)	Δ Cash on Hand		First Stage	Δ Consumption	
		OLS	IV		OLS	IV
Σ HF Monetary Policy Shocks	1.3*** (0.1)					
Δ Mortgage Rate						
Observations	6 748 651					
Adjusted R^2	0.992					
First-Stage F-Stat	189.108					
Coarse Deal Length $\times$ Month FE	✓					
Age FE	✓					

First stage: How high frequency MP shocks impact Δ Mortgage Rate

Effect of monetary policy on c-o-h and consumption: HF identification

[Return](#)

	Δ Cash on Hand			Δ Consumption		
	First Stage (1)	OLS (2)	IV	First Stage	OLS	IV
Σ HF Monetary Policy Shocks	1.3*** (0.1)					
Δ Mortgage Rate		-1659.5*** (171.0)				
Observations	6 748 651	6 748 651				
Adjusted R^2	0.992	0.012				
First-Stage F-Stat	189.108					
Coarse Deal Length $\times$ Month FE	✓	✓				
Age FE	✓	✓				

First stage: How high frequency MP shocks impact Δ Mortgage Rate

OLS natural experiment effect of Δ Mortgage Rate on CoH

Effect of monetary policy on c-o-h and consumption: HF identification

[Return](#)

	Δ Cash on Hand			Δ Consumption		
	First Stage (1)	OLS (2)	IV (3)	First Stage	OLS	IV
Σ HF Monetary Policy Shocks	1.3*** (0.1)					
Δ Mortgage Rate		-1659.5*** (171.0)	-2073.9*** (310.9)			
Observations	6 748 651	6 748 651	6 748 651			
Adjusted R^2	0.992	0.012				
First-Stage F-Stat	189.108					
Coarse Deal Length $\times$ Month FE	✓	✓	✓			
Age FE	✓	✓	✓			

First stage: How high frequency MP shocks impact Δ Mortgage Rate

OLS natural experiment effect of Δ Mortgage Rate on CoH

IV monetary policy effect on CoH

Effect of monetary policy on c-o-h and consumption: HF identification

[Return](#)

	Δ Cash on Hand			Δ Consumption		
	First Stage (1)	OLS (2)	IV (3)	First Stage (4)	OLS (5)	IV (6)
Σ HF Monetary Policy Shocks	1.3*** (0.1)			1.1*** (0.1)		
Δ Mortgage Rate		-1659.5*** (171.0)	-2073.9*** (310.9)		-1711.4** (738.3)	-1339.9 (1837.5)
Observations	6 748 651	6 748 651	6 748 651	68 513	68 513	68 513
Adjusted R^2	0.992	0.012		0.993	0.011	
First-Stage F-Stat	189.108			67.984		
Coarse Deal Length $\times$ Month FE	✓	✓	✓	✓	✓	✓
Age FE	✓	✓	✓	✓	✓	✓

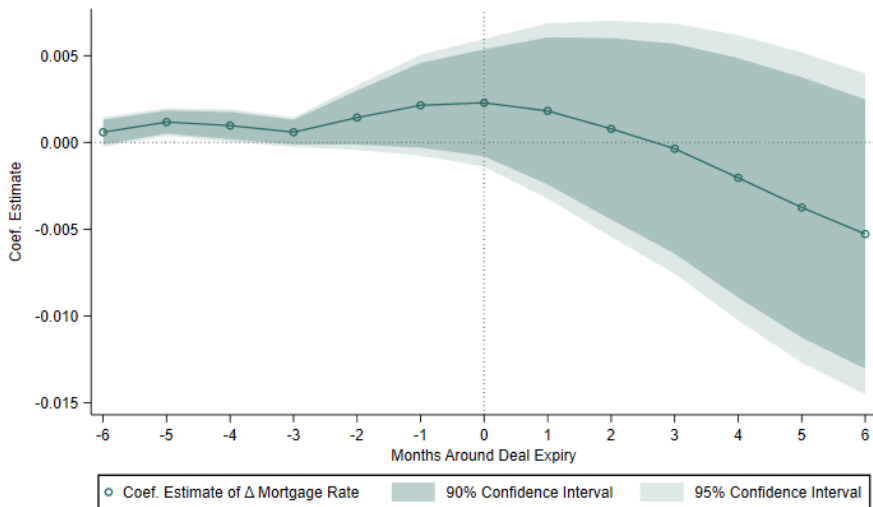
First stage: How high frequency MP shocks impact Δ Mortgage Rate

OLS natural experiment effect of Δ Mortgage Rate on CoH

IV monetary policy effect on CoH

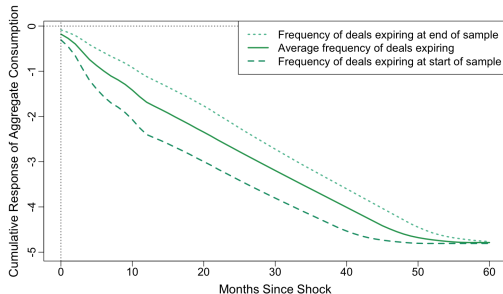
Results for consumption

Impulse Response of Home Selling

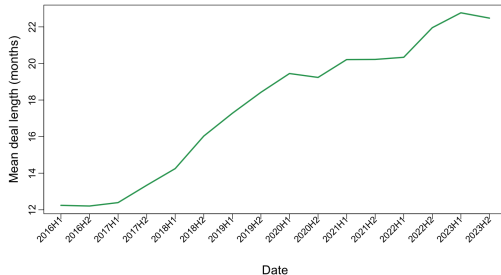
[Return](#)

Aggregated Consumption Effects: Long and Variable Lags

(a) Impulse Response, Varying Lags



(b) Average Deal Length

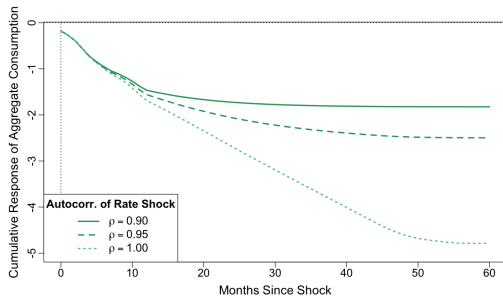


Aggregating P.E. estimates:

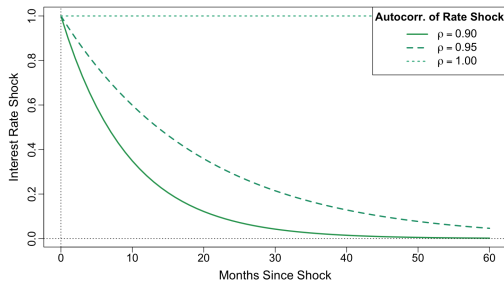
- Consumption share of mortgagors: 39%
- Consumption share of GDP: 59%
- $\Rightarrow$ Consumption response $\approx 0.35\%$ of GDP after 12 months

Aggregated Consumption Effects: Shock Persistence

(a) IRF, Varying Shock Persistence



(b) Persistence of Rate Hike



- Consumption response larger with more persistent shocks [Back](#)

Effect of Mortgage Rates on Mortgage Term

[Return](#)

	Δ Mortgage Term			
	(1)	(2)	(3)	(4)
Δ Mortgage Rate	2.15*** (0.21)	1.64*** (0.28)	1.80*** (0.29)	3.07*** (0.17)
Observations	6 793 674	6 793 674	3 680 041	6 793 674
Adjusted R^2	0.01	0.01	-0.01	0.01
Year FE	✓		✓	
Deal Length $\times$ Year FE		✓		
Household FE			✓	
Month FE				✓
Age FE	✓	✓		✓

Effect of Mortgage Rates on Mortgage Term

[Return](#)

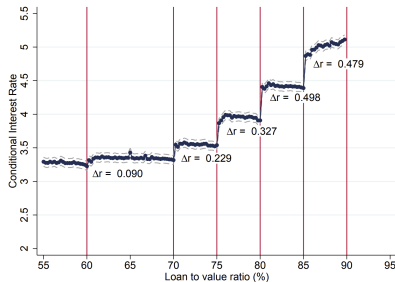
	Δ Mortgage Term			
	(1)	(2)	(3)	(4)
Δ Mortgage Rate	2.15*** (0.21)	1.64*** (0.28)	1.80*** (0.29)	3.07*** (0.17)
Observations	6 793 674	6 793 674	3 680 041	6 793 674
Adjusted R^2	0.01	0.01	-0.01	0.01
Year FE	✓		✓	
Deal Length $\times$ Year FE		✓		
Household FE			✓	
Month FE				✓
Age FE	✓	✓		✓

Households adjust term to compensate for interest rate change.

A 1pp increase in Mortgage Rate leads to about a two month increase in mortgage term.

- The spread charged by a bank is a function of a household's LTV ratio: Best et al (2020)

FIGURE 3: INTEREST RATE JUMPS AT NOTCHES



$$\text{Let } \beta^{\text{Ind}} \equiv \frac{\partial \ln d}{\partial r}$$

$$\text{Then } \frac{d \ln(\text{LTV})}{dr} = (\beta^{\text{Ind}} - \eta)$$

Effect of Financial Accelerator on Individual Rates

[Return](#)

	$\Delta \log$ Individual Mortgage Rate			
	(1)	(2)	(3)	(4)
$\Delta \text{Mort. Rate} \times \mathbb{I}(\text{Bottom } 10\% \eta)$	39.19*** (2.90)	35.10*** (4.59)	39.51*** (2.77)	41.49*** (2.84)
$\Delta \text{Mort. Rate} \times \mathbb{I}(\text{Middle } 80\% \eta)$	37.91*** (2.94)	33.89*** (4.59)	38.69*** (2.81)	40.78*** (2.71)
$\Delta \text{Mort. Rate} \times \mathbb{I}(\text{Top } 10\% \eta)$	35.41*** (3.21)	31.58*** (4.62)	36.90*** (3.06)	39.95*** (3.16)
Observations	6 795 567	6 795 567	6 795 562	3 680 597
Adjusted R^2	0.563	0.573	0.569	0.590
Year $\times$ LAD FE	✓	✓		✓
Deal Length $\times$ Year $\times$ LAD FE			✓	
Household FE				✓
Month FE		✓		
Age FE	✓	✓	✓	
Start Year	✓	✓	✓	✓

Spreads increase more in response to an interest rate rise for households facing stronger FA

Effect of Financial Accelerator on Monthly Payments

	-ΔLog Payments			
	(1)	(2)	(3)	(4)
ΔMortgage Rate × $\mathbb{I}(\text{Bottom } 10\% \eta)$	-13.070*** (0.889)	-13.411*** (0.434)	-12.323*** (1.094)	-13.056*** (1.019)
ΔMortgage Rate × $\mathbb{I}(\text{Middle } 80\% \eta)$	-12.441*** (0.800)	-12.796*** (0.427)	-11.918*** (1.020)	-12.500*** (0.907)
ΔMortgage Rate × $\mathbb{I}(\text{Top } 10\% \eta)$	-10.636*** (0.580)	-11.070*** (0.450)	-10.566*** (0.770)	-11.196*** (0.781)
Observations	6756388	6756388	6756382	3649175
Adjusted R^2	0.167	0.173	0.171	0.102
Year × LAD FE	✓	✓		✓
Month FE		✓		
Deal Length × Year × LAD FE			✓	
Household FE				✓
Age FE	✓	✓	✓	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Monthly payments more responsive with stronger FA: similar magnitude to spreads

Marginal Propensity to Borrow and Consume out of Housing Wealth

	All	<i>LTV</i> ≤ 70%	<i>LTV</i> > 70%	Low Income	High Income	≤35 Years	> 35 Years	≤35 Years	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	<i>LTV</i> ≤ 70%	<i>LTV</i> > 70%
								(8)	(9)
<i>Panel (a): Δ Principal</i>									
ΔHome Value	0.042*** (0.013)	0.039*** (0.014)	0.075*** (0.023)	0.018** (0.008)	0.051*** (0.016)	0.057*** (0.017)	0.040*** (0.013)	0.044** (0.018)	0.066*** (0.023)
Observations	6740340	4953735	1786405	3307122	3306675	1951329	4789011	981333	969945
Adjusted <i>R</i> ²	0.000	0.000	0.002	-0.000	-0.001	0.001	0.000	-0.002	0.002
K-Paap F Stat.	21.61	22.14	39.95	19.46	18.47	24.71	21.32	25.85	45.31
<i>Panel (b): Δ Consumption</i>									
ΔHome Value	0.044 (0.027)	0.031 (0.028)	0.174 (0.139)	0.028 (0.040)	0.039 (0.040)	0.101** (0.050)	0.024 (0.032)	0.061 (0.053)	0.343*** (0.125)
Observations	68541	43841	24308	36606	31554	26292	41894	12356	13361
Adjusted <i>R</i> ²	-0.037	-0.054	-0.108	-0.059	-0.076	-0.099	-0.055	-0.170	-0.231
K-Paap F Stat.	17.56	17.01	24.09	18.13	14.73	19.53	15.68	16.62	27.59
Year x LAD FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Age FE	✓	✓	✓	✓	✓	✓	✓	✓	✓

p* < 0.10, *p* < 0.05, ****p* < 0.01.

- MPBH and MPCH ≈ 0.04
- MPBH and MPCH greatest for mortgagors with high *LTV* ratios

Back

Active vs Passive: MPC out of Active Cash on Hand

	Δ Active CoH	Δ Passive CoH	Δ Consumption	
	(1)	(2)	(3)	(4)
Δ Mortgage Rate	-1259.1*** (238.0)	-658.9*** (18.6)		
Δ Cash on Hand			0.454*** (0.133)	
Δ Active Cash on Hand				0.679** (0.280)
Δ Passive Cash on Hand				0.102 (0.518)
Observations	68 539	68 539	68 539	68 539
K-Paap F Stat.			65.79	14.18
Year $\times$ LAD FE	✓	✓	✓	✓
Age FE	✓	✓	✓	✓

Active cash on hand ($\approx$ borrowing) drives at least two-thirds of consumption response

[Back](#)