

Mortgages Around the World: Observations and Lessons for Policy

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The Importance of Mortgages

- Mortgages are the largest household liability in most developed countries.
- Mortgage rates are the main direct channel through which monetary policy affects household consumption.
- Mortgage rates also have a strong impact on the construction industry.
- Problems with mortgage lending were at the heart of the Swedish financial crisis in 1990-94 and the global financial crisis in 2008-09, and affected US regional banks this spring.

TABLE 2—INTERNATIONAL COMPARISON OF THE ALLOCATION OF HOUSEHOLD WEALTH

| | USA | Canada | France | Germany | Italy | Netherlands | Spain | UK |
|--|-------|--------|--------|---------|-------|-------------|-------|-------|
| Retirement assets and life insurance | 13.3 | 24.1 | 6.1 | 10.5 | 1.5 | 16.8 | 1.4 | 25.1 |
| Deposits and transaction accounts | 11.6 | 9.9 | 22.0 | 30.0 | 11.9 | 21.3 | 10.5 | 5.9 |
| Other financial assets | 2.1 | 1.2 | 1.0 | 3.5 | 0.3 | 0.8 | 0.7 | 0.8 |
| Mutual funds | 1.3 | 1.3 | 0.7 | 2.4 | 0.6 | 1.6 | 0.4 | 0.3 |
| Directly held stocks | 1.3 | 1.0 | 1.0 | 0.9 | 0.2 | 0.6 | 0.5 | 0.6 |
| Bonds | 0.5 | 0.2 | 0.1 | 0.6 | 1.6 | 0.6 | 0.1 | 1.1 |
| Main residence | 40.6 | 31.9 | 38.9 | 29.9 | 53.2 | 43.3 | 61.2 | 34.6 |
| Vehicles, valuables, and other assets | 22.5 | 22.6 | 18.5 | 13.4 | 19.1 | 11.1 | 8.6 | 28.7 |
| Private businesses | 3.5 | 2.6 | 2.7 | 2.0 | 3.4 | 1.7 | 3.2 | NA |
| Other real estate | 3.2 | 5.2 | 9.1 | 6.7 | 8.2 | 2.2 | 13.3 | 2.8 |
| | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Mortgage debt for primary residence | 52.7 | 38.1 | 31.5 | 33.8 | 35.5 | 60.6 | 48.3 | 51.1 |
| Vehicle, student loans, and other debt | 31.2 | 28.2 | 44.5 | 32.7 | 50.8 | 22.5 | 35.5 | 34.2 |
| Credit card debt | 12.1 | 12.4 | NA | 2.3 | 3.0 | 1.1 | 3.4 | 9.8 |
| Other debt secured with real estate | 3.3 | 5.4 | 15.7 | 9.5 | 4.7 | 2.4 | 12.2 | 4.8 |
| Overdrafts and credit lines | 0.7 | 15.9 | 8.3 | 21.7 | 6.2 | 13.4 | 0.5 | NA |
| | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Direct and indirect risky assets | 38.2 | 50.3 | 22.6 | 29.0 | 18.5 | 40.2 | 15.7 | 42.2 |
| Direct and indirect equity | 21.2 | 26.0 | 9.2 | 8.6 | 6.2 | 16.2 | 6.2 | 21.2 |

Notes: We calculate the respective share of each wealth category relative to the total asset and debt holdings of the household and report averages across the population. The top part of the table refers to financial and nonfinancial assets and the bottom part to mortgage and non-mortgage debt. Retirement assets include all types of defined contribution plans (public, occupational, or private) which have an account balance. NA denotes asset or debt categories for which holdings are not separately classified, or for which data has not been collected.

Source: Campbell (2016)

International Diversity (1)

Mortgage systems across countries are remarkably diverse.

- Length of the fixation period
 - 3 months (common in Sweden)
 - 5 years (common in Canada)
 - 30 years (common in the US and Denmark).
- Refinancing rules during the fixation period
 - Pay off face value (US)
 - Pay off market value (Germany)
 - Pay off **lesser** of face value and market value (Denmark)
 - Pay off **greater** of face value and market value (Sweden)

International Diversity (2)

Mortgage systems across countries are remarkably diverse.

- LTV and income limits at mortgage origination
 - And whether these apply to rate-lowering refinances (yes in US, no in Denmark)
- Amortization requirements after origination
 - Are interest-only (zero-amortization) loans allowed?
 - Is negative amortization ever allowed?
- What happens when you move?
 - You must pay off the mortgage (US)
 - Mortgage is assumable (common in Denmark)
 - Mortgage is portable (common in Canada and the UK)

International Diversity (3)

Mortgage systems across countries are remarkably diverse.

- Mortgage funding
 - Deposits (common in ARM countries)
 - Covered bonds (5 years in Sweden, 30 years in Denmark)
 - Mortgage-backed securities (US)
- Unique features in some countries
 - Points: pay a higher rate to borrow a little extra (US)
 - Inflation-indexed mortgages (Israel)

Outline

1. Fixation period, amortization, and monetary policy
2. Monetary tightening and the lock-in effect
3. Options: people love them but mismanage them
4. Consumer preferences over fixation period
5. Amortization and the life cycle

Fixation Period, Amortization, and Monetary Policy

The Mortgage Channel of Monetary Transmission

- The mortgage channel is not about intertemporal substitution, but about **redistribution** across agents (Auclert 2019).
- The mortgage rate affects monthly payments by borrowers but also payments received by lenders. There is an aggregate effect if borrowers change their spending more than lenders do.
 1. Borrowers are domestic residents, while some lenders are foreigners with a higher propensity to spend on foreign rather than domestic goods.
 2. Borrowers have a high marginal propensity to consume (MPC) because they are borrowing-constrained, while lenders have a low MPC because they are unconstrained permanent income consumers.
- The second argument works only if mortgage payment changes are **temporary**. If they are permanent, lenders adjust their consumption one-for-one, perfectly offsetting the effect on borrowers.

Fixation Period and the Mortgage Channel

The mortgage channel is **stronger for a short fixation period** (ARMs) than for a long fixation period (FRMs) (Di Maggio et al 2017).

1. ARM payments are linked to the short rate but FRM payments are linked to the long-term mortgage rate which typically moves less.
2. ARM payments change for all borrowers, but FRM payments change only for new borrowers and (on the downside) refinancers.
 - And refinancing may be limited by credit restrictions and borrower inertia.
3. The change in ARM payments is temporary while the change in FRM payments is long-lasting, so FRM lenders will adjust their consumption more, offsetting the effect on borrowers.

Why Do We Care?

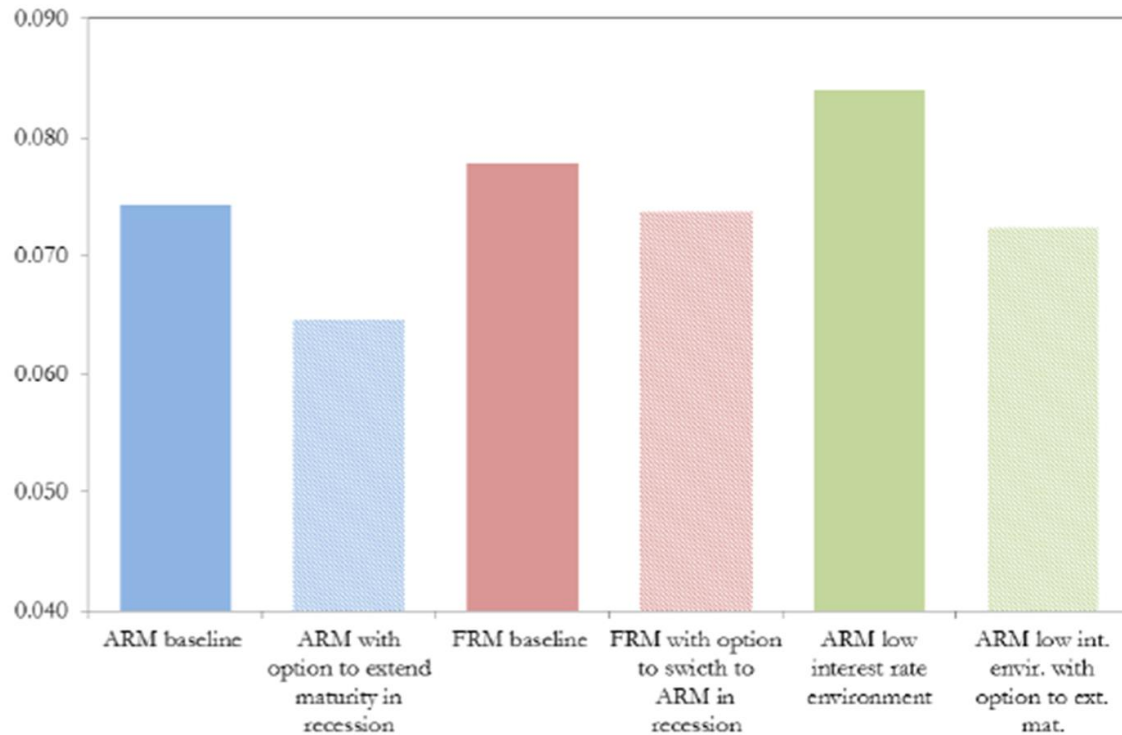
- The central bank may not care about the strength of monetary transmission if it can adjust the interest rate freely to achieve the desired effect on the economy.
- But it may care if
 1. It wants to control the relative impact of monetary policy on households (consumption) and businesses (investment). The mortgage channel primarily affects households.
 2. It is pegging the exchange rate to a foreign currency (SEK to EUR?) whose interest rates are calibrated to a different mortgage system.
 3. There are regional differences in the strength of the mortgage channel (as is the case in the US where the ARM share varies regionally).

Can We Do Better than ARMs?

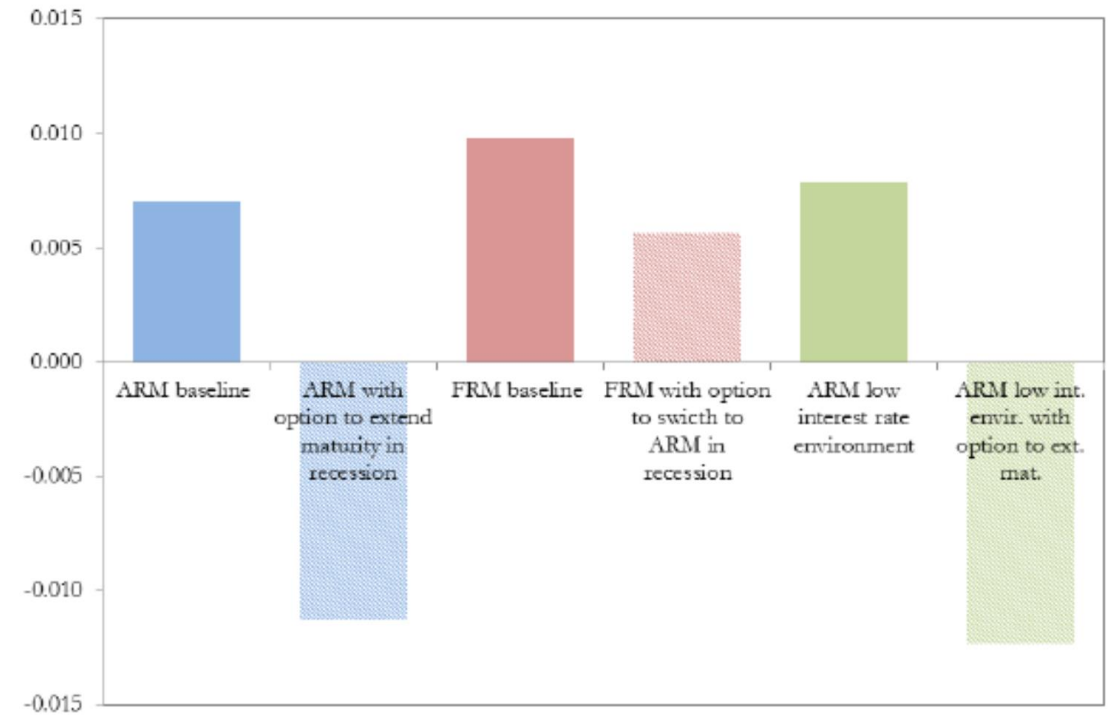
- In some circumstances the central bank may want an even stronger mortgage channel than ARMs offer.
 - For example, when the short rate is close to the zero lower bound.
- One approach is to build forbearance provisions (contingent zero or negative amortization) into mortgage contracts ex ante.
 - As opposed to the ex post approach used in the Covid-19 pandemic (An et al 2022, Cherry et al 2021).
- Campbell, Clara, and Cocco (*JF* 2021) studies the effect of allowing zero amortization in a recession using a structural model.
 - Importantly, the model looks at implications for default as well as consumption.

Cyclicality and Mortgage Structure

Cyclicality of consumption growth



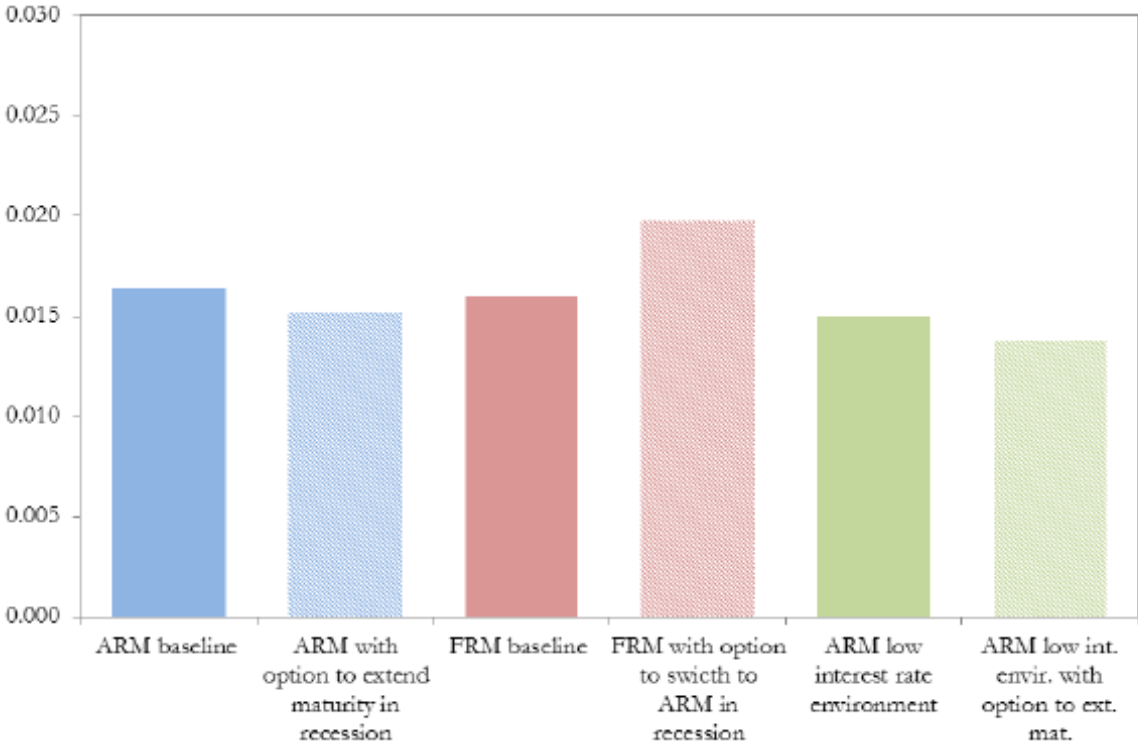
Cyclicality of default rate



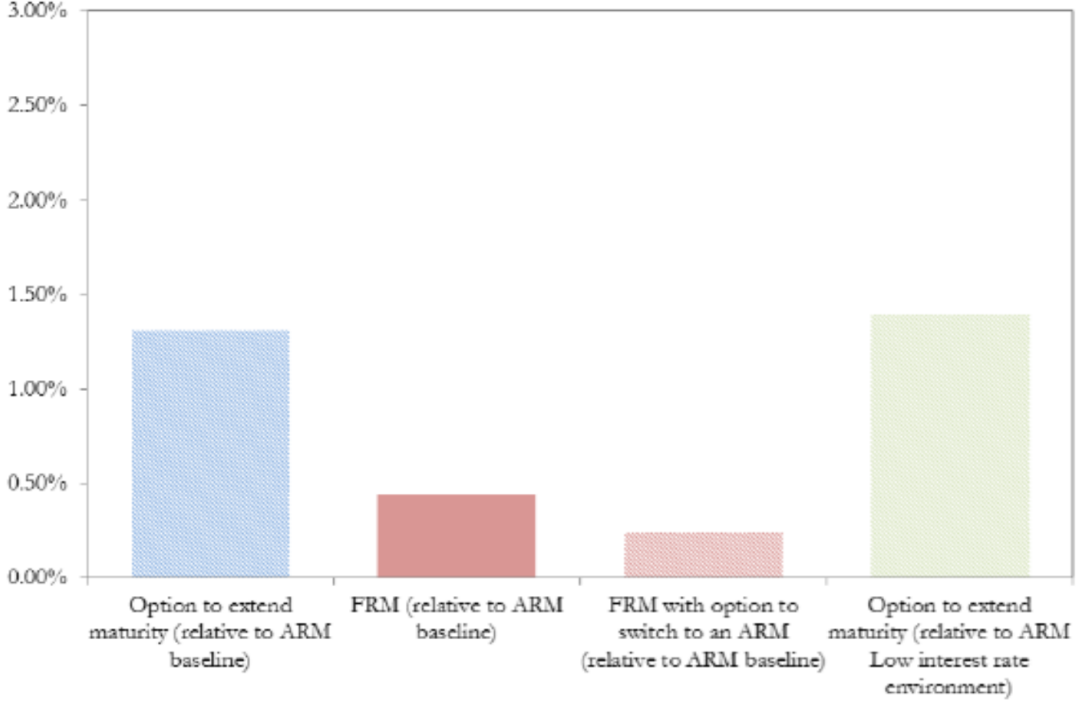
Source: Campbell, Clara, and Cocco (2021)

Cost, Welfare, and Mortgage Structure

Average loan premium



Welfare gains



Source: Campbell, Clara, and Cocco (2021)

Monetary Tightening and the Lock-In Effect

What About Monetary Tightening?

- The discussion so far has been symmetrical for easing vs tightening, but there is another mechanism by which long fixation periods may specifically weaken the effects of a monetary tightening.
- If FRM refinancing is disadvantageous when rates rise, then FRM borrowers become reluctant to move (**lock-in**).
 - This is relevant under both US and Swedish refinancing rules
 - But is more important in the US because fixation periods are much longer
- A decline in homes for sale can prop up house prices, reducing the contractionary impact of higher interest rates.

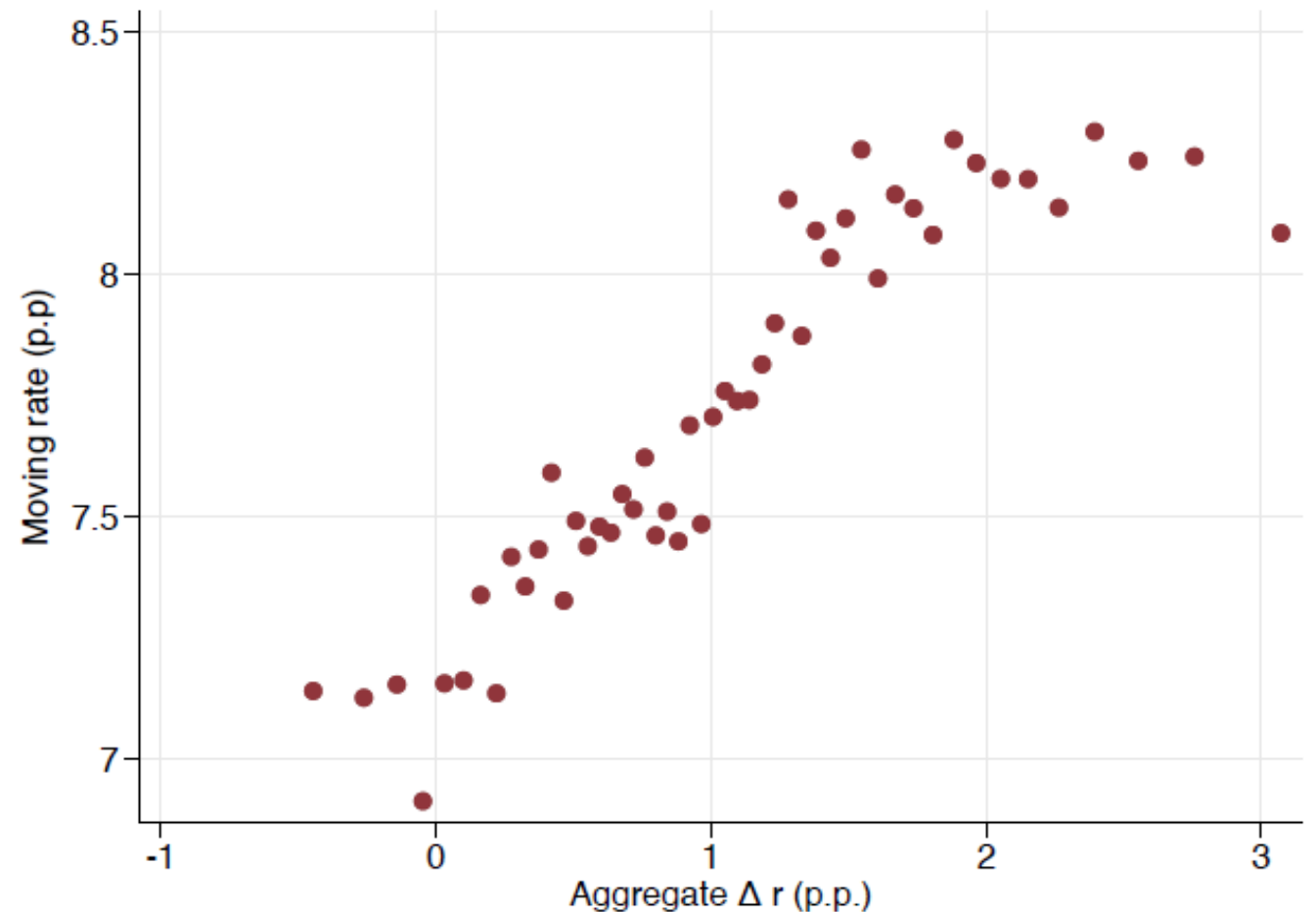
US Evidence of Lock-In

Moving rate plotted against “mortgage delta”, the difference between the household’s old mortgage rate and the currently available mortgage rate.

People to the right of 1.8% are sluggish refinancers who should have refinanced without moving. People to the left of 0% are in a rising-rate environment.

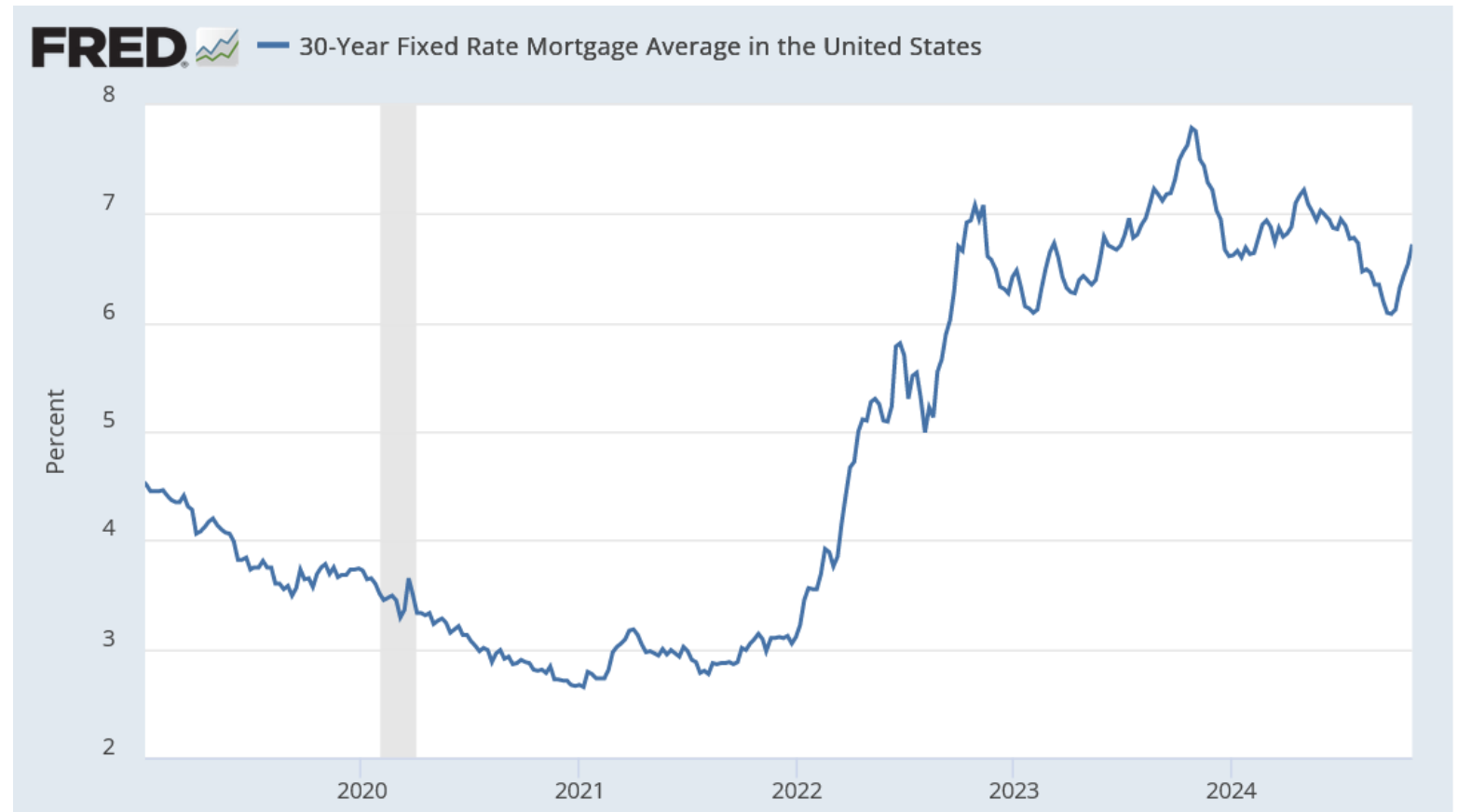
Lock-in (a positive slope) occurs not only to the left of 0%, but also between 0% and 1.8%.

Source: Fonseca and Liu (2023).



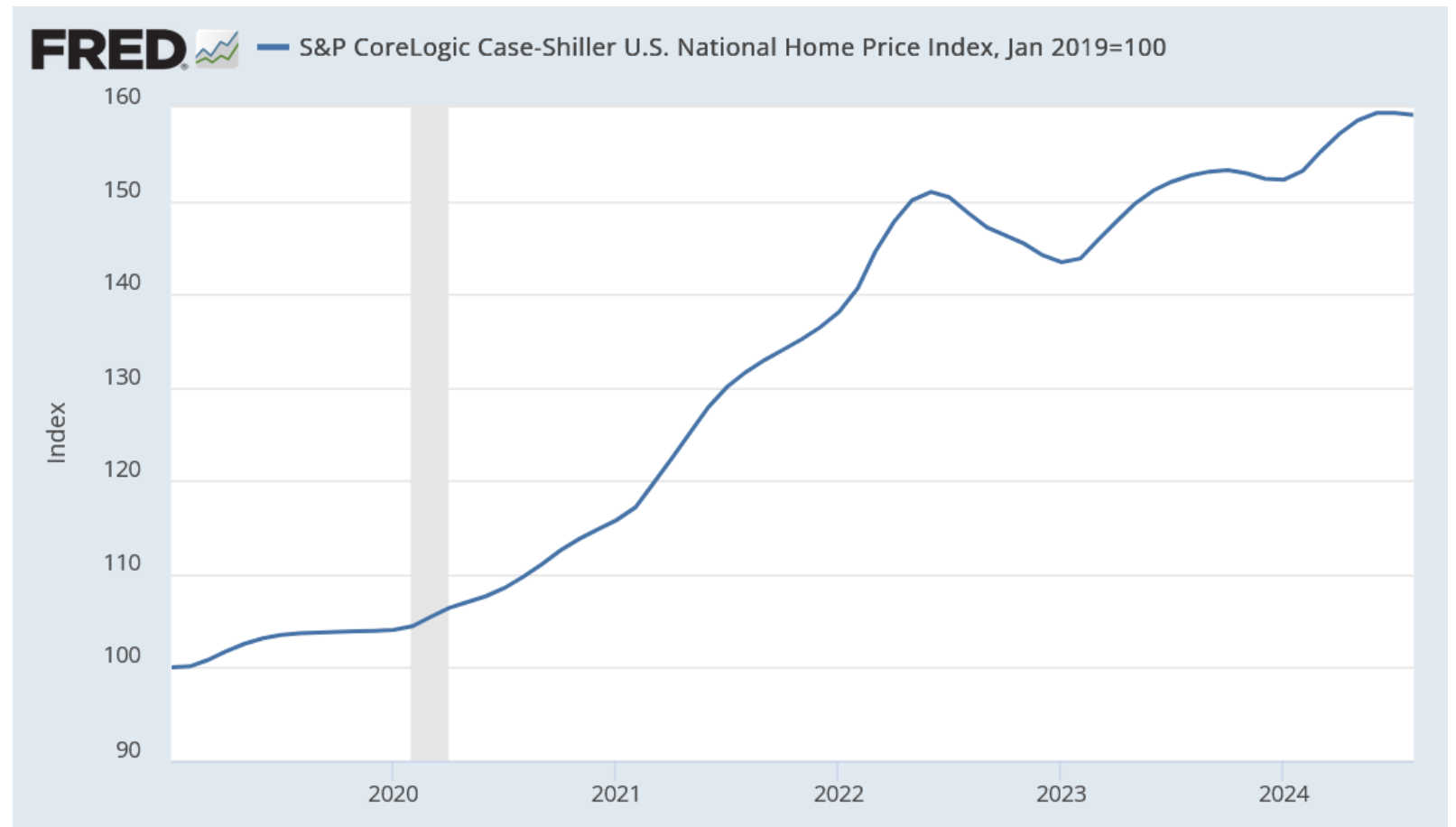
Rising US Mortgage Rates

- Sharp increase in 30-year FRM rate in 2022 with some further increase in 2023.
- Rate was below 3% in 2021, almost 7% now.



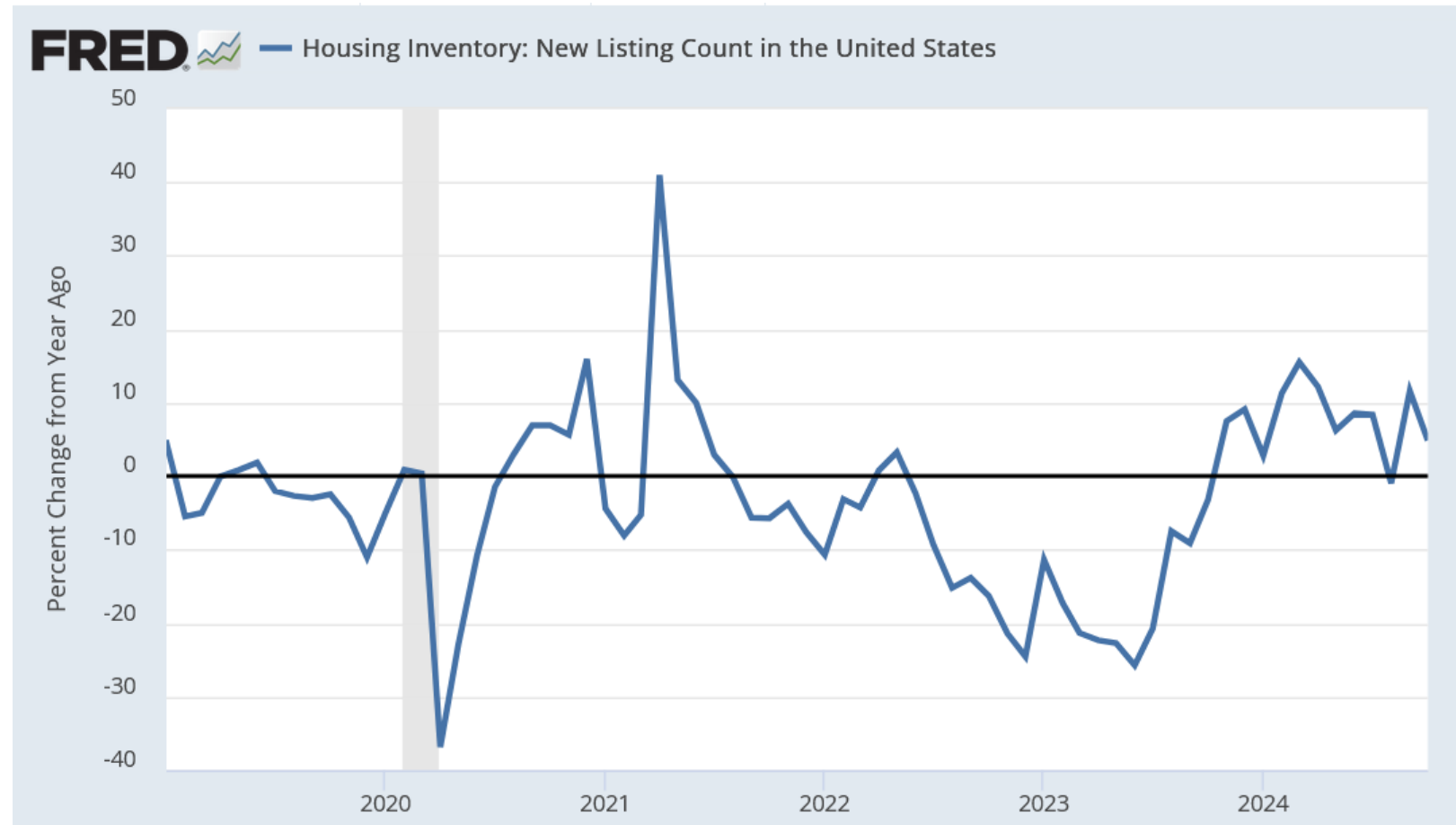
Why Are US House Prices So High?

- US house prices have not declined as one might expect given the rise in mortgage rates.
- Case-Shiller index is up almost 60% since January 2019, with only a small dip in 2022-23.



Could It Be Lock-In?

- One possible explanation is lock-in: existing homeowners are reluctant to sell because they would give up their old cheap mortgages (Batzner et al 2024).



Could It Be Lock-In?

- The difficulty with the lock-in explanation for high house prices is that sellers are also buyers.
- To get an aggregate effect, one needs a sector with more elastic housing supply:
 - Sellers move to the rental market where supply is elastic
 - Or sellers move to a region (Florida?) where supply is elastic
- General equilibrium modeling of the lock-in effect on house prices is a currently active research area.

Options:
People Love Them
But Mismanage Them

People Love Options...

- Ordinary people tend to like financial products with built-in options (the contingent right to do something at a favorable price).
- This may explain the popularity of long fixation periods in the US and Denmark relative to Sweden.
 - In the US, refinancing at face value is attractive when rates fall, but people get locked in when rates rise.
 - Denmark has the same option when rates fall, but no lock-in when rates rise because there is also the option to refinance at market value when rates rise.
 - In Sweden, refinancing is never favorable to the borrower.
- The problem is that people don't exercise these options optimally.

... But Mismanage Them

- Sophisticated (educated, high-income, wealthy) borrowers refinance much more effectively than less sophisticated (poorer) borrowers.
- This effect can be cleanly measured in Denmark given the Danish absolute right to FRM-FRM refinancing that does not extract home equity (Andersen et al *AER* 2020).
- But it is also operative in the US as shown by studies of prequalified refinancing offers (Keys, Pope, and Pope 2016).
- It helps to explain racial differences in mortgage rates paid by US borrowers (Gerardi, Willen, and Zhang 2023).

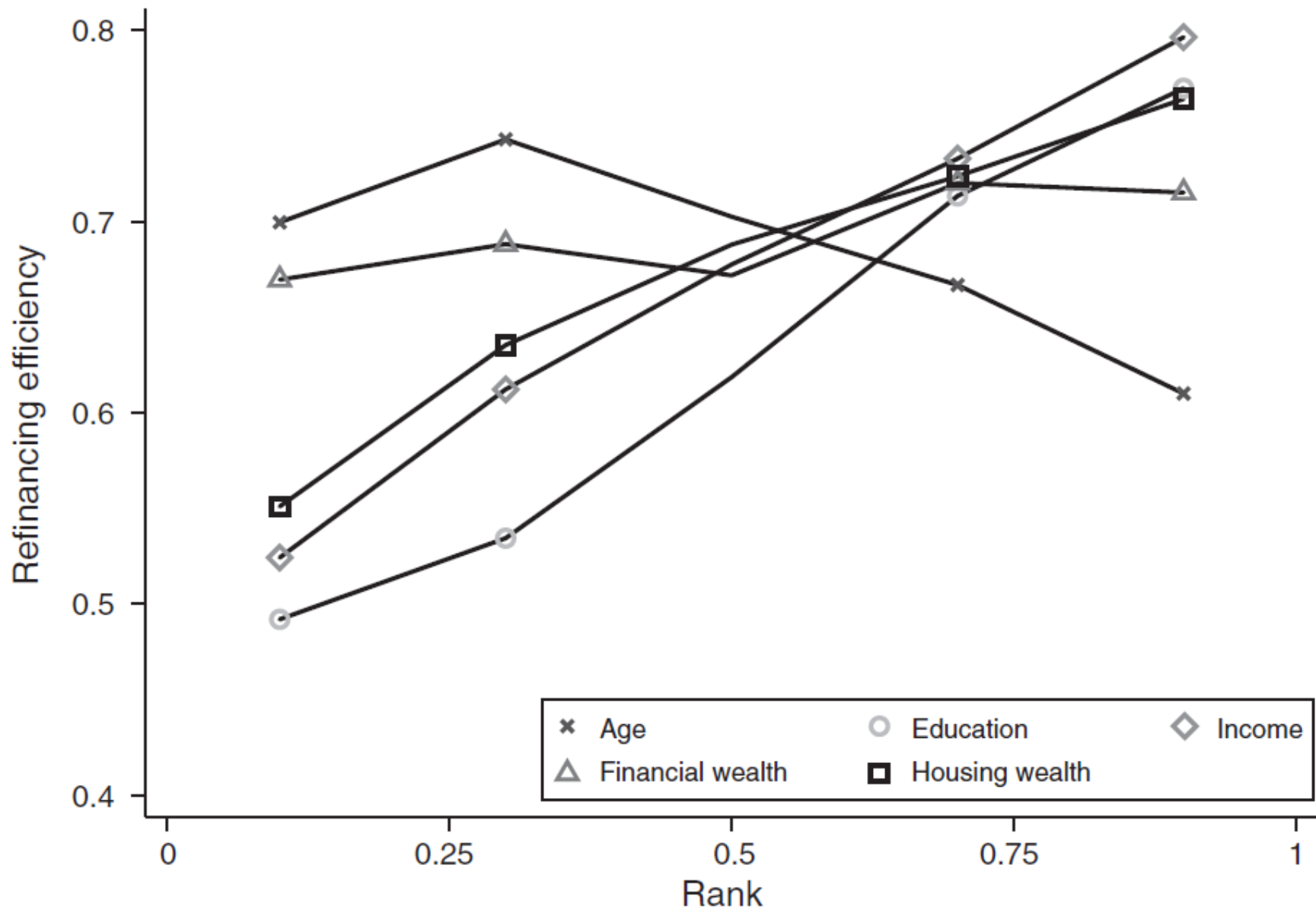
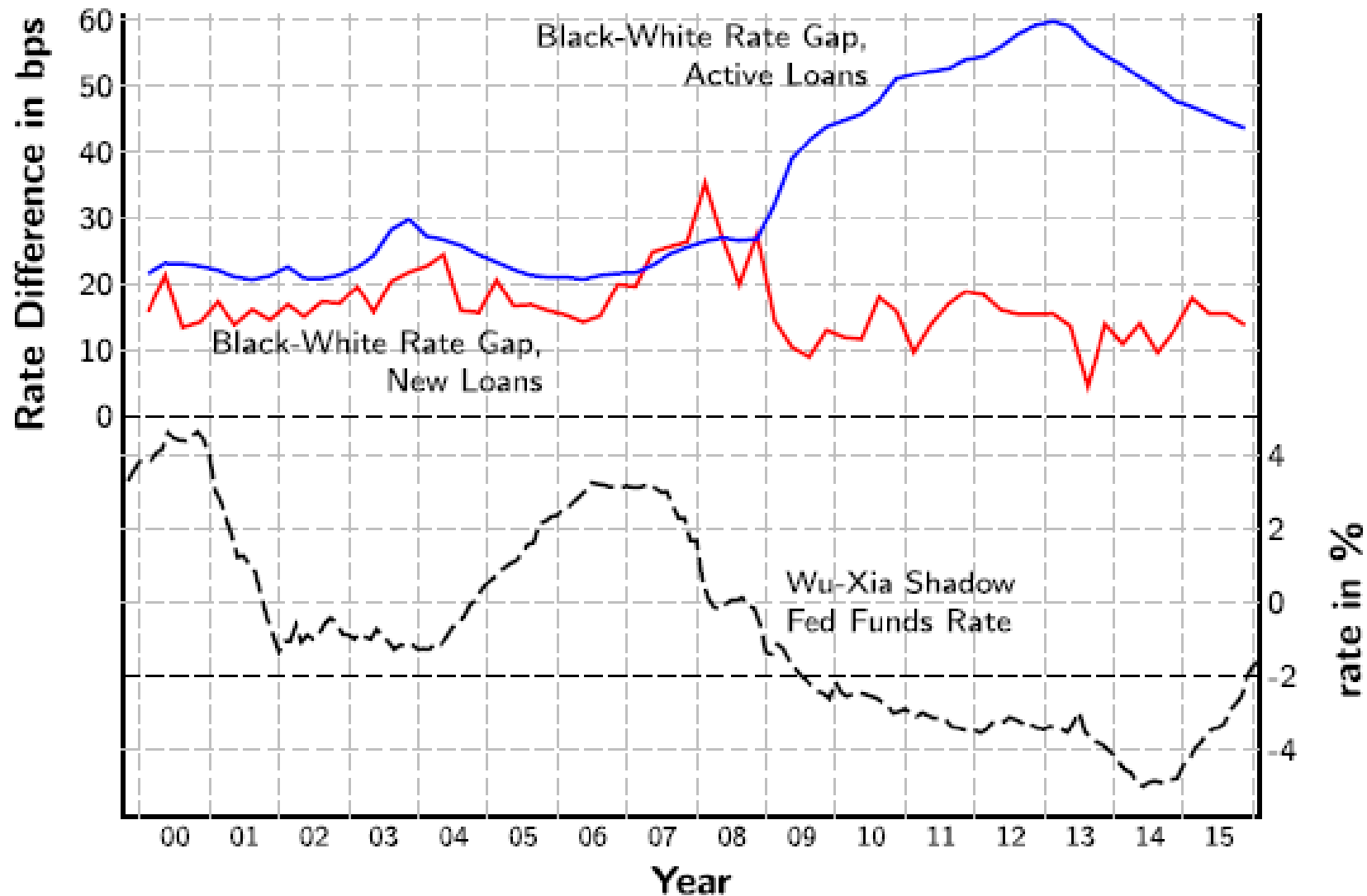


FIGURE 5. REFINANCING EFFICIENCY

Refinancing efficiency is the interest saved by refinancing as a fraction of the interest saved by the optimal strategy of Agarwal, Driscoll, and Laibson (2013).

Refinancing efficiency is measured for Danish households in different quintiles of age, education, income, financial wealth, and housing wealth.

Source: Andersen et al (2020).



The black-white rate gap is small for new loans (and can be explained by other differences in borrower characteristics). It is much larger for outstanding loans, and rises when interest rates decline, reflecting the slower refinancing rate of Black borrowers relative to non-Hispanic white borrowers.

Source: Gerardi, Willen, and Zhang (2023).

Fig. 1. Rates on outstanding mortgages insured by Fannie Mae and Freddie Mac: Black versus white borrowers for mortgages originated from 2000 to 2015.

This figure displays the unconditional rate gaps for Black and white borrowers with 30-year FRMs insured by Fannie Mae and Freddie Mac. New Loans represent mortgages originated in the quarter and active loans represent all outstanding mortgages. The rate gaps for both new loans and active loans represent raw differences not conditioned on loan and borrower characteristics. Data to compute the rate gaps come from the HMDA-McDash database. The Wu-Xia Shadow Fed Funds rate comes from <https://www.frbatlanta.org/cqer/research/wu-xia-shadow-federal-funds-rate>.

Cross-Subsidy from Poor to Rich

- In a competitive market, the extra revenue that mortgage lenders get from non-refinancers is partly passed on in the form of lower up-front mortgage rates.
- This implies that sophisticated refinancers get a cross-subsidy by pooling with non-refinancers (Campbell 2006).
 - An example of Gabaix-Laibson (2006) shrouded equilibrium.
 - The US system of “points” to cover closing costs worsens the problem (Zhang 2023).
- The cross-subsidy makes it harder for innovators to introduce new, easier to manage mortgages.
 - An automatically refinancing mortgage, even if it reduces transactions costs, is expensive for sophisticated refinancers because they lose the cross-subsidy.
 - And unsophisticated borrowers don't know they need it!

Options Are Not Just a FRM Problem

- In the US and Denmark, FRMs are the mortgages that require refinancing and generate inequality.
- But similar problems can arise in ARM systems too.
- In the UK (and many other countries including Canada), ARMs have teaser rates that adjust to a much higher “standard rate” after 1-5 years. Sophisticated people refinance, leaving unsophisticated people to pay high rates.
 - Problem was pointed out in the UK Miles Report in 2004.
 - Fisher, Gavazza, Liu, Ramadorai, and Tripathy (2022) document continuing transfers from poorer to richer mortgage borrowers in the UK.

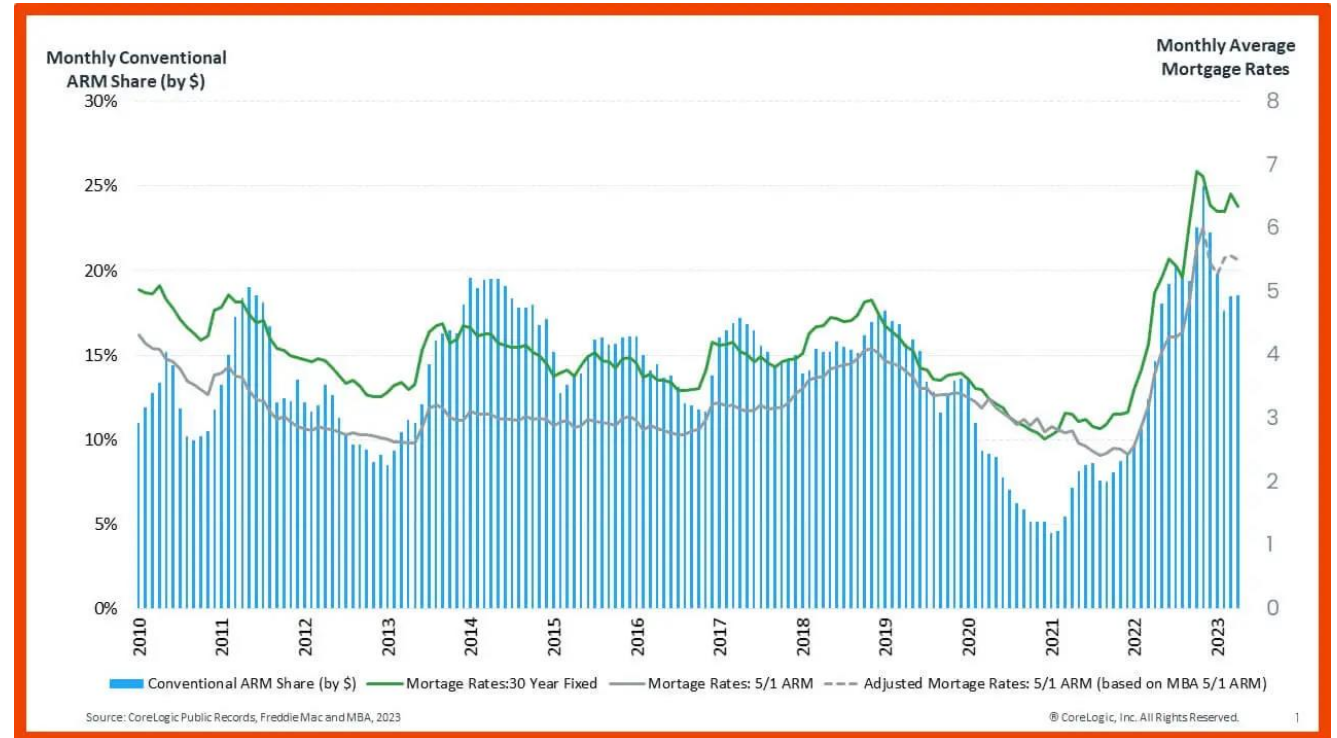
Consumer Preferences Over Fixation Period

What Do People Naturally Choose?

- So far I have discussed mortgage systems without regard to borrower preferences.
- But it is natural to ask what types of mortgages people prefer when they are offered a choice of fixation period.
- In the time series, Badarinza, Campbell, and Ramadorai (2018) show in country-level panel data that the ARM share increases with
 - The spread between the current FRM rate and the current and 1-year-ahead expected ARM rate
 - Recent movements in mortgage rates (which change expected future rates).

The ARM Share in US Data

- ARMs are normally cheaper at the time of origination.
- The market share of ARMs tends to be high when the rate spread is wide, and when mortgage rates have been rising.
- But in the US, the ARM share is always low.



Source: <https://www.corelogic.com/intelligence/rising-rates-lead-to-increase-in-adjustable-rate-mortgage-arm-activity/>

What About the Cross Section?

- In the US cross section, the ARM share is higher for subprime mortgages and jumbo mortgages, and lower for conforming mortgages (prime borrowers, not too large).
- This is often attributed to implicit government subsidies to FRMs provided by the credit guarantees and securitization offered by the GSEs for conforming mortgages.
 - On this interpretation, the cross-sectional pattern is evidence of a distortion in the mortgage market.
- But somewhat similar patterns are visible in Denmark!
 - Where there are no government subsidies distorting choice.

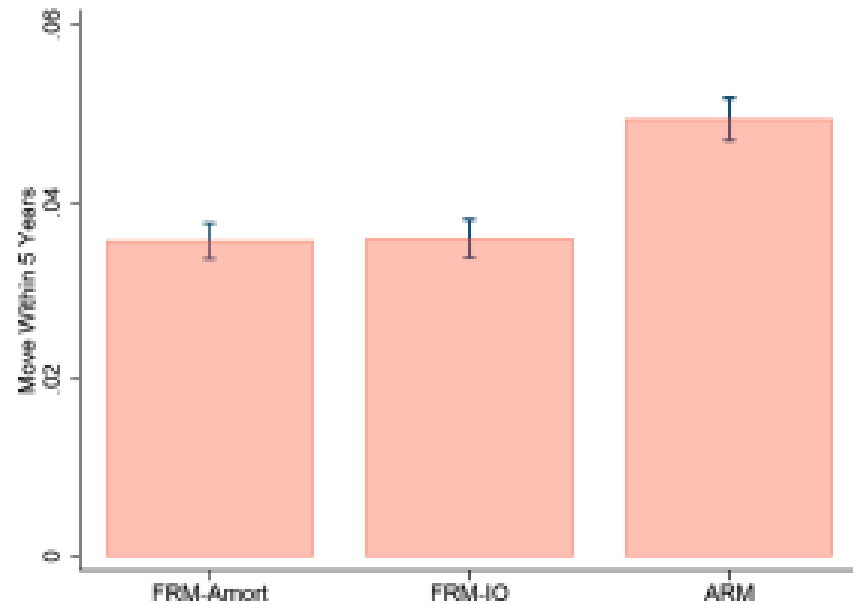
Cross Section of Danish Mortgage Choice

- Andersen, Campbell, Cocco, Hansman, and Ramadorai (2024) is an ongoing study of cross-sectional mortgage choice in Denmark.
- Complete data on the stock of Danish mortgages from Danmarks Nationalbank (ultimately from mortgage banks)
 - Sample period 2009-18
 - 13.2m loan-years, 3.2m mortgages
 - 47% ARM (almost all IO), 44% FRM (some IO, some amortizing)
- Administrative data on demographics, education, income, and wealth
- We focus on mortgage originations associated with house purchases by households with a single mortgage (423k mortgages)

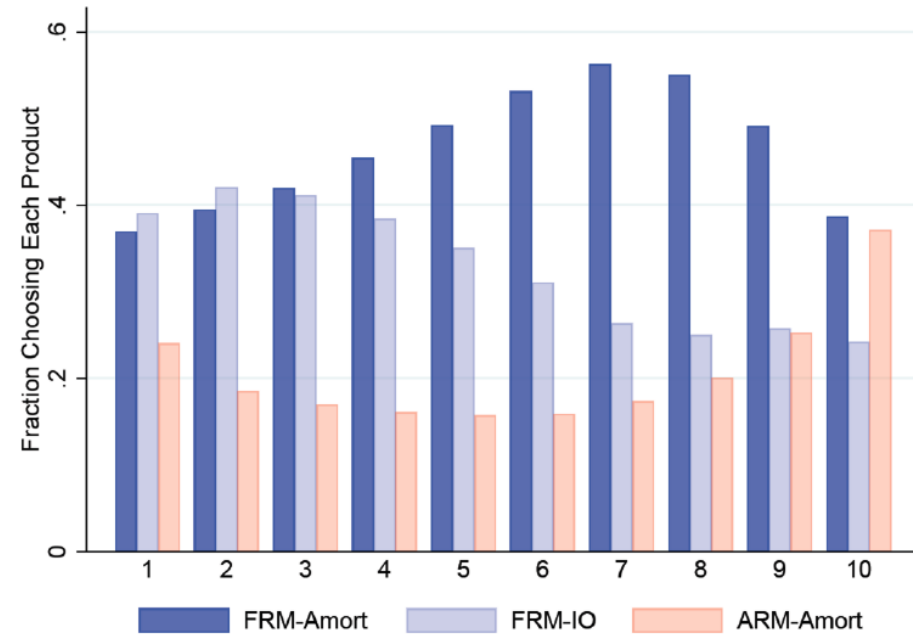
Patterns in Danish Mortgage Choice

- ARM usage predicts moving (movers focus on current costs and don't value protection against future rate increases).
- The ARM share is higher in two separate groups:
 - Young borrowers, first-time homebuyers, with low financial assets.
 - Middle-aged borrowers, with large houses and high financial assets.
- We believe that ARMs appeal differently to these two groups:
 - The first group is borrowing-constrained and a lower current interest rate permits higher current consumption. While rates may increase in the future, income will be higher by then.
 - The second group uses ARMs as a cheap way to lever a financial portfolio. If rates increase in the future, they can always delever and pay off the mortgage.

Univariate Relations with ARM Share



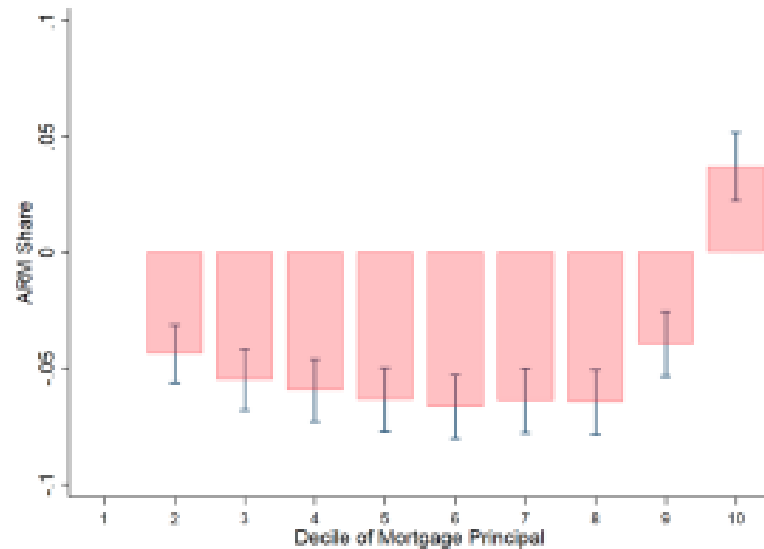
ARM borrowers are more likely to move within 5 years.



The poorest and the richest are the most likely to use ARMs.

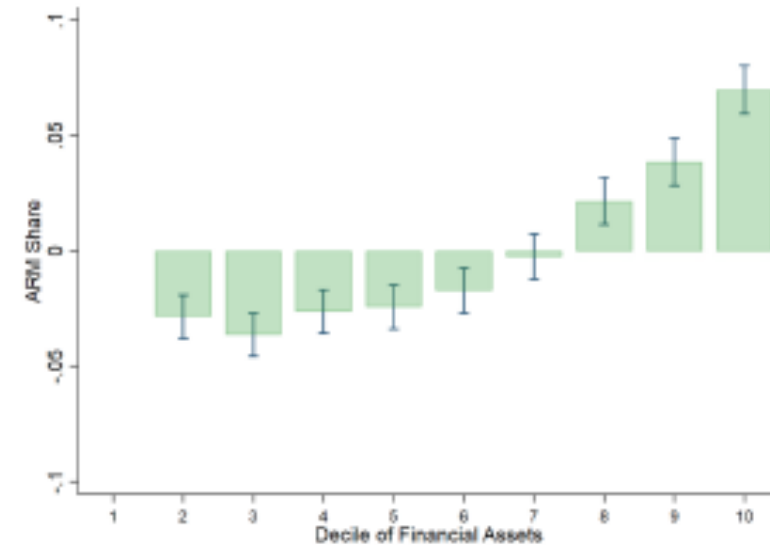
Multivariate Relations with ARM Share

(a) Mortgage Principal



Mortgage principal to income has a U-shaped relation with the ARM share.

(d) Financial Assets



Financial assets to income has a U-shaped relation with the ARM share.

Beyond Stylized Facts

- We are currently setting up, solving, and simulating a life-cycle model of mortgage choice.
 - An extension of Campbell and Cocco (*QJE* 2003, *JF* 2015).
 - The model has risky income, random interest rates, fixed costs of refinancing, LTV and PTI constraints, and choice between FRMs and ARMs.
- The goal is to show that ARMs appeal both to constrained young households and to older households with substantial financial assets and a desire for leverage.
- A caveat is that observable fundamentals have low explanatory power for mortgage choice – so unobservables (beliefs?) also matter.

Amortization and the Life Cycle

Amortization: Consumers vs Regulators

- Many consumers find it appealing to reduce mortgage amortization:
 - Low amortization (long maturities)
 - Zero amortization (IO mortgages)
 - Negative amortization (second mortgages, home equity lines of credit, reverse mortgages).
- Regulators are often concerned by this because of the risks:
 - Inadequate retirement saving
 - Borrower financial distress and destabilizing consumption declines if income falls
 - Defaults, foreclosures, and financial instability if house prices fall

Amortization: Nominal vs Real

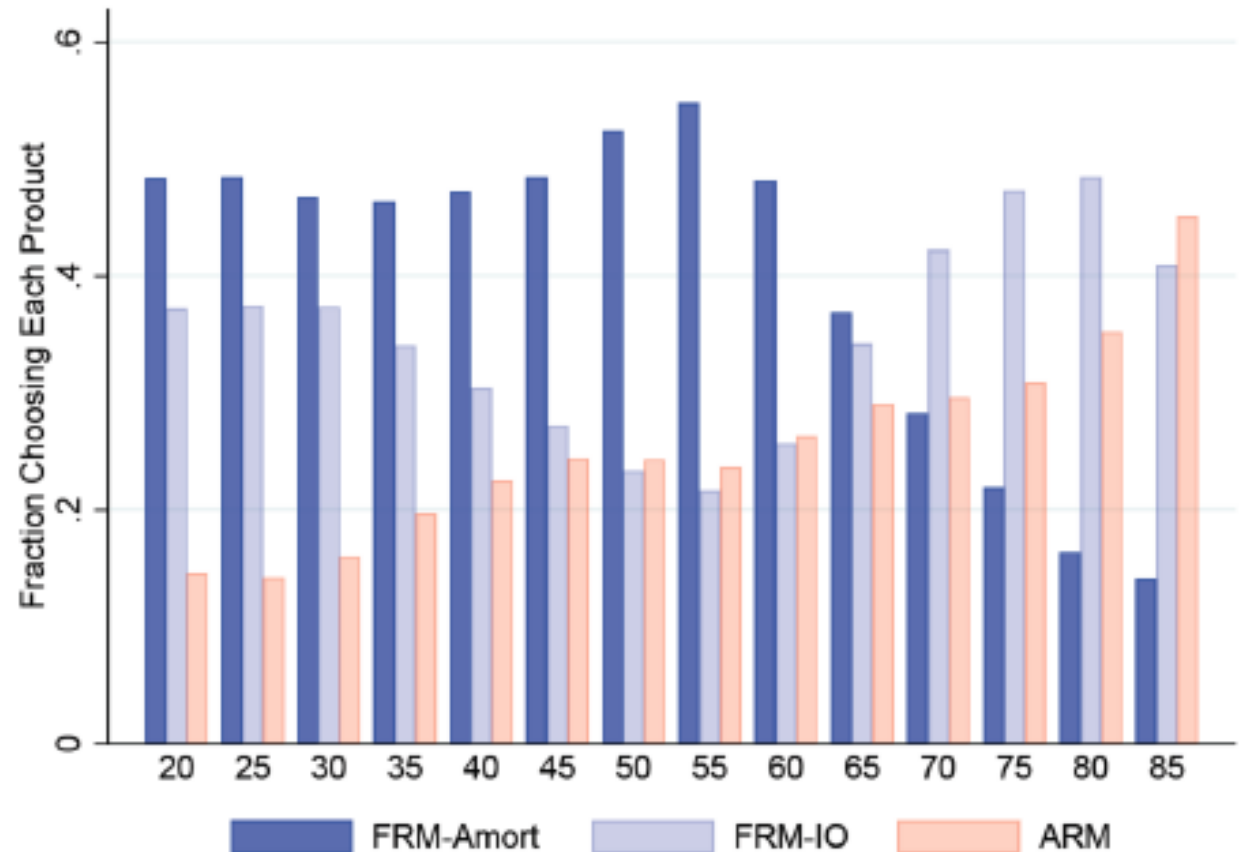
- The downside risks have to do with the real burden of debt on households.
- Hence, amortization should be thought of in real not nominal terms.
 - There is nothing wrong with negative nominal amortization that is less than the inflation rate in absolute value.
- Adjustable mortgage design can be improved by adjusting nominal principal upwards in response to inflation while smoothing real payments over time.
 - Unconstrained borrowers can achieve the same thing on their own, but constrained borrowers cannot.

Amortization and the Life Cycle

- Amortization policy should be sensitive to the stages of the life cycle.
- Young households expect rising income and should not save aggressively.
 - For them, IO mortgages can be appropriate.
- Middle-aged households are in their peak earnings years and should save for retirement.
 - Mortgage amortization requirements may encourage this if other measures are inadequate.
- Older households may be “house-rich, cash-poor”.
 - For them, IO and reverse mortgages and property tax deferrals may be suitable.

Mortgage Choice and the Life Cycle

- In Danish data, young households choose IO FRMs, middle-aged households choose amortizing FRMs, and older households choose ARMs (which are almost all IO).
- We see the theoretically appropriate hump shape in amortization.



A Final Thought on Mortgage Policy

- We should not assume that the mortgages we have are the best that can be designed.
- Policy should make space for innovative mortgages with features such as:
 - Automatic refinancing (ratchet mortgage).
 - Inflation indexation of principal (negative amortization in nominal terms).
 - Negative amortization for retired people who are house-rich but cash-poor and don't want to move (reverse mortgages or IO mortgages).
 - Indexation of principal to home values (shared appreciation mortgages).
- A “regulatory sandbox” for innovation can be useful, with more careful regulation of any products that start to take off.

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