# Economics 742 Lecture 2: Housing I: Intro and Wealth Effects

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# Housing and Macro

1. Introduction
   - 1.1 Why is housing and macro interesting?
   - 1.2 How did I get to housing?
   - 1.3 My JMP: House Price Momentum
2. Question 1: How big are housing wealth effects? Why do they exist? Are they big in the aggregate?
3. Question 2: What explains the 2000s housing boom and bust (and rebound)?
4. Question 3: What types of housing market stabilization policy are effective?
5. Bonus: References for interesting topics I did not cover
   - 5.1 Monetary Policy and Housing Markets
   - 5.2 Behavioral Housing Economics
   - 5.3 Housing Supply

# A Brief Intellectual Autobiography

- I did not think I would study housing when I started my Ph.D.
  - "Boring" and a bit of a niche field
- First day of Ph.D. macro was day Lehman failed
  - Housing wrecked the world!
  - Suddenly, very interesting questions as housing and household finance move to center of macro
- Despite distance from Great Recession, housing has stayed an important part of macro
  - Great Recession made us realize how important household balance sheets and heterogeneity (e.g., HANK) are to macro
  - Cannot study these issues without housing, the 1,000 lb gorilla of household balance sheets
  - Big names in macro now studying housing along with crop of PhD students since Great Recession

# Housing Has a Bit of Everything!

- I find housing interesting because it has a bit of everything

1. Rich empirical questions with great micro data
2. Modeling:
   - Heterogenous agents with household balance sheets
     - Often in GE $\rightarrow$ Computation
   - Asset pricing and household finance
   - Banking and financial frictions
   - Search
   - Non-rational and behavioral features
3. Policy relevance
   - Macroprudential policy
   - Foreclosure mitigation and eviction
   - Tax policy
   - Local regulation and housing supply
   - Low income housing policies
4. A good job market (every business school has real estate)

# Aside on Data

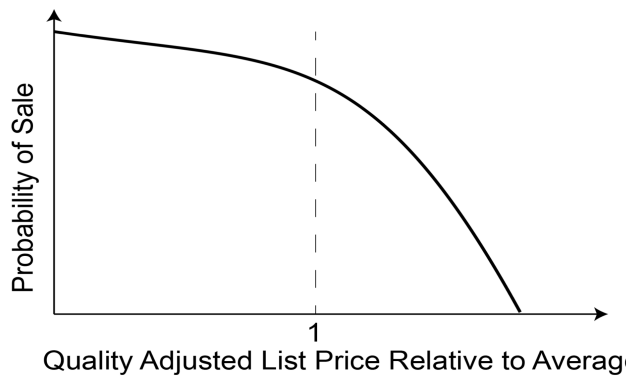
- Data tends to be expensive, but often site-wide licenses or can get by visiting Fed etc.:
- Key common data sources:
  1. Deeds and Assessor (and listings): CoreLogic (BU CAR has)
  2. Mortgage Data
  3. Credit Report Data (which can be linked to mortgage servicing data for CRISM data)
  4. Infutor Migration Data
  5. Consumption: Nielsen Data (BU has university-wide) / JPMC Institute
  6. Other proprietary data sources
- Happy to talk more about data, and we will see a few examples over the course of my lecture

# A Brief Intellectual Autobiography: As a PhD Student

- As a first year I didn't like macro; did trade and public
- In 3rd year, three things pushed me towards macro:
  1. Paper with Raj Chetty on extensive margin labor supply elasticities
     - Connections between public economics evidence and macro models and audiences
  2. Paper with classmate Tim McQuade on housing search
  3. Erik Hurst visited and I realized micro-data macro was a thing
- Searched for JMP as 3rd, 4th, and 5th year, leading to a lot of dead ends (which I learned a lot from)
  - Ended up getting and cleaning a lot of data which proved useful when I did find my JMP
- Finally found my JMP in February of my 5th year, leading to a furious 9 months (which I do not recommend)

# My JMP: How the Sausage Was Made

- Initial idea to explain Housing Phillips Curve: Price changes correlated with inventory levels
  - My intuition: house price momentum – autocorrelation of price changes – and forward-looking buyers and sellers
  - Negative shock → buyers rush out and sellers rush → sudden fall in inventory; price slowly adjusts.
- Presented this in macro lunch in April of my 5th year and kept getting questions about *why* there was momentum
- Initial intuition: Sellers do not want to have outlier list price
  - Had read price stickiness literature; realized this form of strategic complementarity in price setting
  - In particular, a form of "kinked demand" or "concave demand"



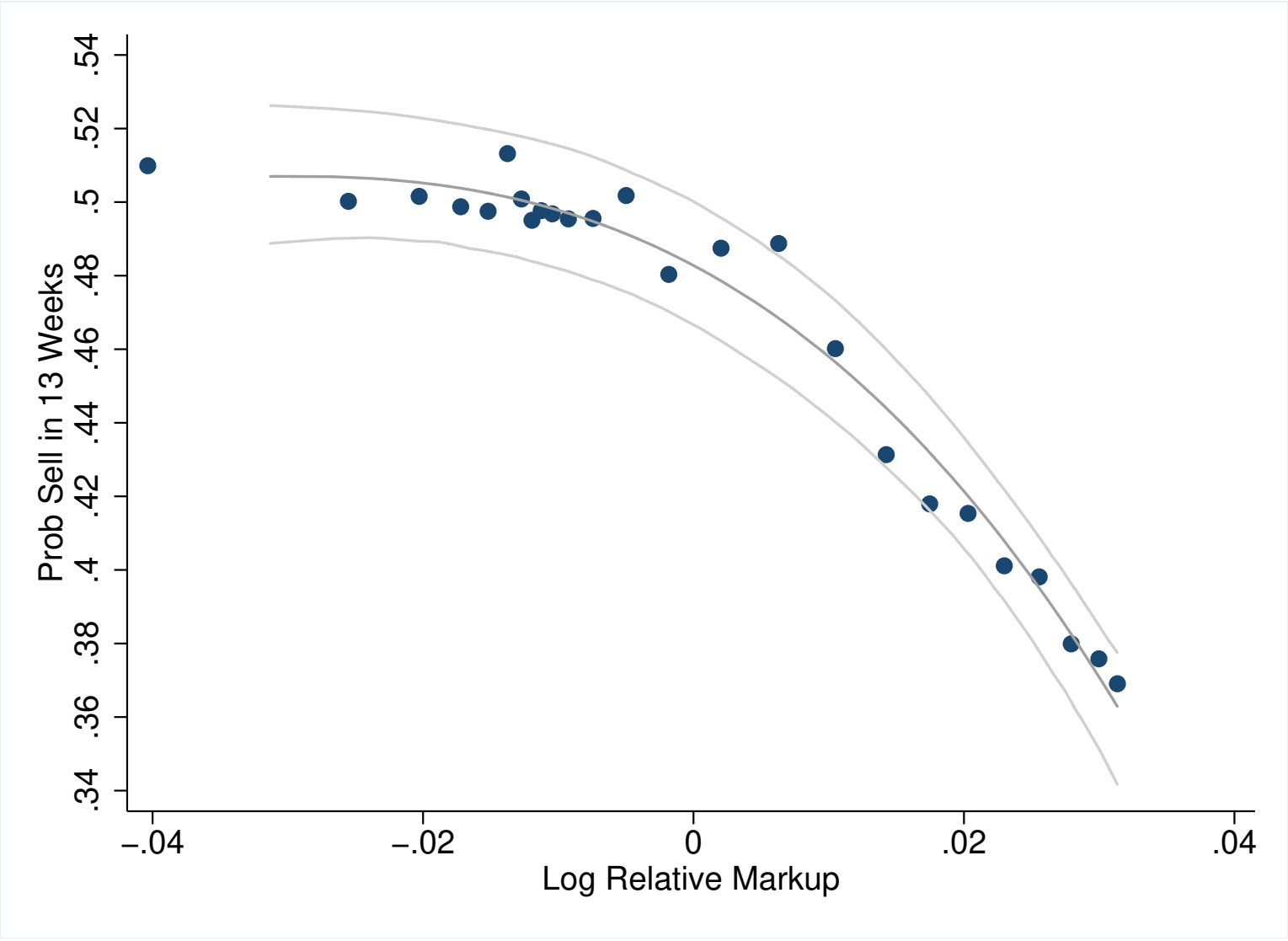
# My JMP: How the Sausage Was Made

- Nobody had ever shown empirical evidence for kinked demand. But housing had great data on listings and transactions and could potentially show
  - Got data in July...and a concave/kinked demand curve SCREAMED from the data in OLS
  - But relationship was too inelastic (monopolist on elastic)
  - Realized OLS is biased by unobserved quality
  - IV list price with appreciation since purchase → more reasonable and elastic demand
- Other issue: Where does markup come from in housing?
  - Search! Creates monopoly power for list-price setting seller → "markup" that can fluctuate with elasticity of demand
  - Last step: Find way to embed concave demand in search model and structurally estimate model to match curvature in data

# My JMP: One Slide Summary

- Proposes that concave demand helps explain house price "momentum" – autocorrelation of price changes
  - Frictions that have been proposed fall well short of explaining 2-3 years of momentum
- Idea: No seller wants to set a list price that "sticks out" from comparable houses.
  - Too high, sits on market
  - Too low, will not sell more quickly, but will garner lower price
  - Sellers who cannot coordinate find it costly to move price too far from average, amplifying frictions that create momentum
- Paper provides:
  1. Direct, identified micro evidence.
     - Non-linear IV procedure to estimate curvature of demand accounting for unobserved quality
     - First direct micro evidence for concave demand
  2. Show using search model that amplifies frictions (staggered price setting and rule of thumb) by a factor of 2-3

# Guren (2018): Price Stickiness in Housing



# Question 1:

# How big are housing wealth effects?
# Why do they exist?
# Are they big in the aggregate?

# Housing "Wealth Effect"

- Do house prices affect consumption?
  - Old question; subject of Alan Greenspan's thesis in 1977, Case-Shiller-Quigley (2005)
  - Leamer (2008): "Housing IS the Business Cycle"
- Came to the fore in the Great Recession due to a remarkable series of papers by Atif Mian and Amir Sufi
  - Home equity borrowing fueled consumption in the boom
  - House prices fall $\rightarrow$ indebted households de-lever and cut $C$
- Outline:
  1. Mian and Sufi (2011, 2013 w/Rao, 2014, 2014)
  2. What explains wealth effects?
     Berger, Guerrieri, Lorenzoni, and Vavra (2018)
  3. Guren, McKay, Nakamura, and Steinsson (2021)

# Mian and Sufi Oeuvre

- To give you idea of how Mian and Sufi's papers fit together:

1. 2009 QJE: Expansion of credit to new subprime borrowers from 2002-2006 led to defaults (will not cover)
2. 2011 AER: Credit expansion through home equity borrowing by existing homeowners. A bit on consumption
3. 2013 QJE (with Rao): Consumption and credit crunch 2006-2009 with household-level data
4. 2014 Emca: Deleveraging and unemployment, 2006-2009
5. 2014 WP: Consumption growth and house prices, 2002-2006
    - Cover along with 2011 paper

# Mian and Sufi: New (At the Time) Data

- Credit Report Data:
  - Mian and Sufi among the first to use, becoming standard (but very expensive)
  - Credit bureaus have:
    - Detailed information on borrowing and repayment
    - Geographic location and address history
    - Debts: Credit card balances (not spending), auto debt, mortgage debt. Can infer homeownership from mortgage debt
    - Can also get spending on store credit cards (e.g. Macy's card)
- ZIP data on: Income, employment, payroll, agg credit score, demographics
- New auto sales by ZIP of purchaser (from registration)
  - Frequently used measure of durables spending
  - Can trace to location of buyer rather than place of purchase
  - But Dupor et al. (2020) argue conversion of auto sales to auto spending wrong because including parts and repairs
- 2013 paper: MasterCard consumption data
  - More recent papers have better and better consumption data

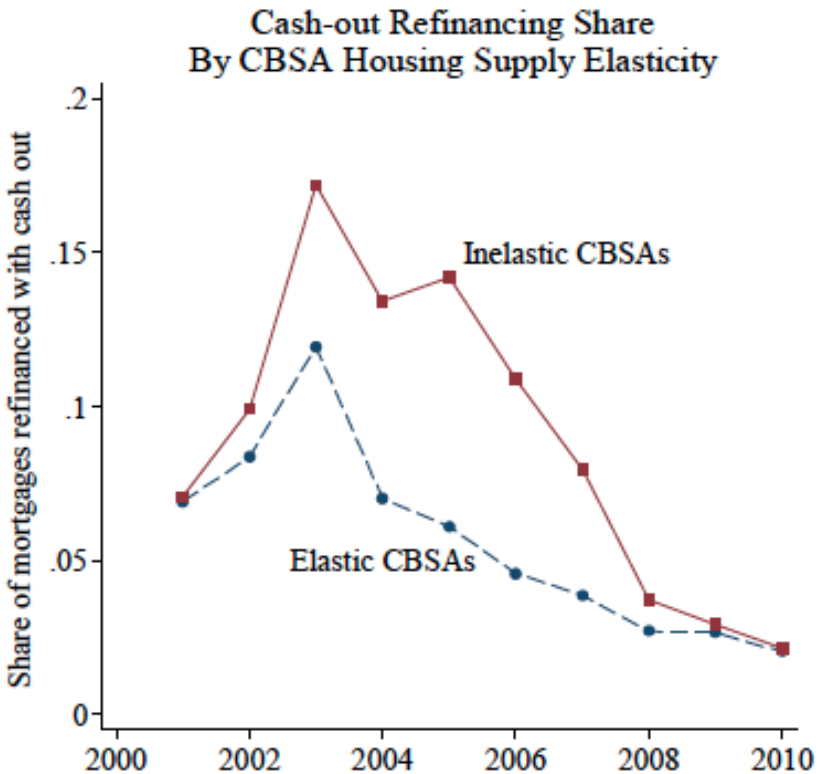
# Identification and Saiz (2010) Instrument

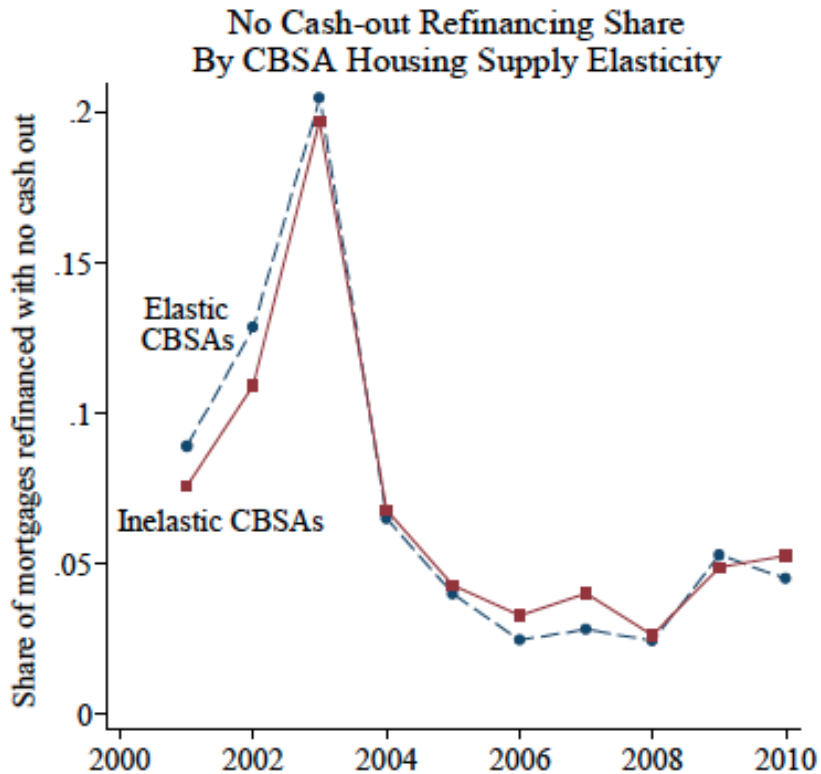
- Concern: OLS regression of $\Delta P$ on $\Delta C$ is biased
  1. Omitted Variables: Income shocks that affect $P$ and $C$
  2. Measurement Error in $\Delta P$: Attenuation bias
- Solution: Instrument $\Delta P$ with *housing supply elasticity*
  - Inelastic $\Rightarrow$ volatile house prices, constrained supply (LA, Miami, San Francisco, New York)
  - Elastic $\Rightarrow$ stable prices, unconstrained supply (Tulsa, Dallas)
- Use elasticities estimated by Saiz (2010)
  - Relates elasticity to *land availability*
    - Featureless plain where can easily build outward (e.g. Tulsa) has prices pinned at structure costs (roughly constant)
    - Island (e.g. Manhattan): Once fill in can only build up (expensive) or purchase land. Steep MC $\rightarrow$ inelastic supply
  - Measure: Fraction of land in 50km radius of center city with water or too steep to build on
- Saiz's elasticity is predicted elasticity from regression of $\Delta P$ on $\Delta H$, unavailability, regulation from 1970-2000

# Mian and Sufi 2011 (and 2014 WP): Exclusion Restriction

- Concern: MSAs with inelastic housing supply may have received other shocks affecting consumption
  - E.g. permanent income shocks
  - Davidoff (2013) critique of Saiz elasticity for cycle:
    - Most of variation simply explained by "sand state" dummies (AZ, CA, FL, NV)
    - Residual variation driven by by long-term changes in demand for amenities on the coasts
    - So in a cross-section this is a bad instrument
- Mian-Sufi tests to address concerns:
  - Correlation of housing supply elasticity with both levels and growth of payroll, wages, employment are near zero
  - No differential effects of housing supply elasticity on these margins by ZIP mean income
  - Examine credit card debt as placebo
  - Look at renters who never buy in same market

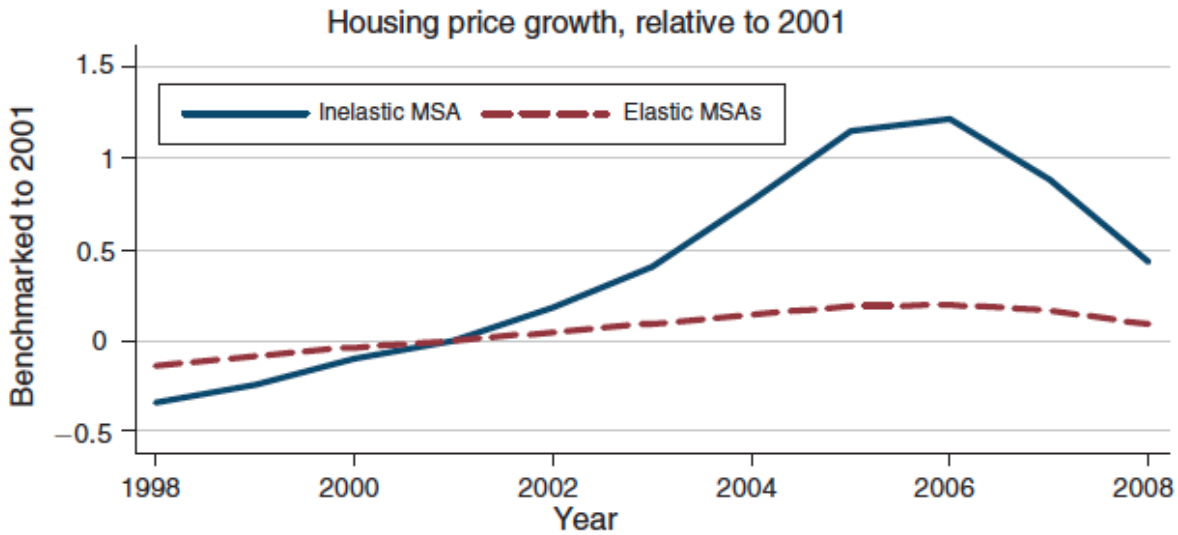
# Mian and Sufi 2011 (and 2014 WP): Basic Story

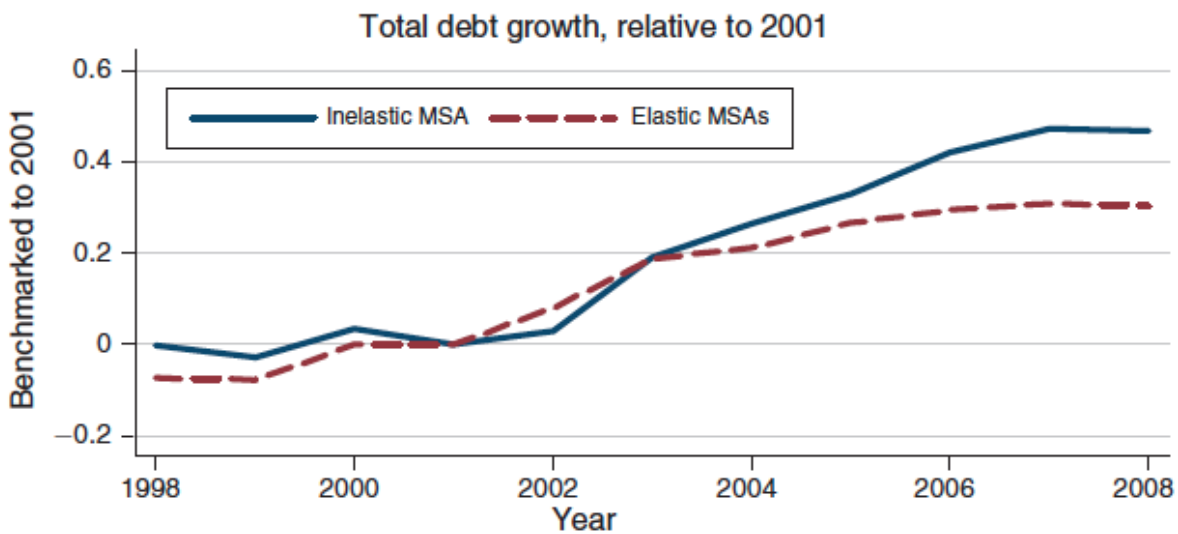


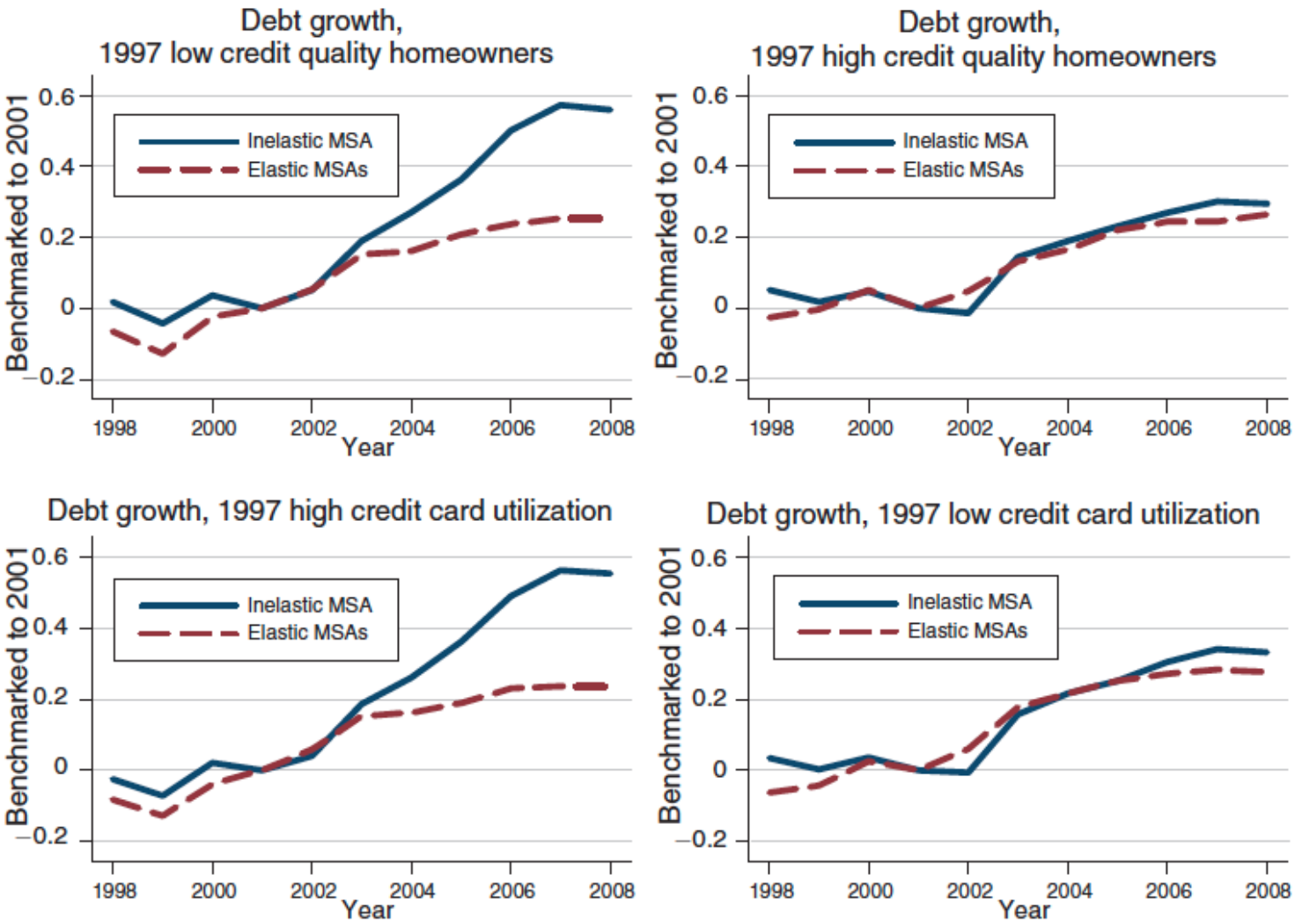

- Borrow 25 cents for every dollar of home equity growth
  - Aggregates to $1.25 trillion increase in debt 2002-6

# Mian and Sufi 2011 (and 2014 WP): Basic Story



# Mian and Sufi 2011 (and 2014 WP): Heterogeneity



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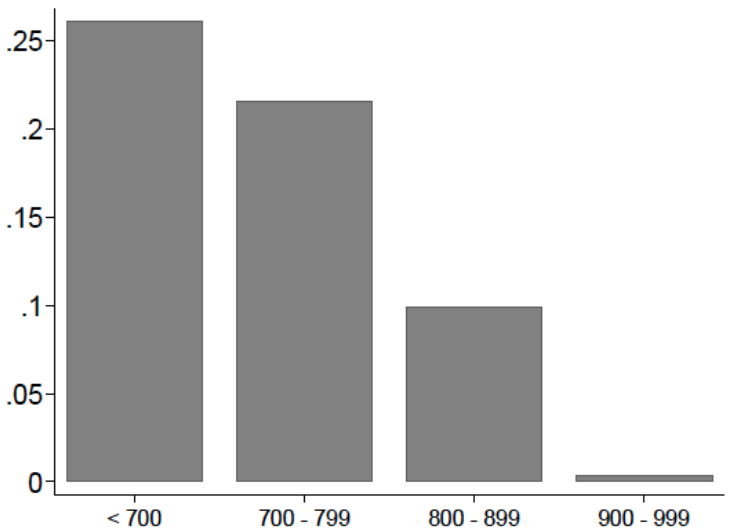
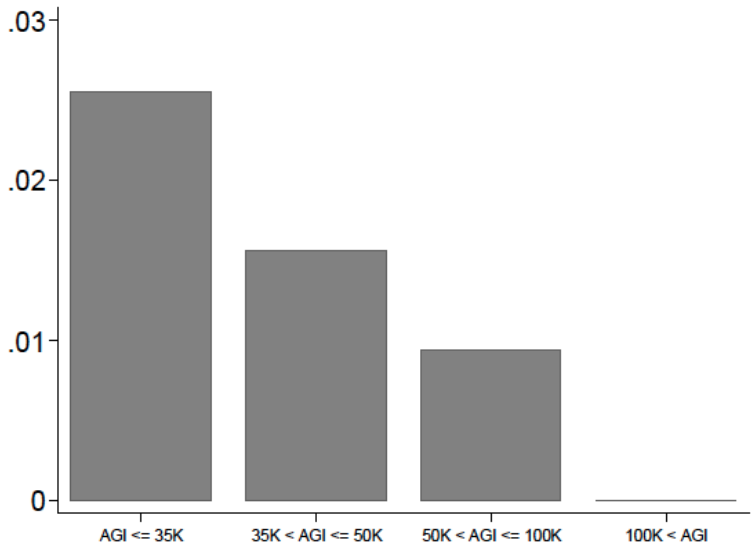
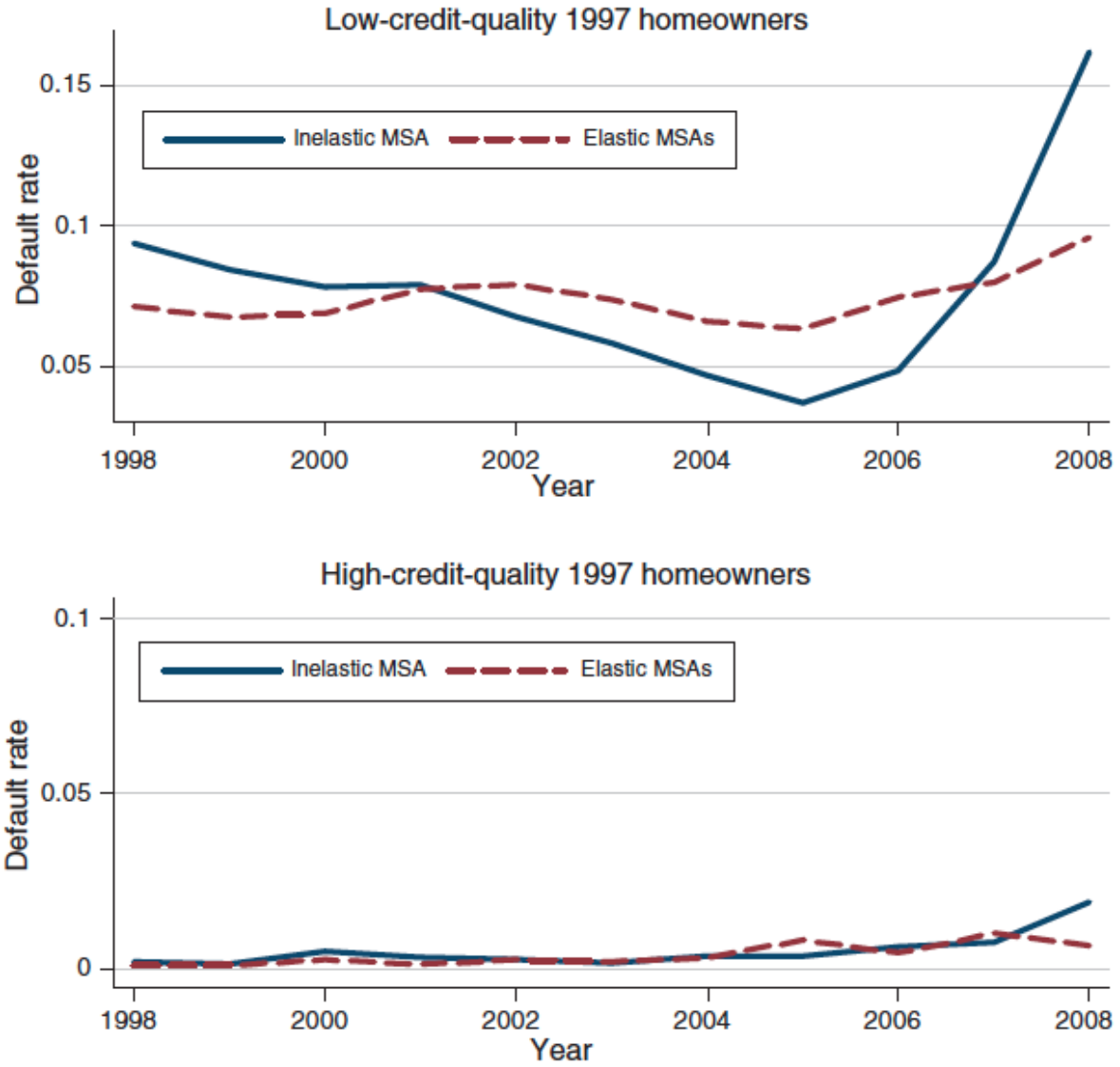



- Borrowing leads to consumption (2014 paper):
  - 4.4 cents for every dollar gain in home equity spent on cars.
  - Implies 10 cents per dollar consumed

# Mian and Sufi 2011 (and 2014 WP): Default



# Mian, Sufi, and Rao (2013)

- How did 2006-2009 house price collapse affect consumption?
  - Data Innovation: MasterCard consumption data
- Elasticity of consumption WRT net worth of 0.6 to 0.8
  - Lowest 10% lost 45% of NW $\Rightarrow$ consumption drop 27-36%
- In dollars, cut consumption 5-7 cents per dollar decline in house value
  - Half of this is autos. Effect on groceries small
  - $<$ \$35k income has 3$\times$ larger MPC than $>$ \$200k
  - $>$ 90% LTV in 2006 has 3$\times$ larger MPC than $<$ 30%
- Interpretation: Evidence for credit constraint channel

# Net Worth Measurement

- Using county-level data construct net worth:

$$NW_t^i = S_t^i + B_t^i + H_t^i - D_t^i$$

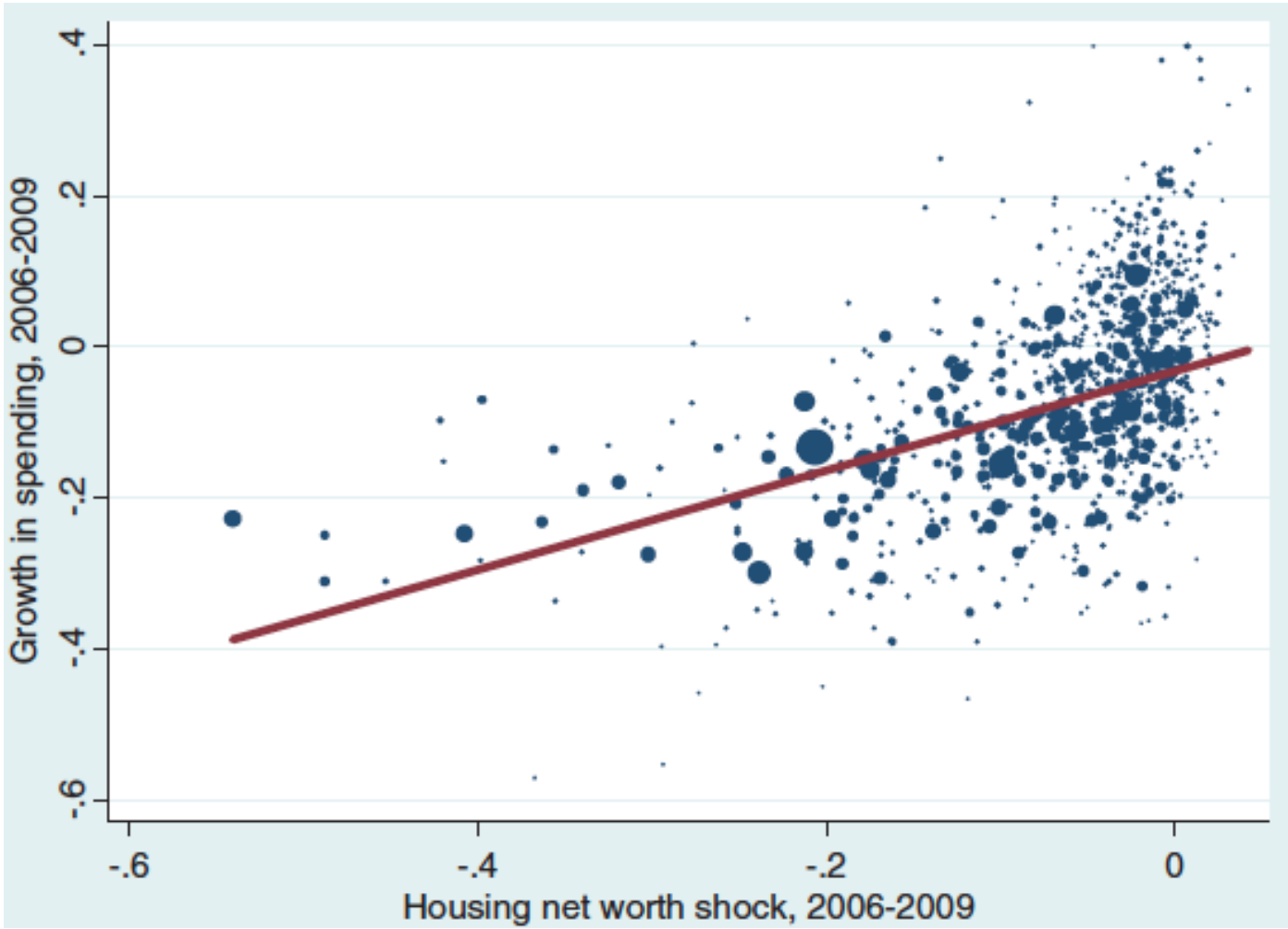
  - $S_t^i$ and $B_t^i$ are stock and bond housing from IRS data
  - $H_t^i$ is housing stock $\times$ value from 2000 census inflated by CoreLogic ZIP HPI
  - Debt from Equifax county data

- Local net wealth shock from housing:

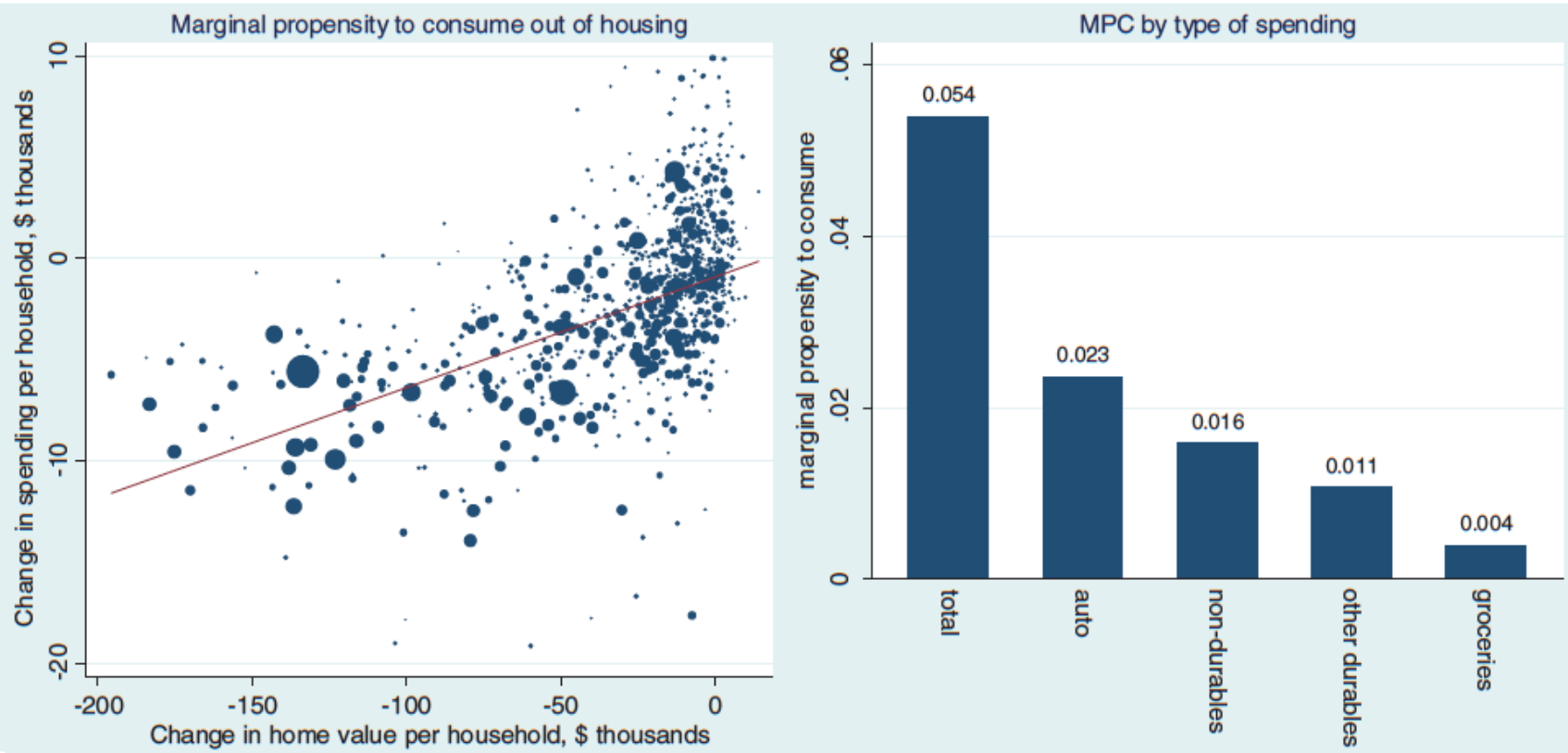
$$\Delta HNW = \frac{\Delta \log p_{06-09}^{H^i} \times H_{2006}^i}{NW_{2006}^i}$$

  - Instrument $\Delta \log p_{06-09}^{H^i}$ with Saiz

# Mian, Sufi, and Rao (2013): Housing Net Worth Elasticity



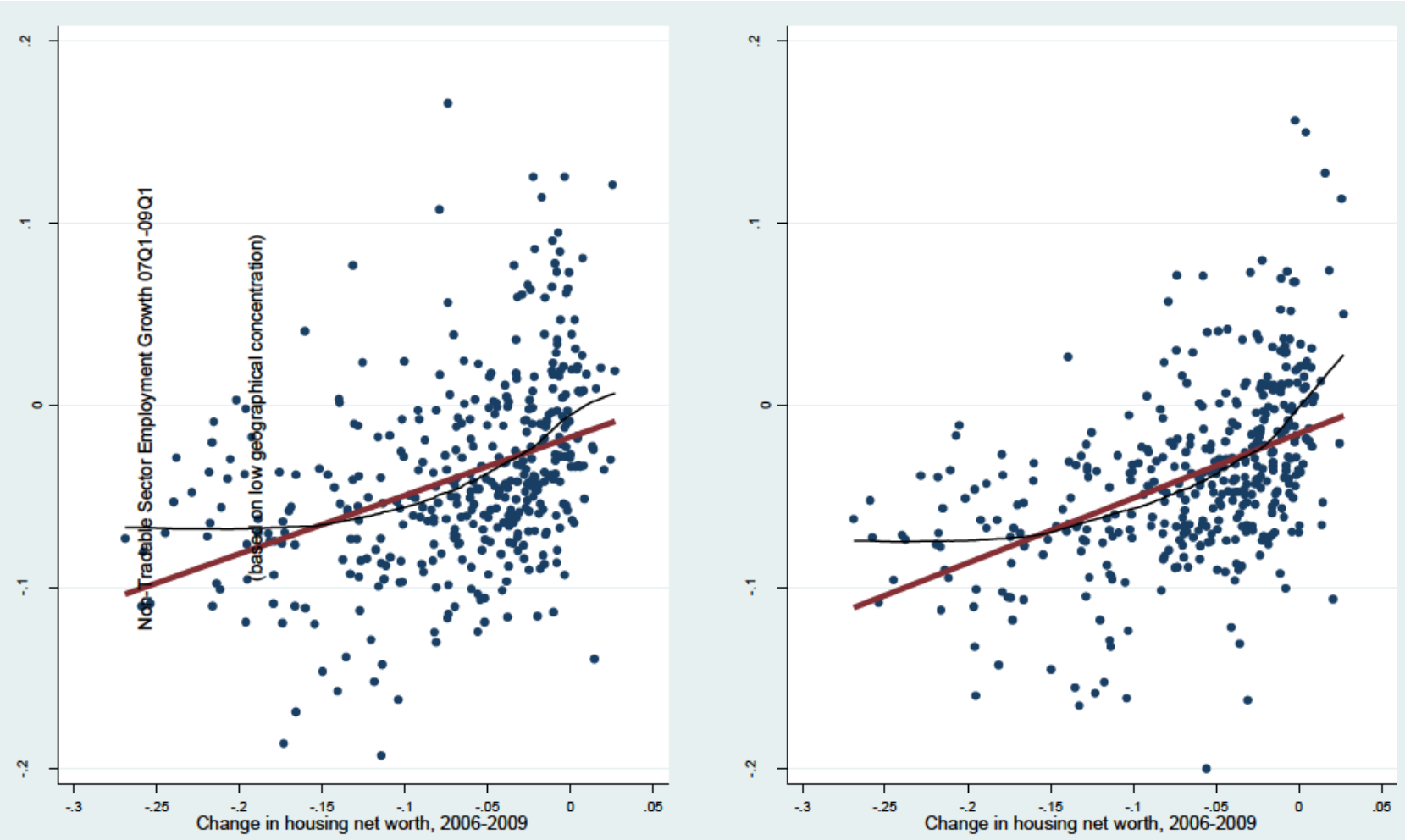
# Mian, Sufi, and Rao (2013): MPC in Dollars



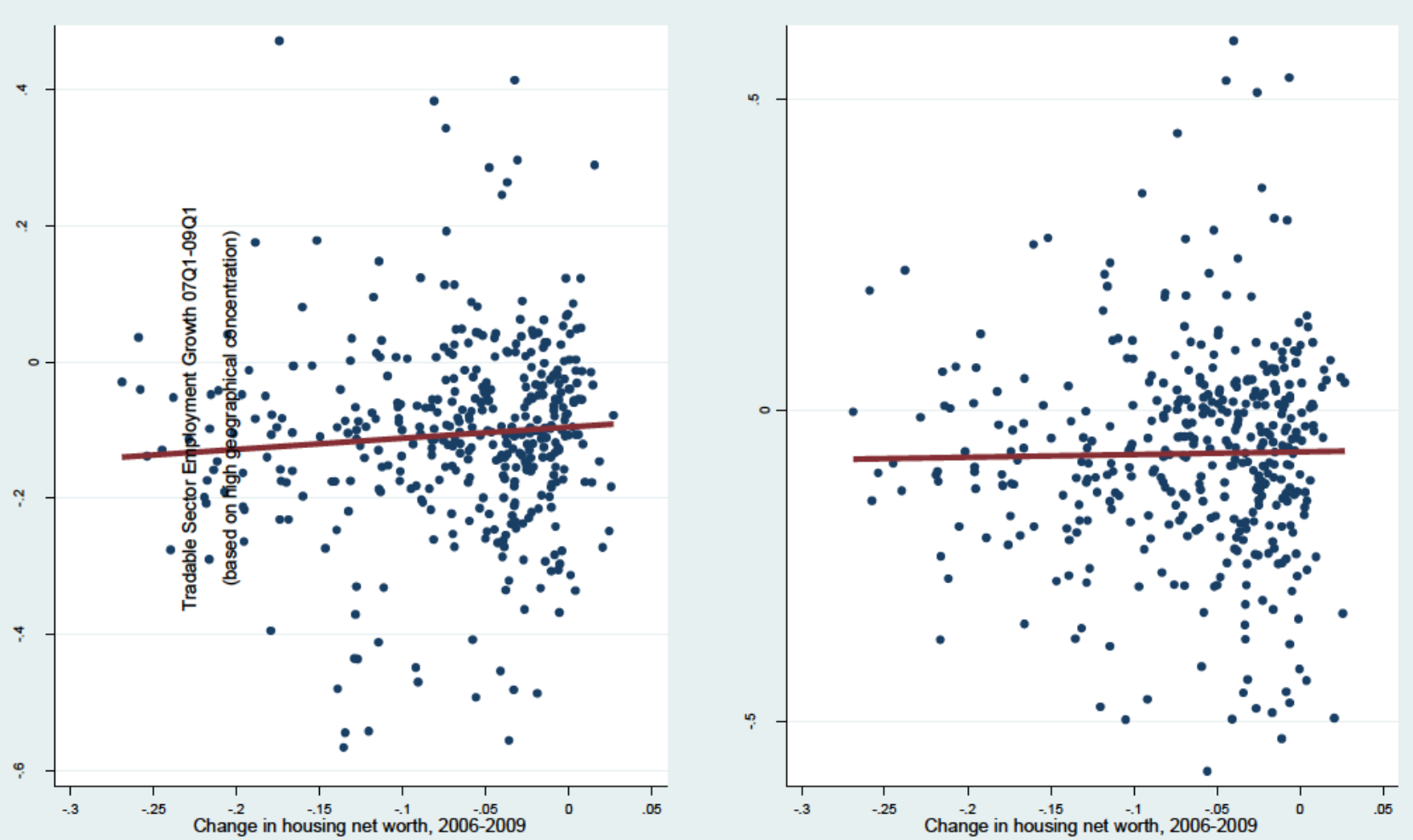
# Mian and Sufi (2014): Employment Effects

- Can debt deleveraging explain the large increase in unemployment in 2007-9?
- Mian and Sufi (2014) answer using clever strategy
  - Non-tradeables have only local demand, tradables have national demand
  - Compare emp responses to house price shock
    - Strong non-tradeable effect if deleveraging is important
    - Tradeable effect depends on GE effects and could go either way
- Argue against other explanations: Supply side, construction, uncertainty, credit supply

# Change in Non-Tradeable Employment vs. Net Worth Shock



# Change in Tradeable Employment vs. Net Worth Shock



# What Explains Housing Wealth Effect?

- Is housing wealth effect surprising?
  - Basic theory says yes!
- First pass intuition: If you are going to live in house forever, change in its price does not change your budget set
- More sophisticated intuition from Sinai and Souleles (2005)
  - House prices are NPV of future rents
  - House prices $\uparrow \rightarrow$ future rents and future house prices $\uparrow$
  - For infinite horizon household, Increase in liabilities offsets increase in asset value so no net wealth change

# What Explains Housing Wealth Effect?

- Berger et al. (2018) reexamine with incomplete market lifecycle model with:
  1. Income and house price risk
  2. Rent or own decision
  3. Ability to borrow against house value
- Show model is in line with empirical evidence, but wealth effect depends on joint distribution of housing and debt
- Intuition: with no adjustment costs, C-D utility, permanent house price shocks, they show that:
  - Substitution effect, income effect due to changes in future implicit rents, and collateral effect cancel
  - This leaves endowment effect from revaluation of initial endowment, and $dC \approx MPC \times PH$
  - This sufficient statistics formula is quite robust

# Guren, McKay, Nakamura, and Steinsson (2021): Housing Wealth Effects: The Long View

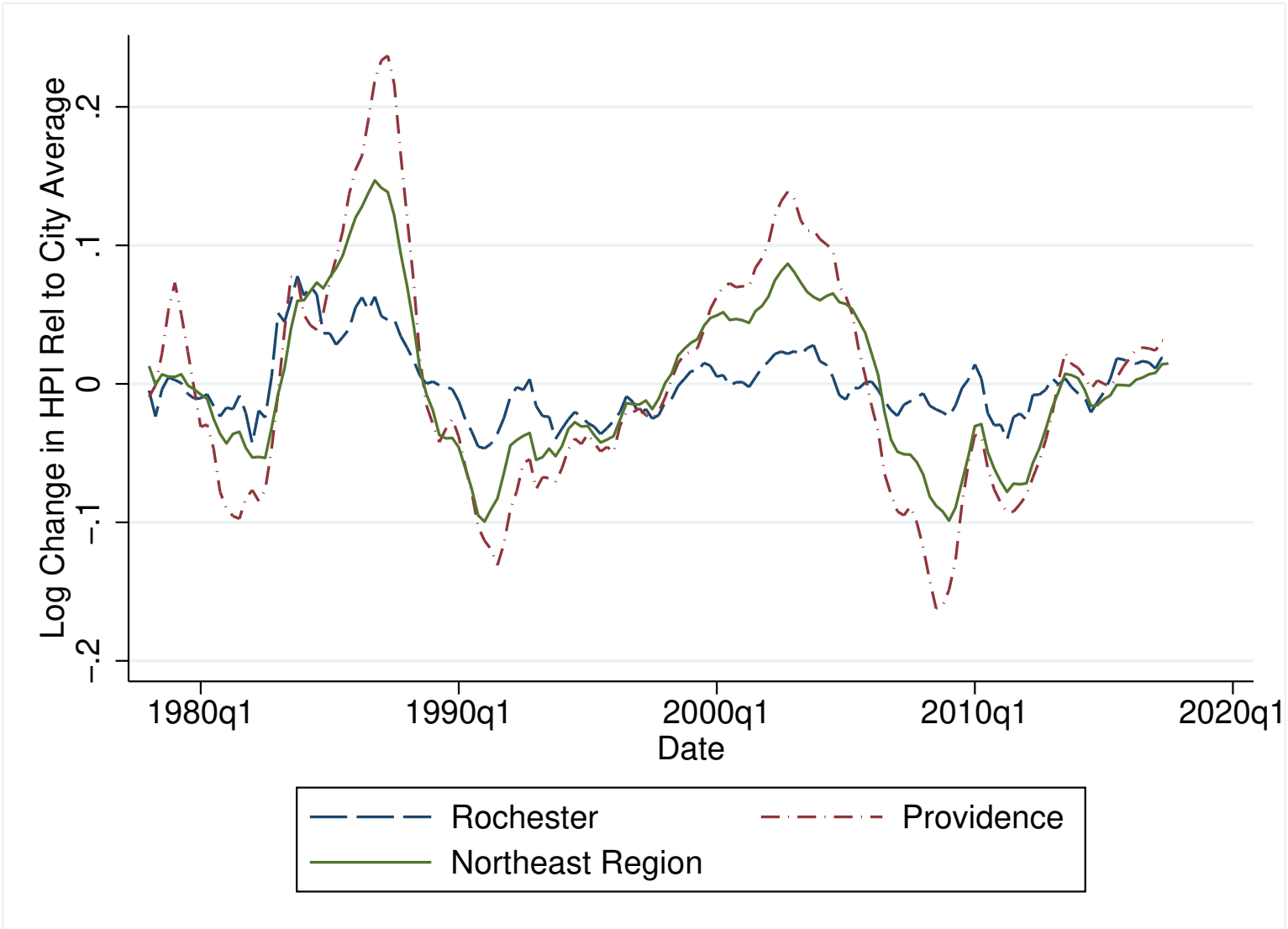
- Substantial evidence of "housing wealth effects" in the 2000s boom and Great Recession (Mian and Sufi)
- Where the 2000s boom-bust special?
  - Boom: Automated underwriting, subprime credit, HELOCs
  - Bust: House price and credit $\downarrow$ trigger deleveraging
- What GMNS do:
  - Estimate housing wealth effect back to early 1980s using consistent methodology
    - Panel approach: Addresses Davidoff (2013) concerns
    - Novel cross-cities identification strategy based on historic sensitivity building on Palmer (2015)
    - Large housing wealth effect back to 1980s
  - Explain results using model "new canonical model" of housing wealth effects

# Empirical Framework

$$\Delta y_{i,r,t} = \psi_i + \xi_{r,t} + \beta \Delta p_{i,r,t} + \Gamma X_{i,r,t} + \varepsilon_{i,r,t}$$

- $i$ is CBSA (i.e., city), $r$ is region, $t$ is quarter, and $\Delta$ is annual difference.
- Goal is to estimate $\beta$
  - Effect of a foreign demand shock to housing in a structural model
- Exploit panel: Control for fixed effects, industry shares, diff exposure to agg shocks
  - Addresses Davidoff, concerns about diff exposure to cycle
- New approach to identification: "sensitivity instrument"
  - Exploit differential sensitivity of local house prices to regional housing cycles (Sinai 2012; Palmer 2015)
  - Compare to OLS and panel Saiz, which tell same story

# Sensitivity Example: Providence vs. Rochester



# Sensitivity Instrument: First Pass

- Estimate:

$$\Delta p_{i,r,t} = \varphi_i + \gamma_i \Delta P_{r,t} + \nu_{i,r,t}.$$

  and use $\hat{\gamma}_i \Delta P_{r,t}$ as our instrument?

- Intuition: Differences in housing supply curves across locations lead to different response of house prices to aggregate shocks
- Concern: Heterogeneous $\hat{\gamma}_i$ could arise from reverse causation
  - Heterogeneous industrial structure $\rightarrow$ heterogenous business cycle volatility $\rightarrow$ heterogeneous house price volatility

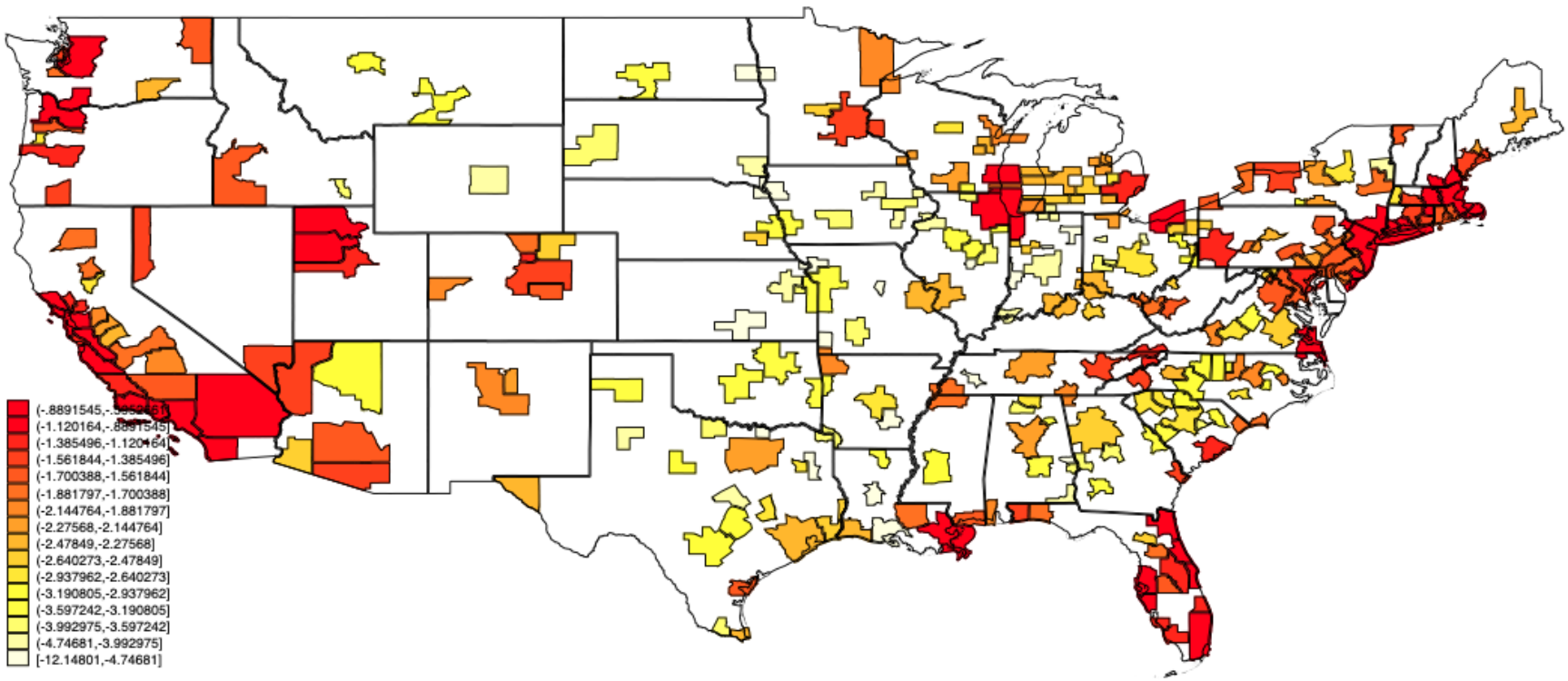
# Sensitivity Instrument: Refined Version

- Control for local and agg change in $y$ when estimating $\gamma_i$:

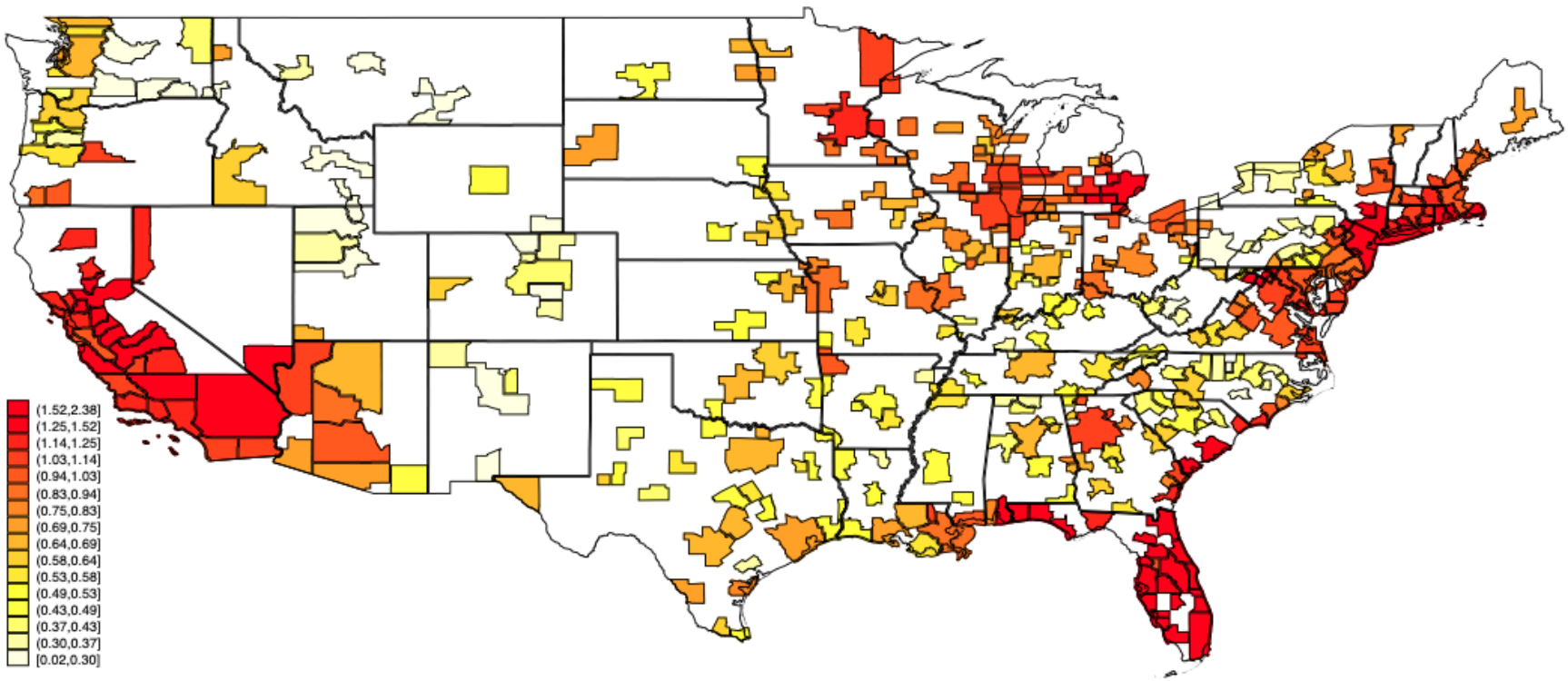
$$\Delta p_{i,r,t} = \varphi_i + \delta_i \Delta y_{i,r,t} + \mu_i \Delta Y_{r,t} + \gamma_i \Delta P_{r,t} + \nu_{i,r,t}$$

  and use $\hat{\gamma}_i \Delta P_{r,t}$ as our instrument.
  - R-squared without $\gamma_i \Delta P_{r,t}$ term: 0.24
  - Adding $\gamma_i \Delta P_{r,t}$ term raises R-squared to 0.71!
  - **Large part of housing cycles orthogonal to local employment cycles.**
- $\hat{\gamma}_i \Delta P_{r,t}$ correlated with Saiz and Wharton Land Use Regulation Index, but much more powerful.
  - Interpretation: Better measure of supply elasticity.
  - Concern: Including some "endogenous" variation. But Saiz also endogenous, so might as well use all the variation we have and purify it as best we can

# Heat Map: Saiz Elasticity



# Heat Map: Sensitivity Instrument



# Identifying Assumption

- Not some other unobserved aggregate factor that:
  1. Moves with house prices in time series.
  2. Differentially affects the same set of cities
- Similar to assumptions behind a Bartik instrument (which we will discuss soon)
  - Consider differential exposure to oil shocks (Texas vs Florida)
  - Not some other factor that happens to differentially affect Texas at the same time as oil price go up
- Panel data allows us to add controls:
  - We can estimate sensitivity to other observables and control
  - *E.g.*, cyclical sensitivity, industrial structure
  - Identification assumption *conditional on these controls*

# GMNS Identification Strategy Summary

- Estimate:

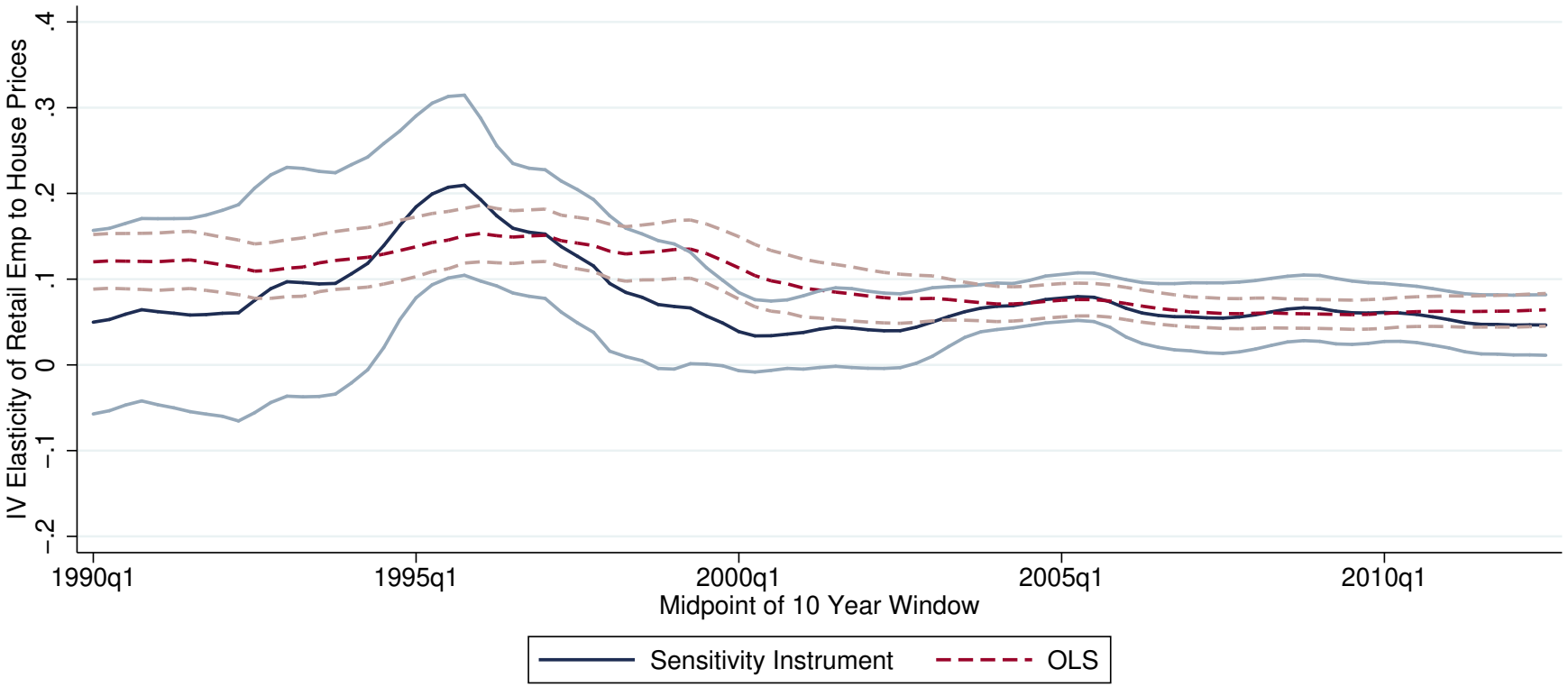
$$\Delta y_{i,r,t} = \psi_i + \xi_{r,t} + \beta \Delta p_{i,r,t} + \Gamma X_{i,r,t} + \varepsilon_{i,r,t}$$

  by IV with $z_{i,r,t} = \hat{\gamma}_i \Delta P_{r,t}$ where $\hat{\gamma}_i$ is obtained from

$$\Delta p_{i,r,t} = \varphi_i + \delta_i \Delta y_{i,r,t} + \mu_i \Delta Y_{r,t} + \gamma_i \Delta P_{r,t} + \nu_{i,r,t}$$

- Exploits systematic differences in sensitivity of local house prices to regional house price cycles
- Does not reflect systematic differences in local business cycles that induce systematic differences in local house prices
- Details:
  - 10 year rolling window estimation
  - Leave-one-out on time and city to avoid mechanical correlations in small sample
  - Use retail employment per capita as proxy for consumption; historical regional "consumption" data extrapolates from this

# Elasticity of Retail Emp to House Prices: 10-Year Windows



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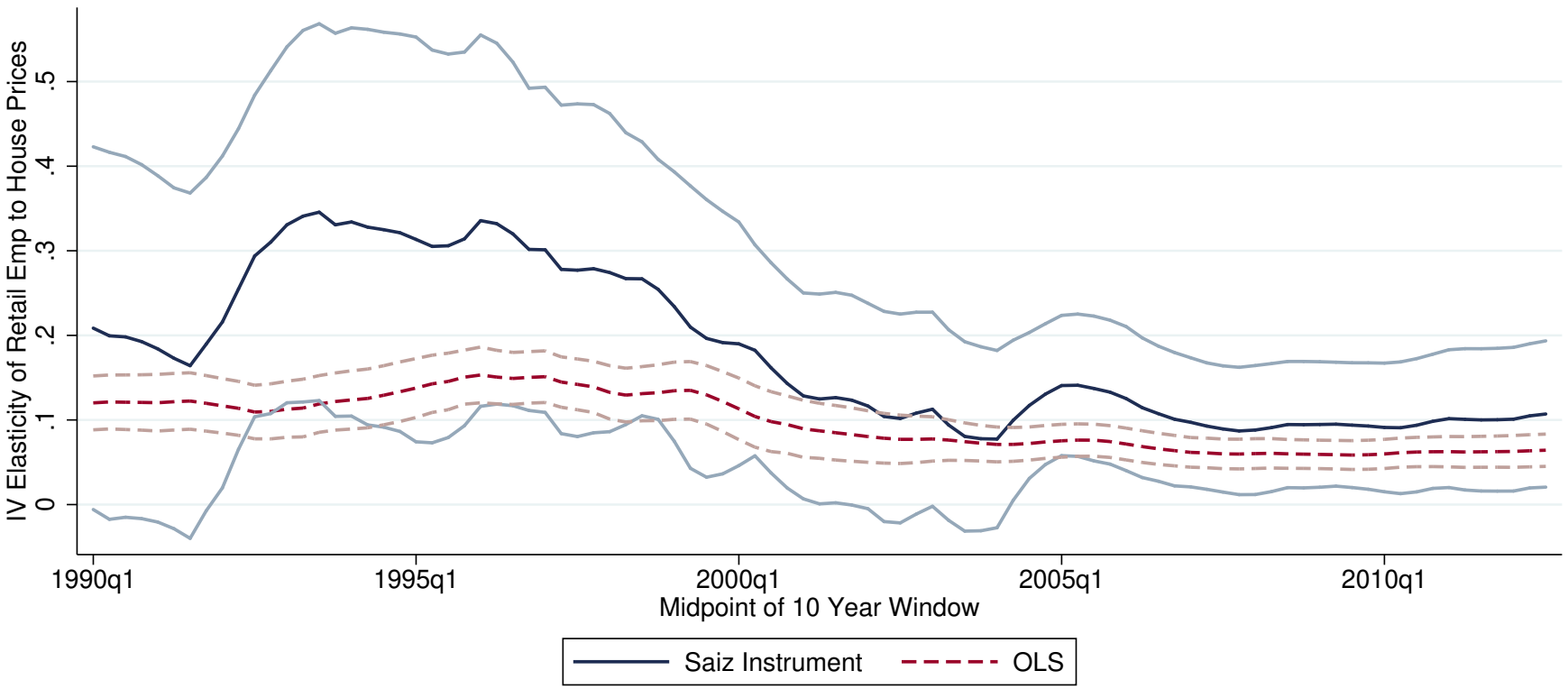
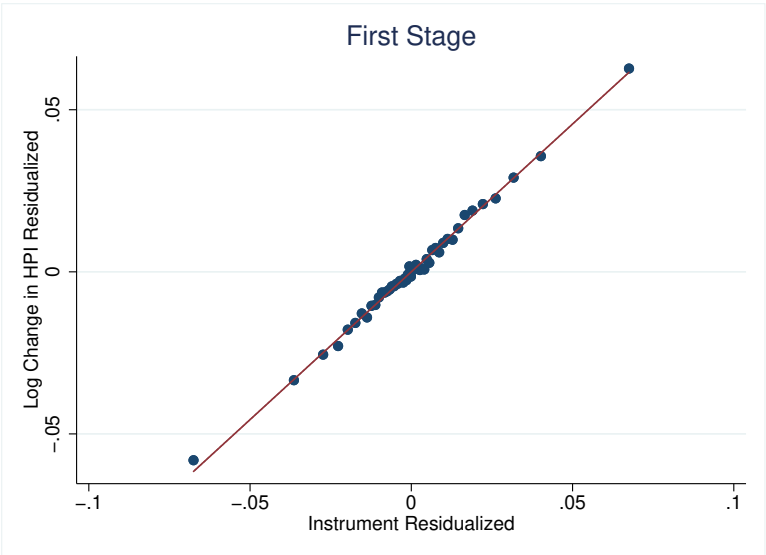
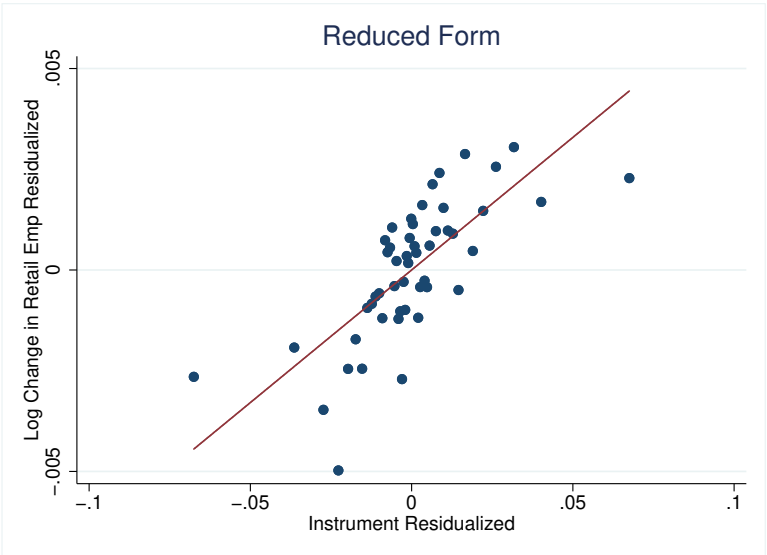


# Pooled Estimates and Statistical Tests




- Pooled sensitivity estimate for 1990-2017: 0.072 (0.015).
- Implied marginal propensity to consume out of housing wealth: 3.32 cents per dollar of housing wealth (7.2/2.17=3.32)
- When statistically test, boom and bust elasticity are if anything *lower*

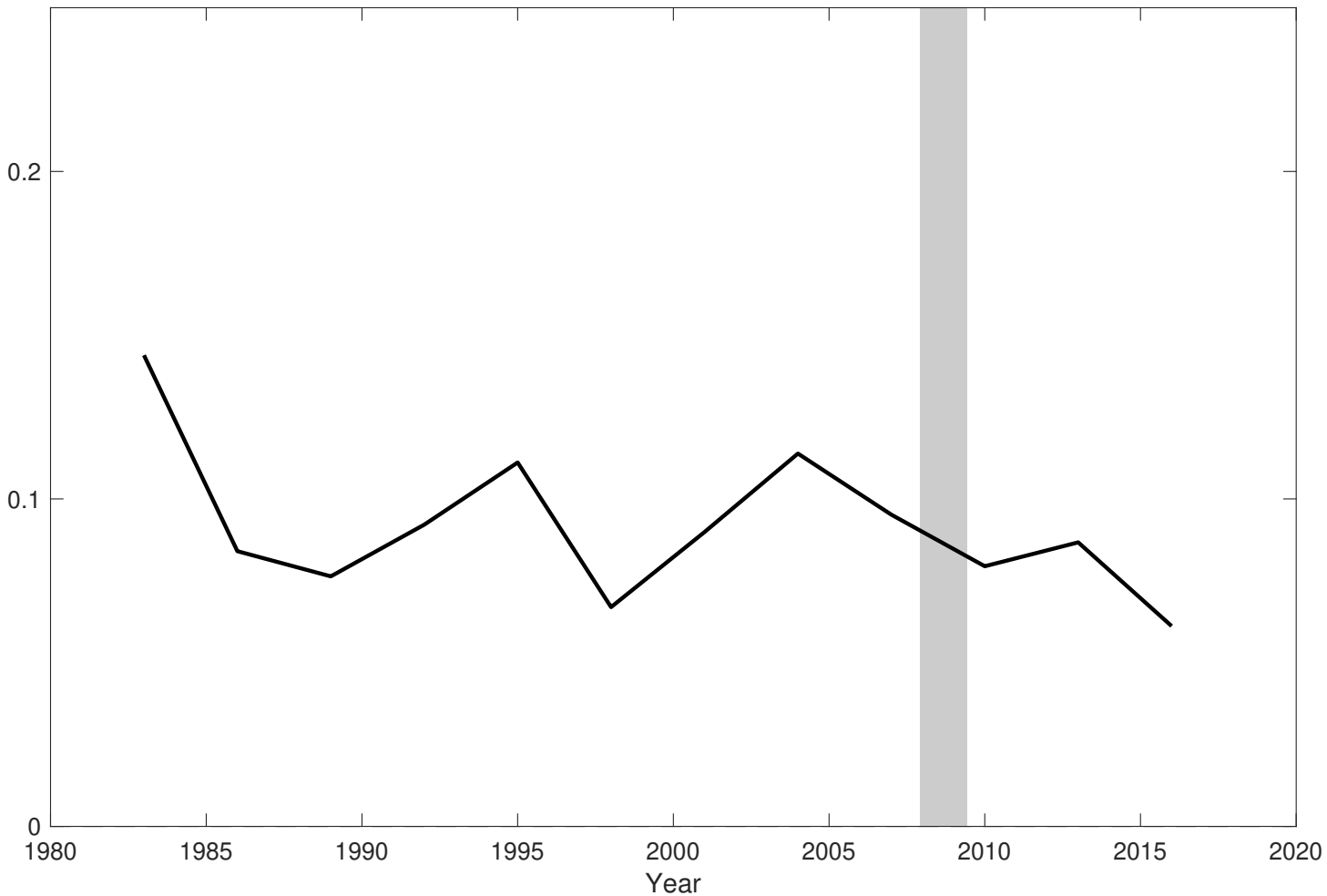
# Model Sketch: "New Canonical Model"

- Lifecycle incomplete markets model with:
  - Uninsurable income risk
  - Long-term mortgages (only way to borrow), liquid asset
  - LTV Constraint $M' \leq \theta P H'$
  - CRRA preferences over CES bundle of housing (utility bump from owning) and non-durable consumption with warm-glow bequest motive (so do not eat equity in retirement)
- Solve model for $C$ function as a function of state variables
  - Liquid assets, mortgage, home value, income, age, house price
  - Assume households expect house prices will remain constant in future (consider extensions later)
- Calculate derivative of city consumption to house price by integrating over states

$$\frac{\partial C}{\partial P} = \frac{\partial}{\partial P} \int c(a, m, h, y, t, P) d\Phi(a, m, h, y, t)$$

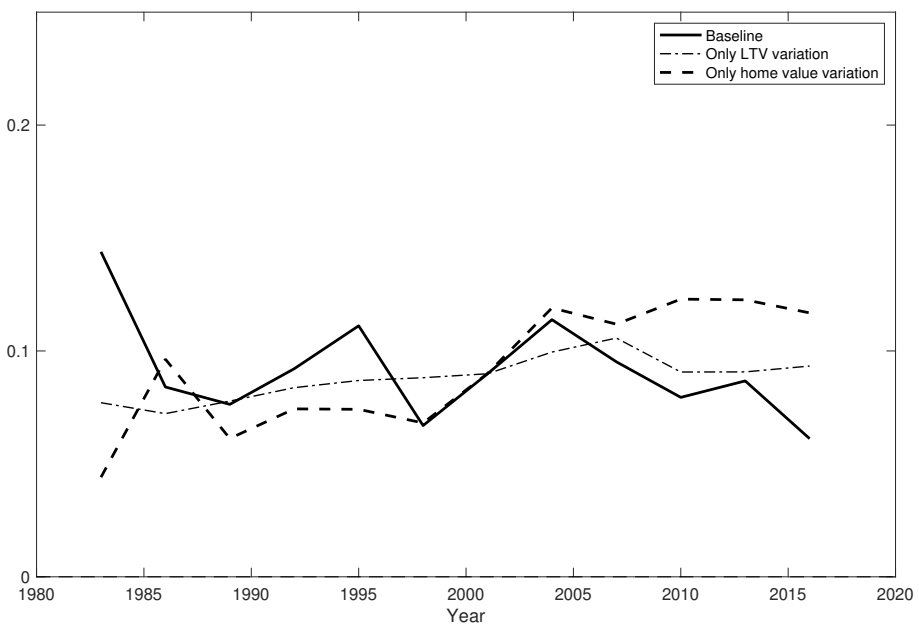
  - Distribution of states, $\Phi_t$, is empirical distribution from SCF

# Theory: Local Consumption Response to House Prices



# Evolution of Household Leverage

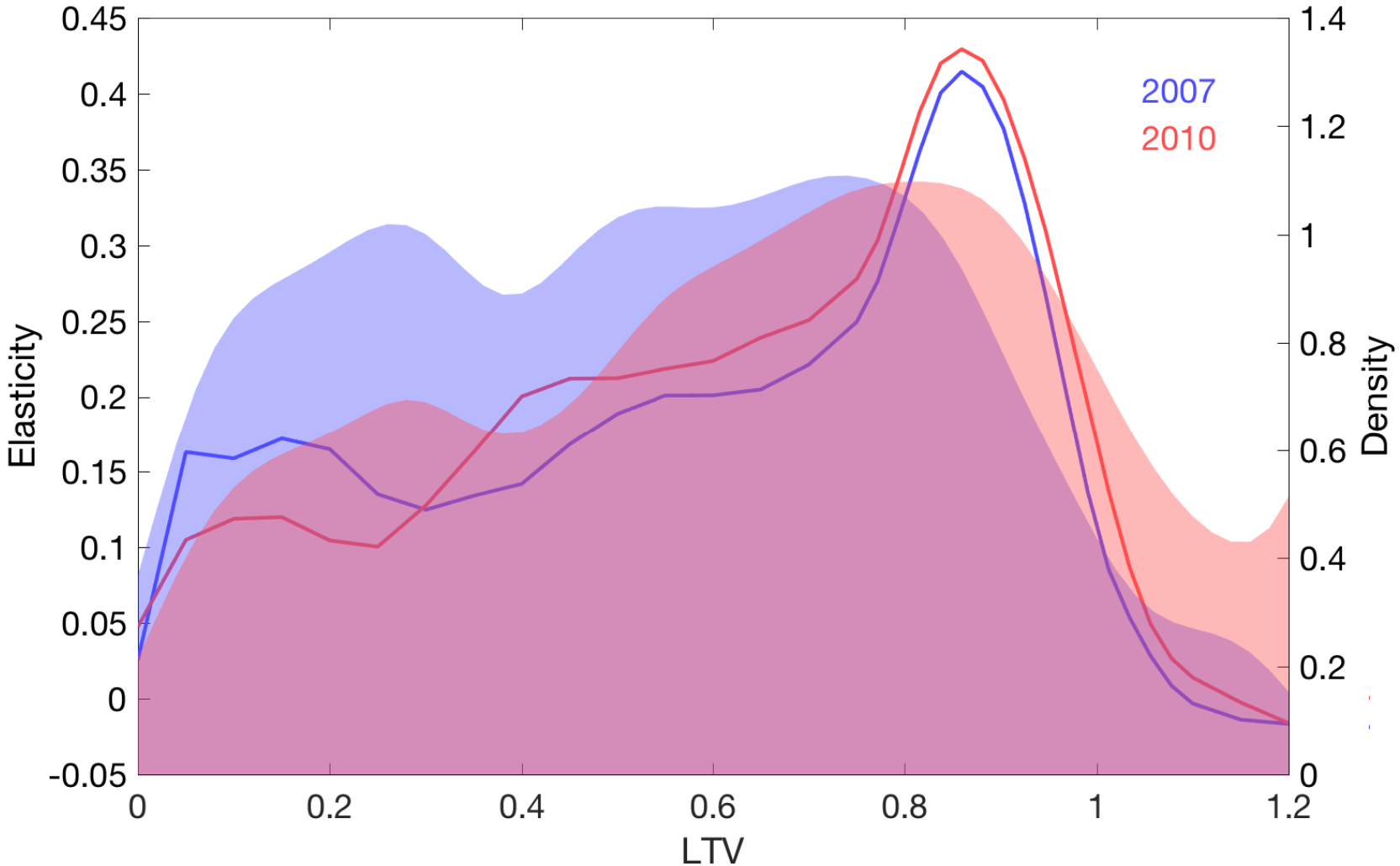
- Spike in leverage during the Great Recession as prices fall
- "Great Leveraging" of 80's and 90's: 75th percentile of LTV's rose from 0.4 to 0.8
- Why didn't either of these lead to bigger changes in housing wealth elasticity?
  - Counterfactual with only marginal dist of LTV changing:



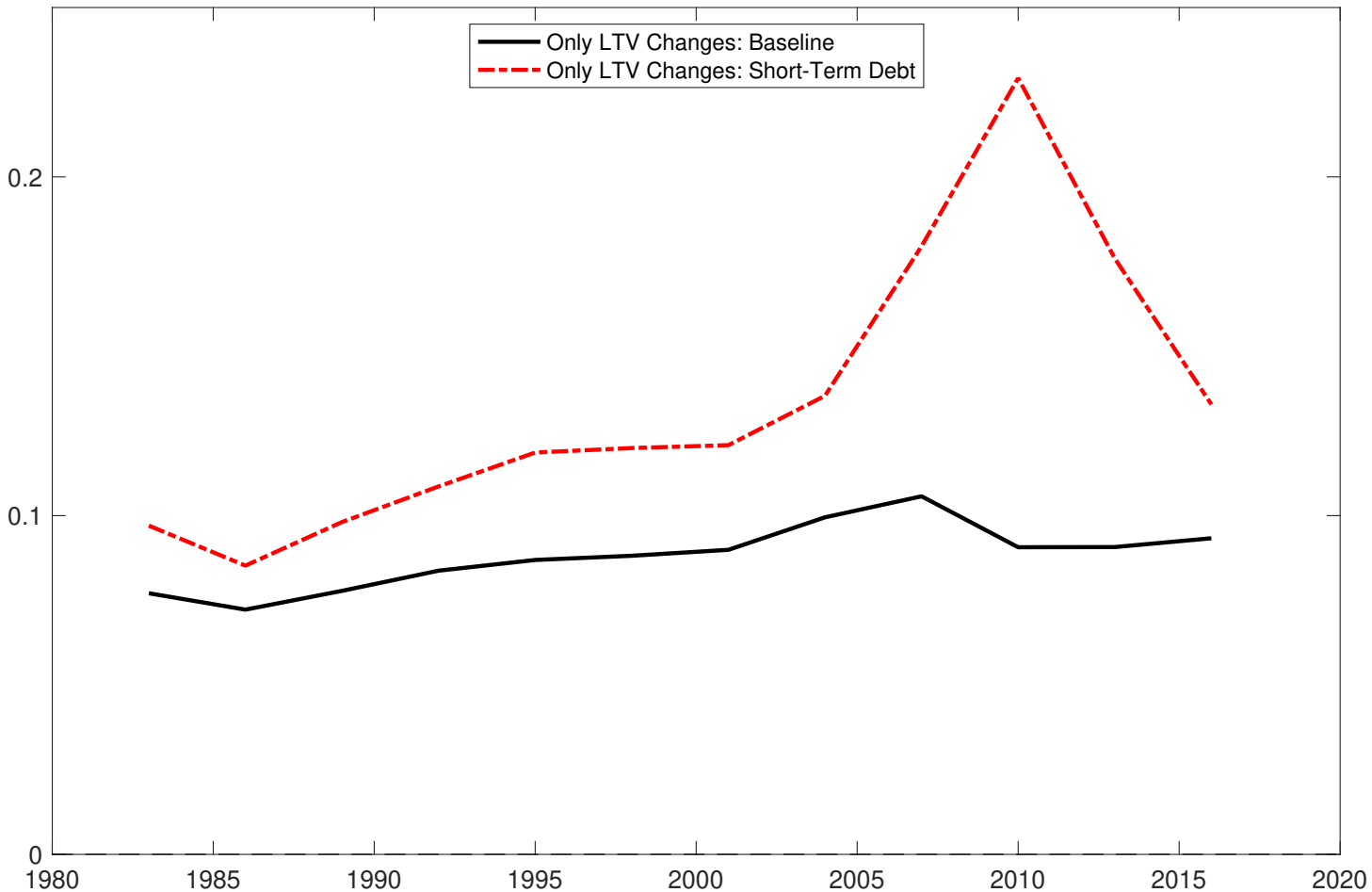
# Why so Stable? Intuition

1. High MPC out of housing wealth for unconstrained due to impatience
   - Incomplete Markets:$\beta < R^{-1}$ due to precautionary motive (vs. PIH implies $\beta = R^{-1}$)
   - Even low LTV homeowners (62% in 2007) have substantial MPCs, MPC does not change much with LTV for low LTV homeowners
2. "Hump" in MPC out of housing wealth
   - MPC rises as households approach borrowing constraint, then falls for underwater households (Ganong and Noel)
   - Effects of households being pushed into constraint offset by effect of households pushed far past constraint
   - This effect depends crucially on mortgage debt being long-term

# Hump in LTVs


0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
Elasticity
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Density
2007
2010
0
0.2
0.4
0.6
0.8
1
1.2
LTV

# Role of Long-Term Debt




- Without long-term debt, underwater households also have high elasticities

# Housing Wealth Effects Literature Summary

- Marginal propensity to spend out of housing wealth is between 3 and 5 cents and relatively stable over time
  - Makes sense in workhorse "new canonical model" – life cycle incomplete market model with realistic mortgages
  - Aggregates to a big effect with massive changes in house prices like 2000s boom and bust and COVID boom
  - But not a huge force for smaller changes in house prices, e.g. in response to a small monetary shock
  - Unclear whether this will be the case with mortgage rates rising dramatically in recent months. What changes when rates spike in a high inflation environment?
- Compare to MPC of 3.2 cents per year for stocks from Chodorow-Reich, Nenov, and Simsek
  - Is housing that special or different? Perhaps in mechanisms (sell stocks to spend out of stock wealth, refinance to consume out of housing wealth) but maybe not significant in magnitude
  - Comparative wealth effects provide interesting open questions