House Prices, Local Demand, and Retail Prices

Johannes Stroebel
NYU Stern, NBER & CEPR

Joseph Vavra
Chicago Booth & NBER

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Introduction

- How do markups and prices respond to demand shocks?
  - Important for business cycle modeling.
  - Large empirical literature uses aggregate time-series data:
    - Hard to identify demand shock and measure marginal cost.
    - Little consensus on markup cyclicality.

Introduction

- How do markups and prices respond to demand shocks?
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    - Hard to identify demand shock and measure marginal cost.
    - Little consensus on markup cyclicality.
- **Our approach:** Link disaggregated data on house prices, retail prices, and shopping behavior to:
  1. Identify causal response of local retail prices to house-price-induced local demand shocks.
  2. Show that price response driven by Δ markups, not Δ marginal cost.
  3. Why? Show homeowners become less price sensitive when house prices rise, and firms respond by raising markups.
  4. Countercyclical shopping effort $\implies$ important component of markups is pro-cyclical

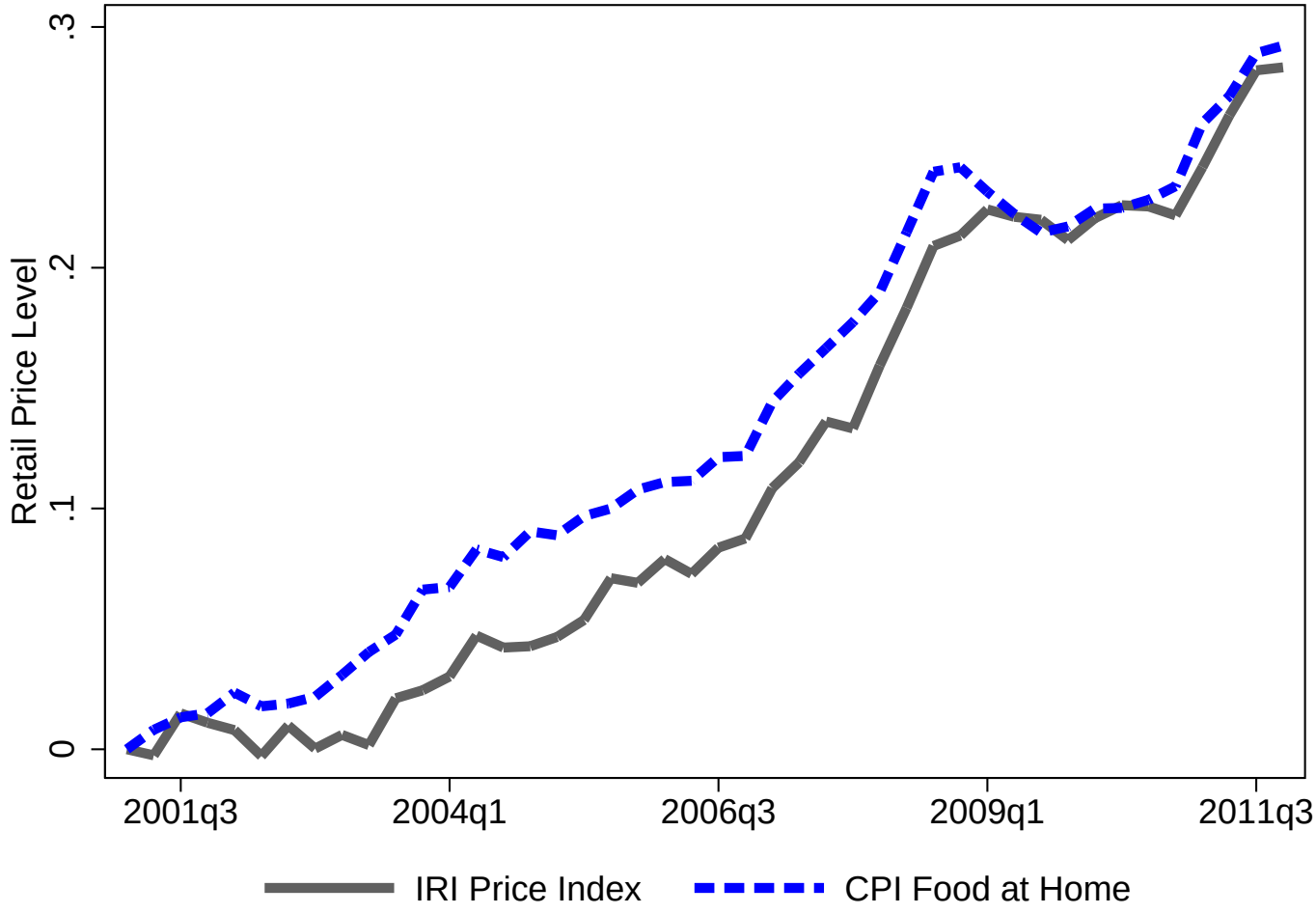
Why Study House-Price Driven Demand Shocks

- Directly informative for understanding Great Recession
- But patterns we identify more general, since share many characteristics with business cycle patterns
  - Unanticipated and large
  - Medium-Run persistence, business cycle frequencies
  - Shopping responses similar to aggregate business cycle
- Contrasts with existing literature that has studied store strikes, weather events, seasonal holidays

Constructing a Local Price Indices

- Data description:
  - Point-of-sale scanner data reported directly by stores to IRI.
  - Weekly data from 2001-2011 for 7,200 retail stores in 2,400 zip codes.
  - UPC-level price information for products in 31 categories (e.g., frozen dinners, carbonated beverages, toothpaste).
- Price Index Construction:
  - Annually chained retail price indices for MSAs and zip codes.
  - Approximate BLS-CPI construction.

IRI Data Compared to CPI



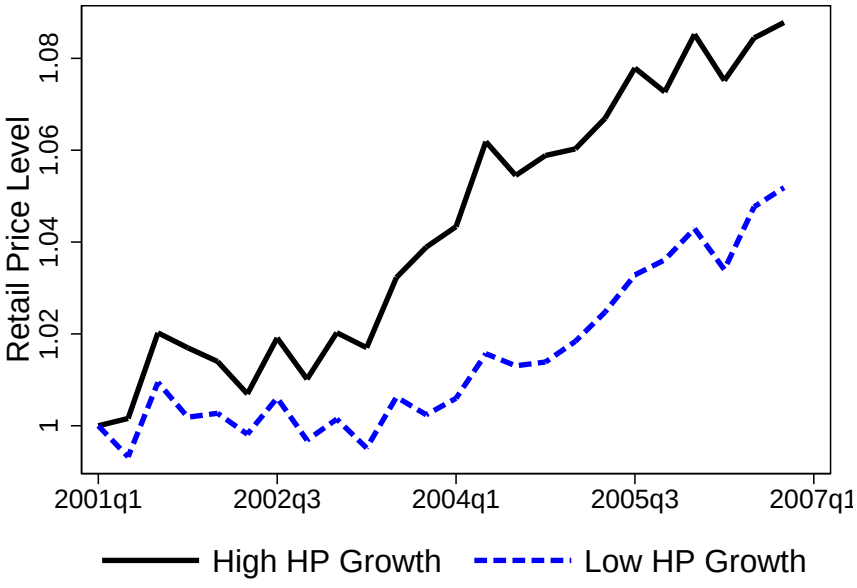
- Nationally-aggregated IRI index tracks CPI Food-at-Home.
  - Not exact since different regional and product coverage.

Section 1

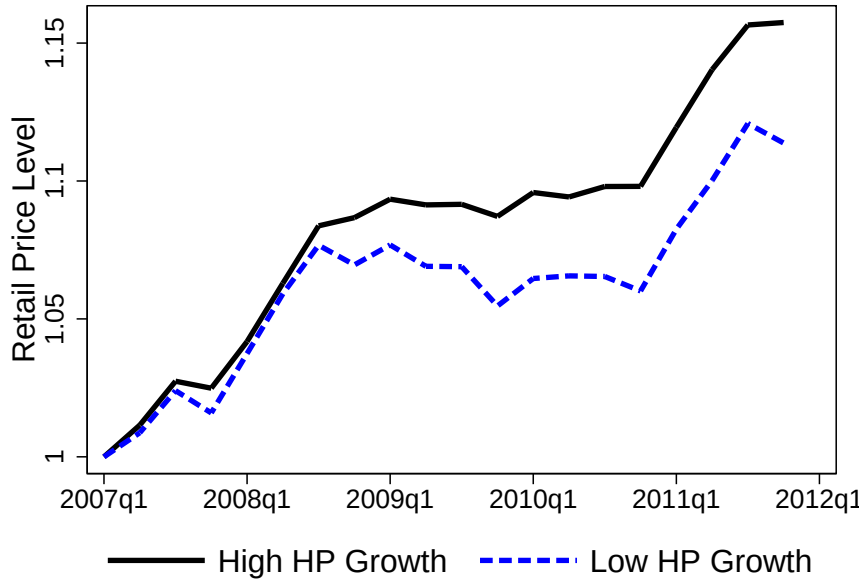
Effects of House Prices on Retail Prices

Empirical Results - Correlation

- Merge local retail price indices with local house price indices.
- Strong positive relationship between local retail prices and house prices.



(a) Time Period: 2001-2006



(b) Time Period: 2007-2011

Empirical Results - Causality

- Simultaneity concern: Common unobserved shock might raise both house prices and retail prices.
- Causal evidence using two complementary identification strategies:
  - Instrumental variables
  - Exploiting differences in house price effects for homeowners and renters
- Hard to rationalize alternative stories for both.

Identification Strategy 1 - Instrumental Variables

- Instrument for house price changes using well-studied measures of local housing supply elasticity:
  - Local geography-based supply elasticity (Saiz)
  - Wharton Regulation Index (Gyourko et al.)
- **Logic:** Same national housing demand shock translates into larger price increases where supply increases less elastically.
  - Strong predictors of house price changes in both boom and bust.
  - Exclusion restriction: Housing supply elasticity only affects retail price changes through house price channel.
    - Inherently untestable
    - Uncorrelated with many economic fundamentals such as income growth.
    - Correlated with some observables that we can and do control for.
    - In paper, we directly address other channels (e.g., entry)

Identification Strategy 1 - Instrumental Variables (MSA)

Second Stage: $\Delta \log RP_i = \alpha + \beta \Delta \widehat{\log HP}_i + \epsilon_i$

First Stage: $\Delta \log HP_i = \xi + \psi SupplyElasticity_i + \varepsilon_i$

	Second Stage – Dependent Variable: $\Delta \log RP_i$			
Time Period:	2001-2006 Saiz IV	2007-2011 Saiz IV	2001-2006 Wharton IV	2007-2011 Wharton IV
$\Delta \log HP$	0.129***	0.124***	0.224***	0.147***
	(0.042)	(0.042)	(0.048)	(0.048)
Num Obs	112	112	112	112

Identification Strategy 2: Renters vs. Owners

- Renters and homeowners: Different net asset positions in housing
  - House price increase asset value + implicit rent for home owners (Sinai and Souleles, 2005), no asset value increase for renters, who still face higher rents.
- Various channels can lead housing wealth to generate real wealth effects for homeowners, none of which apply to renters.
  - Relaxed borrowing constraints
  - Can move to realize capital gain
  - Target bequests or behavioral stories
- Rising house prices increase **relative** wealth for homeowners, so should see strong interaction between house prices, retail prices and owner occupancy rates

Identification Strategy 2: Renters vs. Owners

- Looking at owner occupancy interaction requires moving to zip code level analysis to have power.
  - Zip code level owner occupancy rates from 9%-98%, SD of 16%
  - Much smaller variation across MSAs
- Only show zip code results for additional identification evidence, not primary elasticity estimate
- Zip code results probably biased down relative to MSA benchmark:
  - Zip code data noiser, not all shopping in zip codes, no zip code IV

Identification Strategy 2: Renters vs. Owners

$$\Delta \log RP_i = \alpha + \beta_1 \Delta \log HP_i + \beta_2 \Delta \log HP_i \times Occ_i + \beta_3 Occ_i + \varepsilon_i$$

	Boom (2001-2006)		Bust (2007-2011)	
log *HP*	0.046***	-0.049	0.026***	-0.036***
	(0.009)	(.032)	(0.009)	(0.032)
log *HP* × *OwnOcc*		0.144***		0.090**
		(0.048)		(0.046)
OwnOcc		-0.063**		0.026
		(0.027)		(0.019)
Labor Market Controls	YES	YES	YES	YES
Number of Observations	708	708	846	846

Identification Strategy 2: Renters vs. Owners

- Is zip code homeownership rate just picking up other demographics?
  - Could correlate with age, which might affect responsiveness to housing wealth shocks.
  - Could correlate with population density, which affects share bought in zip code (and therefore measured response).
- Include interaction of house price change with (i) age and (ii) population density; does not affect estimated homeownership interaction.

Section 2

Why do retail prices rise?

Empirical Results - Markups or Marginal Costs?

- Price increase: Higher markup or higher marginal cost?

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    - COGS 75% of total cost, nearly all of marginal cost.

      $\longrightarrow$ Local component in marginal cost small.
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    - Robust to excluding goods with high local value (e.g., milk).
  - Controlling for wages and labor market conditions doesn't change result.
  - Results not driven by changes in firms' rent overhead.
    - Elasticity of retail rent wrt. house prices over period only 10%.
    - Control for Δ retail rent.
    - Results persist after excluding high-rent cities (e.g., New York).
    - Rent pass-through could not explain HO interaction.

Directly measuring costs and markups

- IRI data only has prices, but obtain data from "large-retailer" used in Jaimovich, Eichenbaum and Rebelo (2012)
  - Internal measure of marginal cost ("shadow replacement cost") inclusive of wholesale cost, shipping, and various vendor rebates
  - Relevant measure for their price-setting
  - Construct price, marginal cost and markup index just like in IRI
- Disadvantages relative to IRI:
  - Single chain with only 240 stores (IRI has 7,200), so learning about specific retailer rather than broad local prices
  - 2004q1-2007q2
  - 192 zip codes but only 39 MSAs and most of these only have 1 store, data concentrated in CA, TX, NJ
  - MSA analysis infeasible, focus on zip-HO interaction

Observable markup results

$$\Delta \log Outcome_i = \alpha + \beta_1 \Delta \log HP_i + \beta_2 \Delta \log HP_i \times Occ_i + \beta_3 Occ_i + \varepsilon_i$$

2004q1-2007q2

	ΔRP	Δ Markup	Δ Cost
$\Delta \log HP$	-0.093	-0.132*	0.041
	(0.083)	(.077)	(0.080)
$\Delta \log HP \times OwnOcc$	0.146**	0.172***	-0.026
	(0.072)	(0.065)	(0.067)
$OwnOcc$	-0.038	-0.041	0.003
	(0.019)	(0.018)	(0.020)
Labor Market Controls	YES	YES	YES
Demographic/Density Controls	YES	YES	YES
Number of Observations	192	192	192

$\rightarrow$ If not marginal cost pass-through, has to be higher markups.

Section 3

Household-Level Evidence

Empirical Results - Shopping and Demand Elasticity

- Why raise markups?
  - Higher house prices make homeowners less price sensitive.
  - Many optimal price-setting models then imply larger markups.
- Evidence? Use household shopping data to measure price sensitivity.
  - Nielsen Homsecan household panel from 2004-2011.
  - 125k households in over 20k zip codes.
  - Households record expenditures and prices on shopping trips.
  - Record which goods purchased on sale, with coupon or generic.

Effect on Broad Expenditures

$$\log Exp_{i,t} = \beta \log HP_{i,t} + \alpha \log HP_{i,t} \times Own_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t}$$

Dependent Variable:	log *Exp*	log *Exp*
log *HP*	-0.018	-0.021
	(0.014)	(0.015)
log *HP* × *Own*	0.050***	0.052***
	(0.014)	(0.014)
Time Fixed Effect	YES	YES
Household Fixed Effect	YES	YES
Labor Market Controls	NO	YES
Number of Observations	830,142	802,200

- Suggests that ⇑ HP generates a demand shock.

Empirical Results - Shopping and Demand Elasticity

$$\log ExpShare_{i,t} = \beta \log HP_{i,t} + \alpha \log HP_{i,t} \times Own_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t}$$

Dependent Variable:	$Frac_{deal}$	$Frac_{coupon}$	$Frac_{generic}$
log *HP*	0.021***	0.007***	0.001
	(0.005)	(0.003)	(0.003)
log *HP* × *Own*	-0.022***	-0.014***	-0.008**
	(0.005)	(0.002)	(0.003)
Time Fixed Effect	YES	YES	YES
Household Fixed Effect	YES	YES	YES
Labor Market Controls	YES	YES	YES
Mean Dependent Variable	0.298	0.075	0.172
Number of Observations	802,200	802,200	802,200

Section 4

Summary and Implications

Summary of Empirical Evidence

- Strong positive relationship between HP and RP
  - Both in OLS and various different IVs
  - Not driven by observable costs or commercial rents
  - Suggests that house price increases cause increases in retail markups
- Different relationship between HP and RP for high and low owner-occupancy zip codes
  - Naturally explained if capturing wealth effect
  - Hard to think of unobserved confounding shock that would match this evidence
- Shopping behavior changes in a way consistent with wealth effects
  - Again, strong interaction with home ownership

Implications for Inflation Magnitudes

- Our pricing elasticities imply 4.4 - 8.4% increase in retail prices from aggregate house price boom (2001-2007).
  - Food-at-home CPI increase was 13.2%, broad CPI increased 14.5%.
  - Other factors also affect aggregate inflation (trade, oil prices).
- Our elasticities explain half the cross-MSA heterogeneity in retail price changes.
  - Differential housing boom-bust was one of largest regional factors during sample period.

Implications for Business Cycle Modeling

- Demand shocks provide pro-cyclical force on firms' **desired** markups.
  - Works against sticky-price counter-cyclical markup.
  - Total markup sum of both effects: complicates learning about NK channel from cyclicality of total markup.
- Business Cycle Modeling:
  - Simple NK models, assume constant desired markups: not supported
  - Quantitative models (e.g., Smets-Wouters) add *exogenous* shocks to desired markups: can be rationalized by our evidence
  - But our evidence implies desired markups *endogenously* respond to policy (Lucas critique).

Implications for Urban and Real Estate Economics

- Geographic Variation Literature:
  - Growing literature exploits geographical variation to study macro questions: should be cautious of "PEQ" style conclusions
    - Aggregating nominal consumption responses from local level might overstate aggregate real effect
- Regional Insurance:
  - Price movements can potentially help insure against local shocks: retail prices fall in regions that experience negative wealth shocks.
  - Amplifies conclusions in Notowidigdo (2013).
- Spatial sorting:
  - In Roback style models, workers sort across locations to equalize costs and benefits ... response of retail prices to house prices can be an important force