Learning about Housing Cost

Survey Evidence from the German House Price Boom

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joint with

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Central Bank of Ireland, December 2019

Motivation

- ► How are expectations formed in housing booms?

- ► Many theories of housing booms,

    but we don't have much micro/survey data on booms!

This paper

- ▶ Study German house price boom 2010–now

- ▶ Rich new data
  - ▶ survey expectations
  - ▶ household characteristics and choices
  - ▶ regional disaggregation

- ▶ Stylized facts on expectations:
  - ▶ forecasts lower than realized price growth
  - ▶ forecasts in line with local housing market conditions
  - ▶ cross section of forecasts: only region & tenure matter
  - ▶ renters always expect higher price growth than owners!

An explanation: learning about housing cost

- ▶ Special feature of housing as an asset
  - ▶ non-owners (= renters) pay rent, talk to renter neighbors
    - → receive cheap signals of dividend
  - ▶ owners consume dividend directly, as do owner neighbors
    - → need not know dividend

- ▶ Model of asset valuation & learning from prices
  - ▶ renters better informed about rents than owners
  - → booms with renters who expect higher price growth

- ▶ Direct evidence on learning mechanism
  - ▶ new data on rent forecasts and long-term expectations
  - ▶ signals about housing markets are cheap
  - ▶ renters look more to rents, owners more to prices
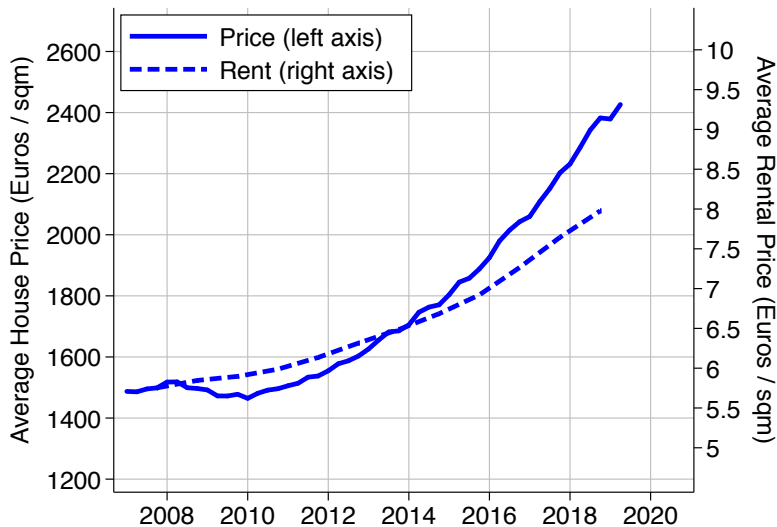
Stylized Facts

Primary data sources

- ▶ We merge three data sources

- ▶ Panel on Household Finances (PHF)
  - ▶ Detailed data on household characteristics and portfolios
  - ▶ Asks households to make forecasts of future prices
  - ▶ House price expectations in 2014 and 2017

- ▶ Online Survey of Consumer Expectations (SCE)
  - ▶ House price and rent expectations 2019

- ▶ House price data
  - ▶ bulwiengesa AG / destatis / vdp
  - ▶ data on sqm house prices and rents (transaction prices)
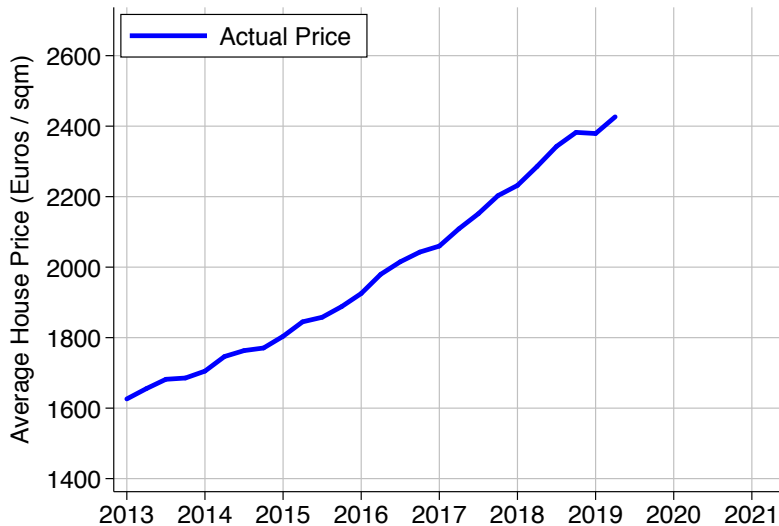 - ▶ on detailed regional level (Kreise/counties)
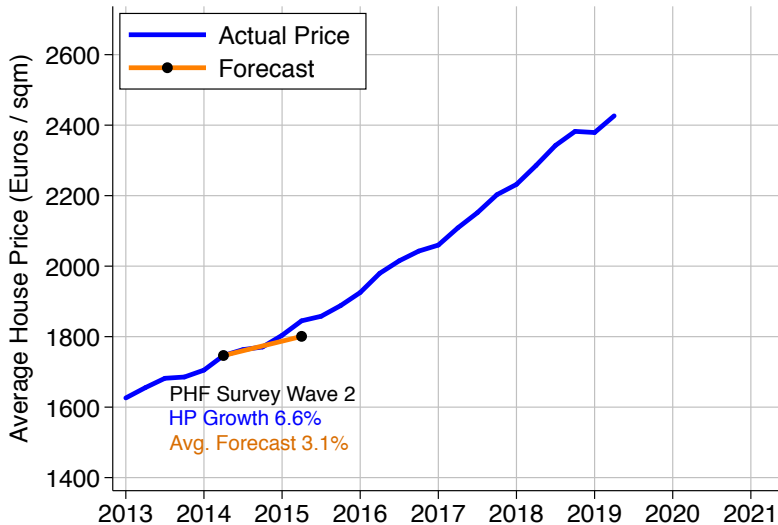
The German house price boom
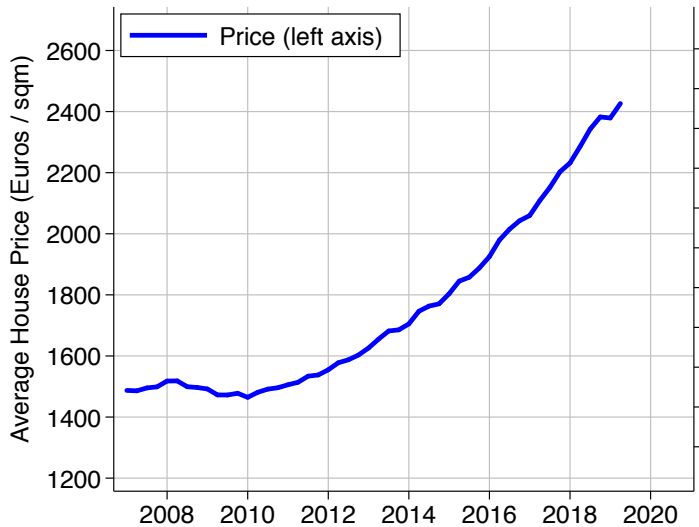
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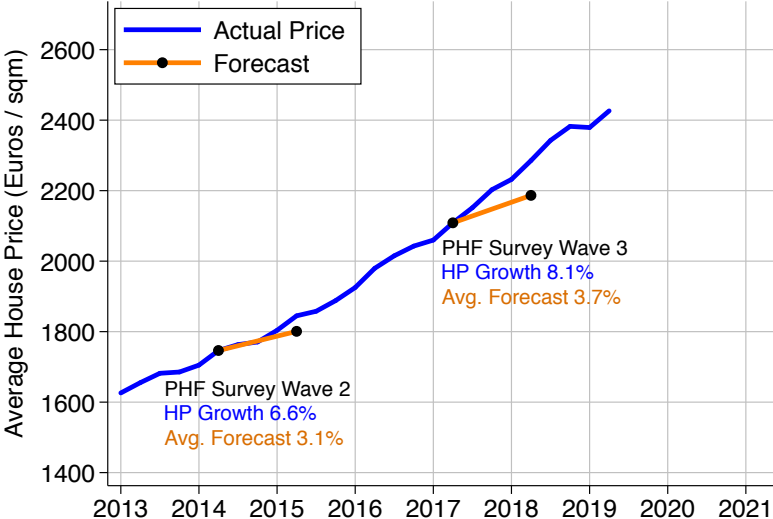

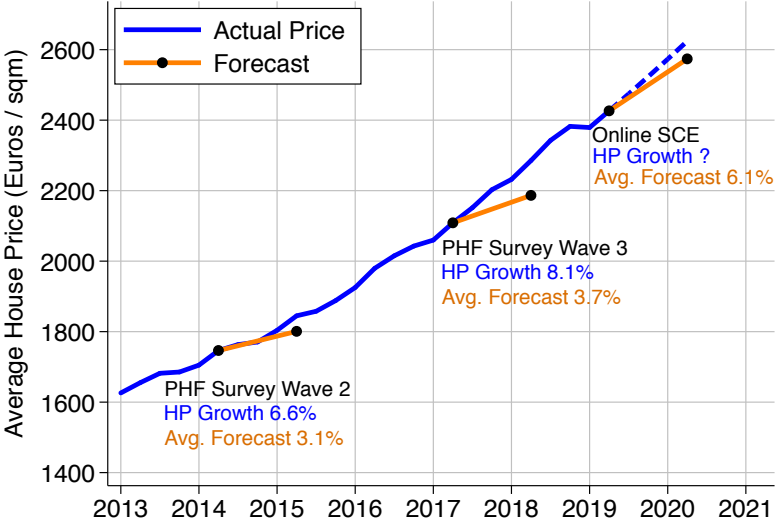▶ Rents grow before prices

Prices and forecasts

Prices and forecasts

Chart: Average House Price (Euros / sqm) vs year (2013–2021), showing Actual Price (blue) and Forecast (orange). Annotations: PHF Survey Wave 2, HP Growth 6.6%, Avg. Forecast 3.1%.
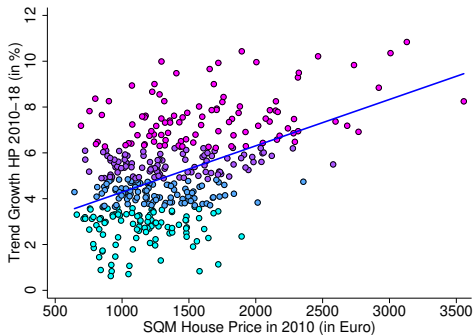
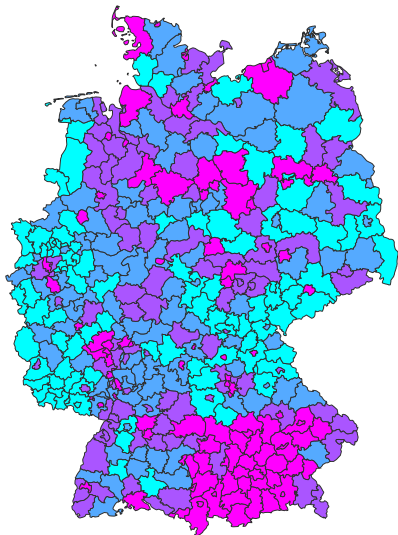# Prices and forecasts

Prices and forecasts

Regional heterogeneity (growth regions)

low growth   medium low growth   medium high growth   high growth

What predicts house price forecasts?

1. Demographics, wealth and income:
   - ▶ Age, household composition
   - ▶ Wealth and income quartiles

2. Behavioral traits:
   - ▶ Financial literacy, risk aversion, patience

3. Tenure:
   - ▶ Being an owner or a renter

4. Regional and housing characteristics:
   - ▶ Local house price growth
   - ▶ City center vs. outskirts, house size

Predicting house price forecasts

Demogr., Inc., Wealth
    Age Group 40–49
    5+ HH members
    Wealth Q3
    Wealth Q4

Behavioral Traits

Tenure
    Renter

Growth Region
    Medium Low
    Medium High
    High

Housing and Regional
    Sqm size/100
    (Sqm size/100)^2

Number of Cases
R-Square

Predicting house price forecasts

Demogr., Inc., Wealth	
Age Group 40–49	-1.348**
5+ HH members	-0.436
Wealth Q3	-1.830***
Wealth Q4	-1.569**
Behavioral Traits	
Tenure	
Renter	
Growth Region	
Medium Low	
Medium High	
High	
Housing and Regional	
Sqm size/100	
(Sqm size/100)^2	
Number of Cases	3647
R-Square	0.037

Predicting house price forecasts

Demogr., Inc., Wealth		
Age Group 40–49	-1.348**	-1.348**
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Wealth Q3	-1.830***	-1.840***
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Behavioral Traits		yes
Tenure		
Renter		
Growth Region		
Medium Low		
Medium High		
High		
Housing and Regional		
Sqm size/100		
(Sqm size/100)^2		
Number of Cases	3647	3647
R-Square	0.037	0.041

Predicting house price forecasts

Demogr., Inc., Wealth			
Age Group 40–49	-1.348**	-1.348**	-0.898
5+ HH members	-0.436	-0.388	0.317
Wealth Q3	-1.830***	-1.840***	-0.022
Wealth Q4	-1.569**	-1.545	0.517
Behavioral Traits		yes	yes
Tenure			
Renter			2.488***
Growth Region			
Medium Low			
Medium High			
High			
Housing and Regional			
Sqm size/100			
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Number of Cases	3647	3647	3647
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Predicting house price forecasts

Demogr., Inc., Wealth				
Age Group 40–49	-1.348**	-1.348**	-0.898	-0.773
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Wealth Q4	-1.569**	-1.545	0.517	0.213
Behavioral Traits		yes	yes	yes
Tenure				
Renter			2.488***	2.372***
Growth Region				
Medium Low				0.826***
Medium High				1.795***
High				3.631***
Housing and Regional				
Sqm size/100				
(Sqm size/100)^2				
Number of Cases	3647	3647	3647	3647
R-Square	0.037	0.041	0.064	0.121

Predicting house price forecasts

Demogr., Inc., Wealth					
Age Group 40–49	-1.348**	-1.348**	-0.898	-0.773	-0.454
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Wealth Q3	-1.830***	-1.840***	-0.022	0.064	0.390
Wealth Q4	-1.569**	-1.545	0.517	0.213	0.486
Behavioral Traits		yes	yes	yes	yes
Tenure					
Renter			2.488***	2.372***	2.071***
Growth Region					
Medium Low				0.826***	0.685**
Medium High				1.795***	1.309***
High				3.631***	2.903***
Housing and Regional					
Sqm size/100					-1.801**
(Sqm size/100)^2					0.469***
Number of Cases	3647	3647	3647	3647	3598
R-Square	0.037	0.041	0.064	0.121	0.145

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Stylized fact

- ► Central determinants of house price forecasts
    - ► tenure
    - ► local house price growth

Stylized fact

- ▶ Central determinants of house price forecasts
  - ▶ tenure
  - ▶ local house price growth
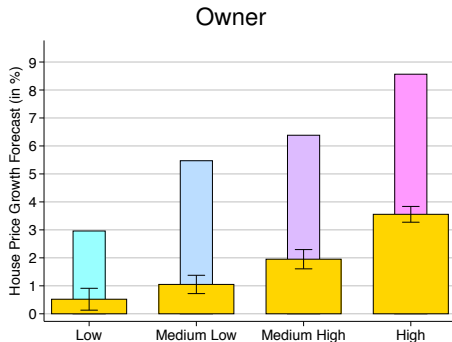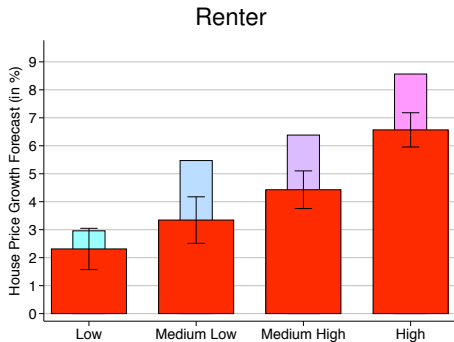
Difference persists over time
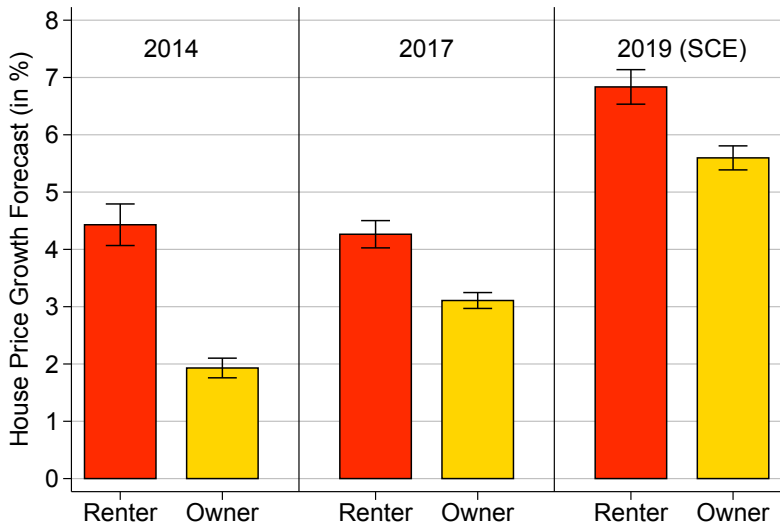
Potential Stories

Potential Stories

1. Respondents report risk-neutral forecasts

2. Respondents report what they fear

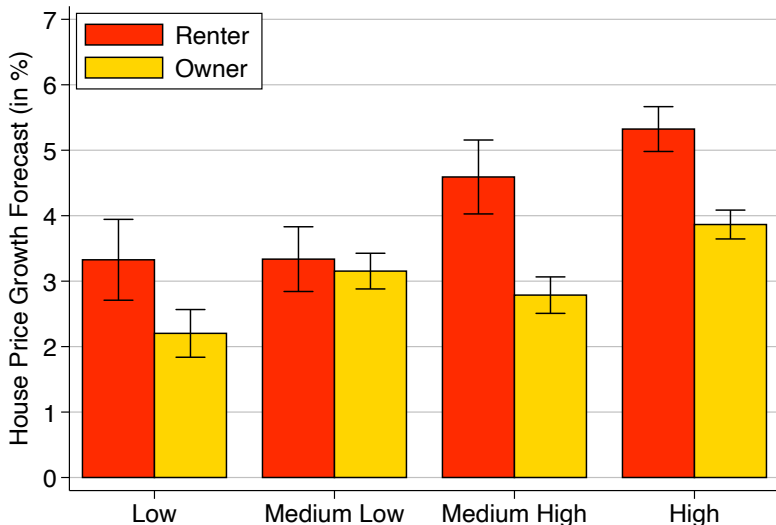3. Respondents learn about prices from what they observe

Risk-Neutral Forecasts
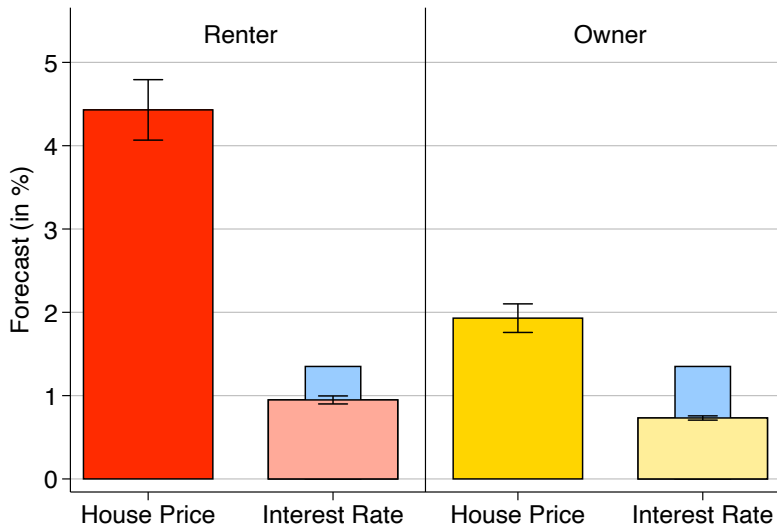
▶ see also Adam/Matveev/Nagel (WP, 2019) for stock prices

Fear Hypothesis

Wave 3 forecasts of regional house price growth

Fear Hypothesis

Wave 3 forecasts of primary residence price growth
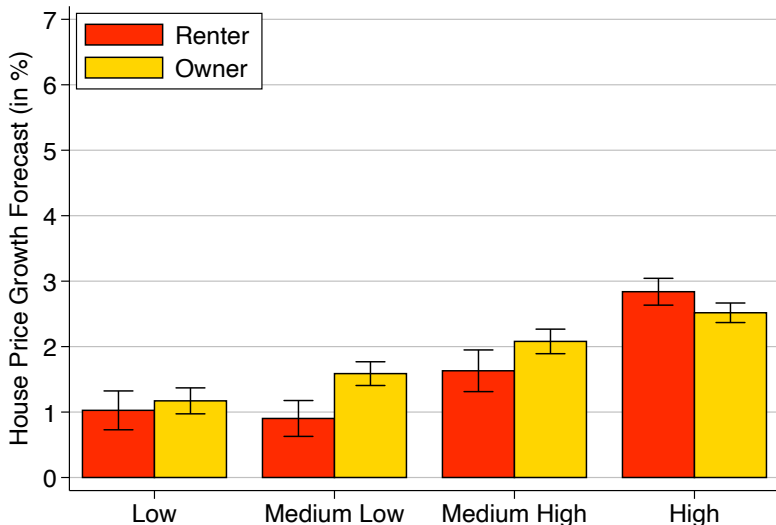
A Model of Learning About Housing Cost

Prices, rents & forecasts: a simple framework

- ▶ Developers
  - ▶ active in both house and rental markets
  - ▶ value houses at price P_t = present value of rents R_t:

  $$P_t = E_t \left[M_{t+1} \left(P_{t+1} + R_{t+1} \right) \right]$$

  - ▶ stochastic discount factor M_{t+1}
    $\rightarrow$ may capture financial frictions faced by developers

- ▶ Two types of households
  - ▶ renters observe (histories of) both rent & price (for now)
  - ▶ owners observe only price

- ▶ In equilibrium
  - ▶ pricing equation of developer holds
  - ▶ evaluate equation using info set of renters and owners

Functional forms

▶ Valuation equation of developer

$$P_t = E_t \left[M_{t+1} \left(P_{t+1} + R_{t+1} \right) \right]$$

▶ Rewrite with $V_t = P_t / R_t$ and $G_t = R_t / R_{t-1}$

$$V_t = E_t \left[M_{t+1} \left(V_{t+1} + 1 \right) G_{t+1} \right]$$

▶ Price dynamics

    ▶ mean-reverting log price/rent: $v_{t+1} = (1-\alpha)\bar{v} + \alpha v_t + \epsilon_{t+1}^v$

    ▶ iid log rent growth: $g_{t+1} = \log G_{t+1} = \bar{g} + \epsilon_{t+1}^g$

    ▶ orthogonal normally distributed shocks $\epsilon_{t+1}^v, \epsilon_{t+1}^g$

  $\rightarrow$ log price $p_t = \log P_t = v_t + r_t$

         = mean-reverting + permanent component

When do renters make higher price forecasts?

- ▶ Household forecasts of log price $p_t = v_t + r_t$

  - ▶ renter knows price & rent, hence also v_t:

  $$E_t[p_{t+1}] = (1 - \alpha)\, \bar{v} + \alpha\, v_t + r_t + \bar{g}$$

  - ▶ owner relies only on price history

  $$E_t[p_{t+1}] = E_{t-1}[p_t] + \kappa\, (v_t + r_t - E_{t-1}[p_t]) + \bar{g}$$

  - ▶ owner compromises, adjusts by $\kappa \in (\alpha, 1)$

- ▶ Positive shock to rents

  - ▶ renter responds 1-1, owner underreacts since $\kappa < 1$
  - ▶ renter has higher forecast, owner gradually catches up

- ▶ Negative shock to price-rent ratio

  - ▶ renter responds by α, owner overreacts since $\kappa > \alpha$
  - ▶ again renter has higher forecast in "boom" as price recovers

Impulse responses

▶ Generalize by adding noise to observation of rents, prices

Everybody observes rents & prices, but with different precision
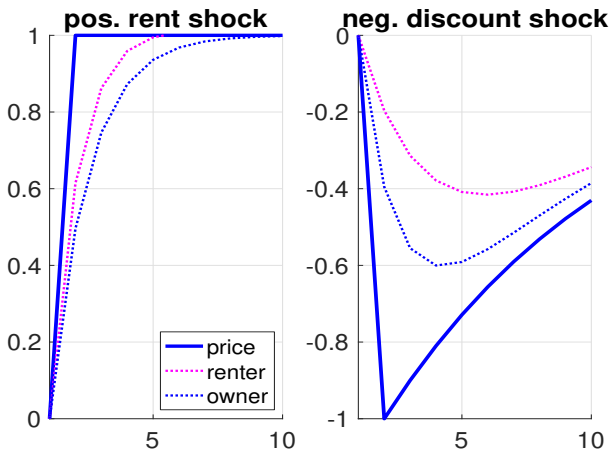
Direct Evidence for Modeling Assumptions

Direct evidence for modeling assumptions

1. New data on rent forecasts and long-term expectations

   ▶ Strong mean reversion in 5yr ahead forecasts

   ▶ Reversion in price-to-rent ratio forecasts

   ▶ Strong correlation between rent and price forecasts

2. Signals about housing markets are cheap

   ▶ Do non-owners of assets have opinion about future price?

      ▶ Yes for housing, no for stocks

   ▶ Owners are aware of past price movements

3. Survey evidence on households' information sources

   ▶ Renters look more to rents, owners more to prices

   ▶ Quality of forecasts independent of incentives

Rent Forecasts and Long-Term Expectations

House price and rent growth forecasts in 2019
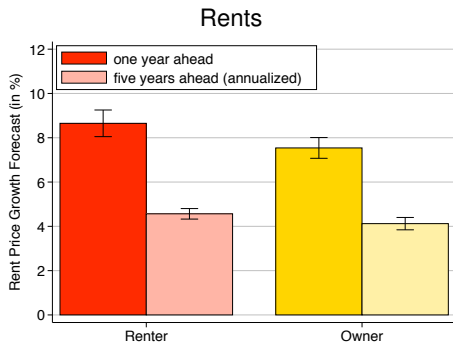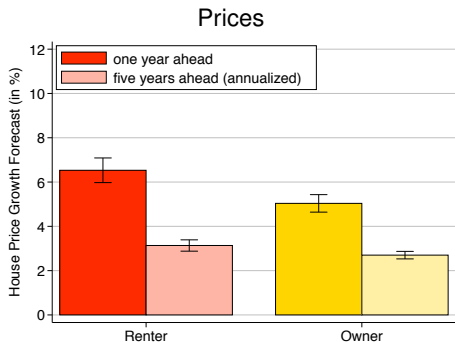
Price-to-Rent Ratios
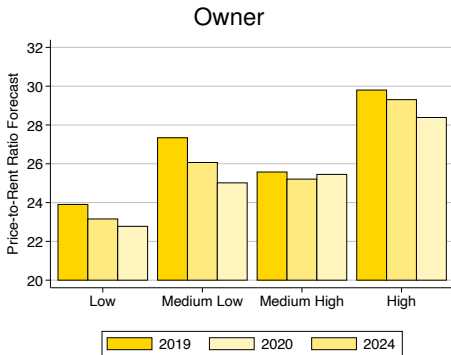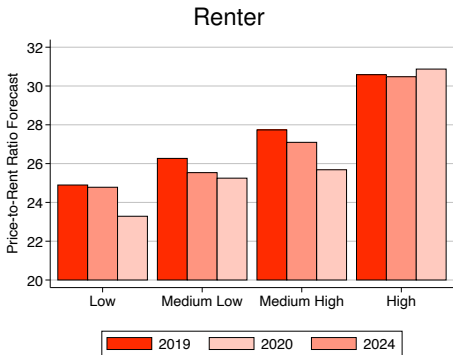
Factor Analysis

First principal component factor loadings

	Full Sample	Renter	Owner
HP growth 1yr	0.7536	0.6790	0.7956
RP growth 1yr	0.7176	0.7586	0.6944
HP growth 5yr	0.7690	0.7438	0.8008
RP growth 5yr	0.6523	0.7873	0.5753
Variance explained	0.5250	0.5524	0.5218
Eigenvalue	2.0998	2.2095	2.0874

▶ High correlation between all forecasts

▶ Suggests that there is one common underlying component

Details

Signals About Housing Markets are Cheap

Households who "Don't Know" about house prices
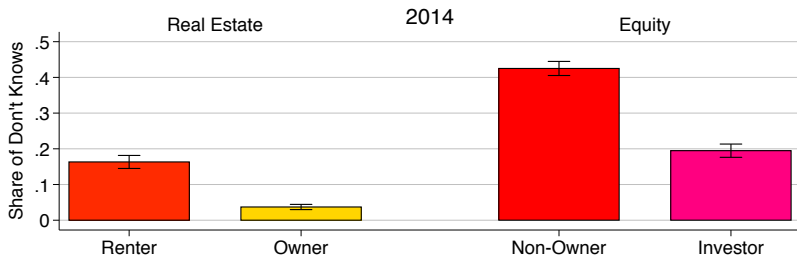
Households who "Don't Know" about house prices
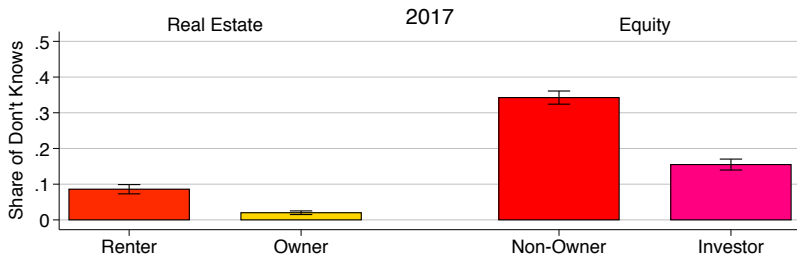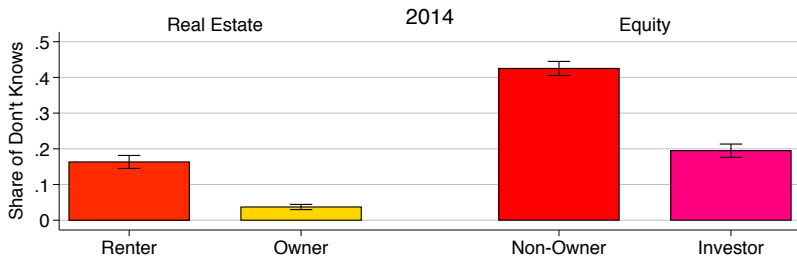
Price perceptions of owners

- ► Exploit panel dimension of the PHF

- ► Evaluate how homeowners quantify value of their house

- ► Number of panel homeowners
  - ► 1,043 from 2010 to 2014
  - ► 1,620 from 2014 to 2017

- ► Calculate perceived price growth

- ► Contrast with realized price growth

Owners know what is going on
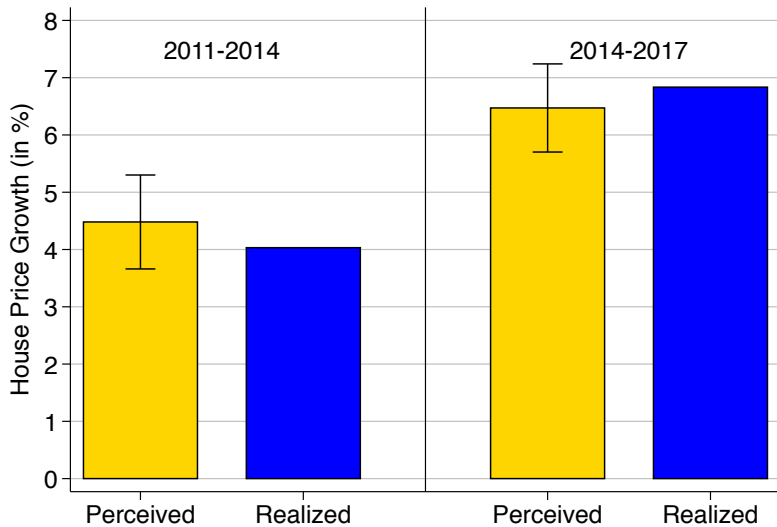
Renters Look More to Rents,

Owners More to Prices

Information sources

- Online Survey of Consumer Expectations (2019)

- *"How important are each of the following sources of information for you to evaluate future house prices?"*

  - Direct observations of rents in your neighborhood
  - Direct observations of house prices in your neighborhood
  - Online real estate platforms
  - Financial Consultants
  - Relatives, Friends and Neighbors
  - Classical Media (newspapers, tv, etc.)
  - Social Media (like Facebook and Twitter)

Information sources

Source	Renters	Owners	Difference
Direct obs. rents	71.9	69.5	-2.45**
Direct obs. prices	65.9	69.9	3.99***
Classical Media	60.3	60.4	0.12
Online Real Estate Portals	57.9	55.4	-2.47**
Friends	52.7	48.1	-4.68***
Financial Advisors	44.7	45.6	0.90
Social Media	23.8	21.0	-2.77***

- ▶ Primary source of information is price observations

- ▶ Owners look more to house prices

- ▶ Renters more to rents, online and through social channels

Forecasts and incentives
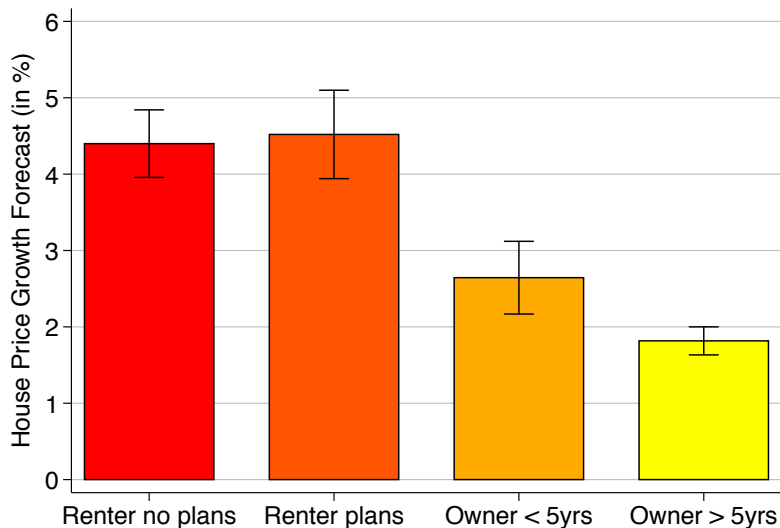
Conclusion

Summary

- New mechanism for German boom:

    Learning about housing cost

- Stylized facts on expectations:

    - forecasts lower than realized price growth

    - forecasts in line with local housing market conditions

    - cross section of forecasts: only region & tenure matter

    - renters have higher price forecasts than owners!

- "Standard" learning model explains stylized facts

Summary: Direct evidence for learning mechanism

1. New data on rent forecasts and long-term expectations

    ▶ Strong mean reversion in 5yr ahead forecasts

    ▶ Reversion in price-to-rent ratio forecasts

    ▶ Strong correlation between rent and price forecasts

2. Signals about housing markets are cheap

    ▶ Do non-owners of assets have opinion about future price?

        ▶ Yes for housing, no for stocks

    ▶ Owners are aware of past price movements

3. Survey evidence on households' information sources

    ▶ Renters look more to rents, owners more to prices

    ▶ Quality of forecasts independent of incentives

Appendix

Expectations of Homebuyers

Los Angeles
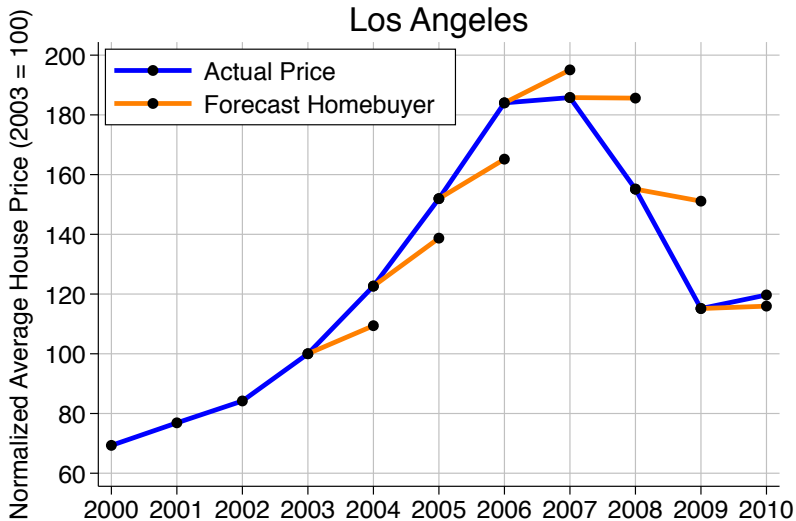
Source: Case-Shiller-Thompson (Brookings Papers, 2012)
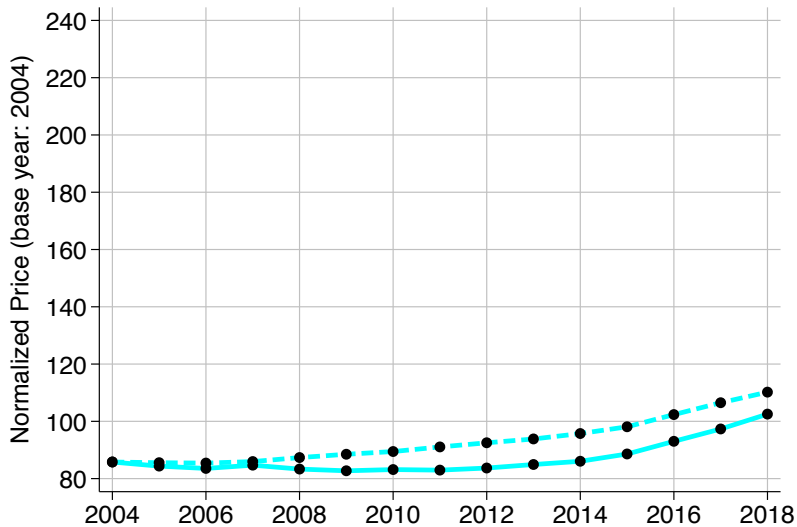
Back

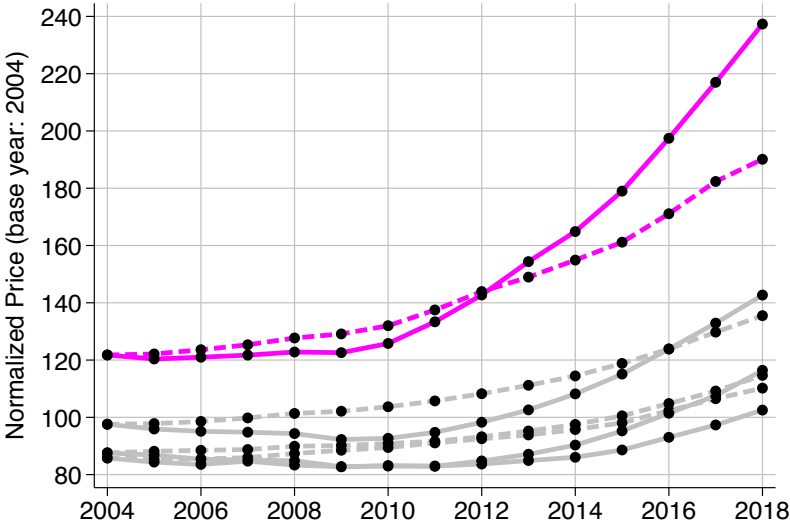# Regional Heterogeneity (Growth Regions)

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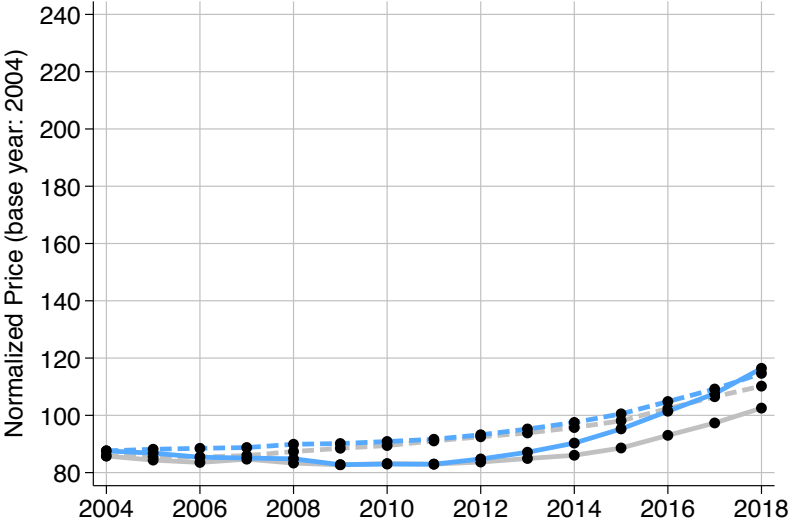
Regional Heterogeneity (Growth Regions)
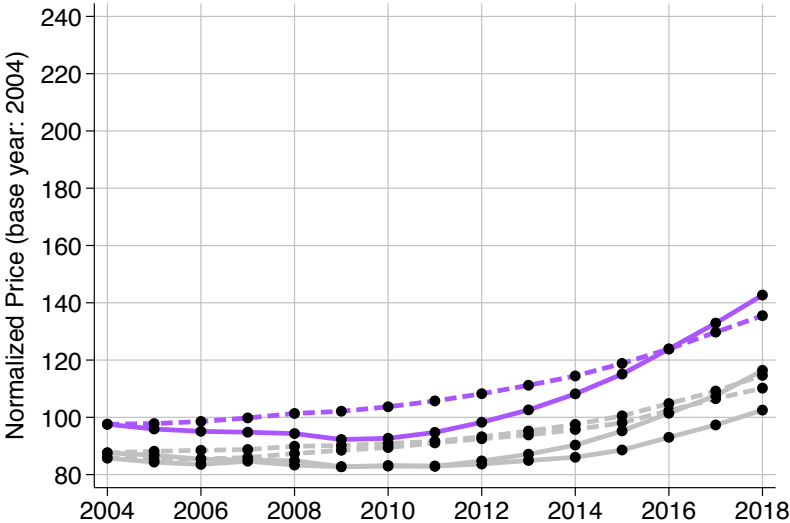
Regional Heterogeneity (Growth Regions)

Additional Details and Robustness

▶ Forecasts by growth region over time   Details

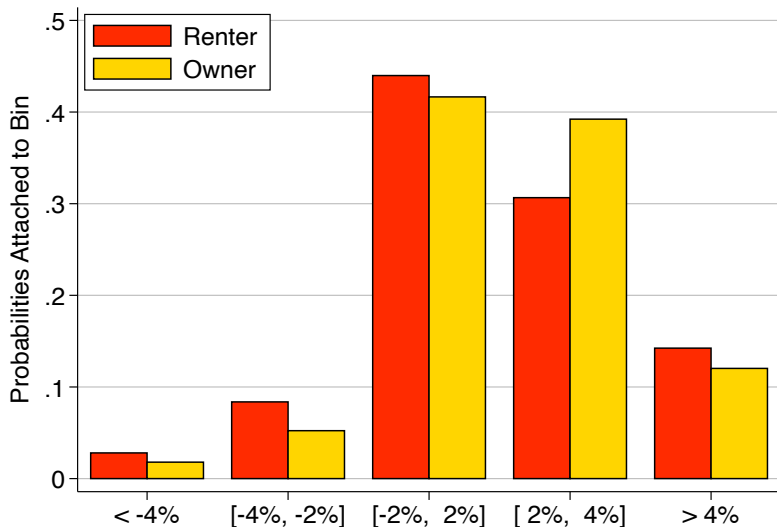▶ Reweighting and Aggregation   Details

▶ Extreme observations   Details

Back

Details on Fear Hypothesis

- Wave 3 question on own house price expectations:
  - less than -4% growth
  - between -4% and -2% growth
  - between -2% and 2% growth
  - between 2% and 4% growth
  - more than 4% growth

- Households can assign 10 points to indicate probabilities
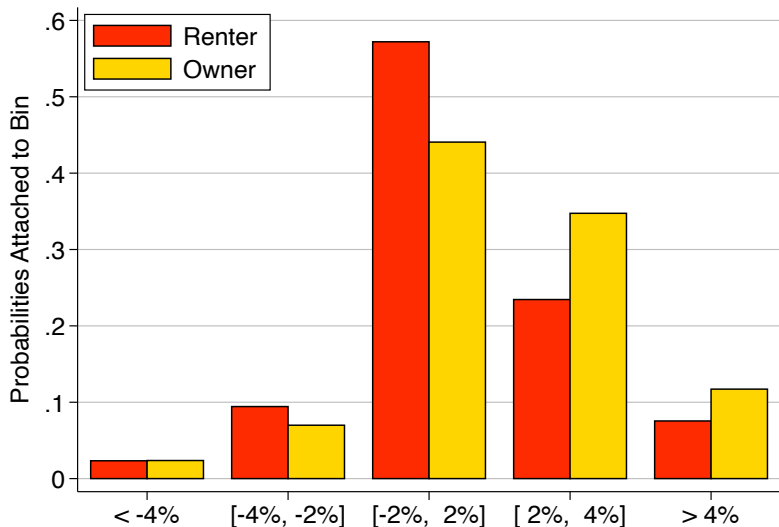
- We use conditional means from point forecasts for coding

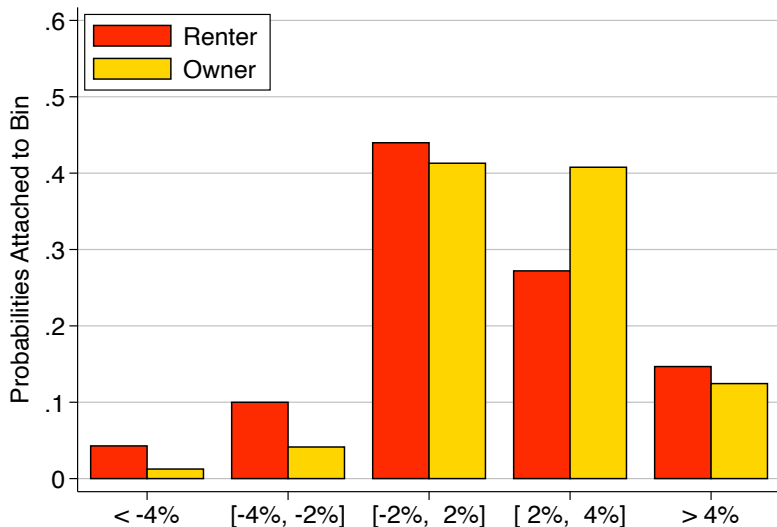# Bin Distribution for Whole Sample

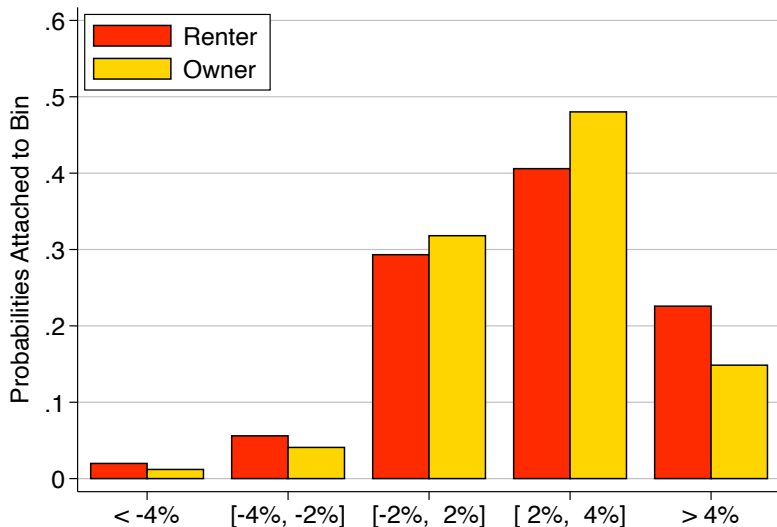# Bin Distribution: Low Growth Region
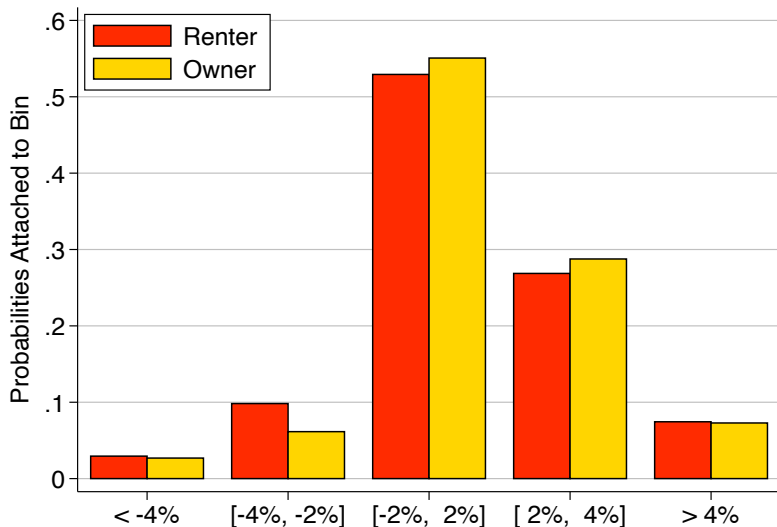
Bin Distribution: Medium Low Growth Region

Back

Bin Distribution: Medium High Growth Region

# Bin Distribution: High Growth Region

Details on Fear Hypothesis

- Wave 3 question on own house price expectations:
  - less than -4% growth
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  - between -2% and 2% growth
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- Households can assign 10 points to indicate probabilities
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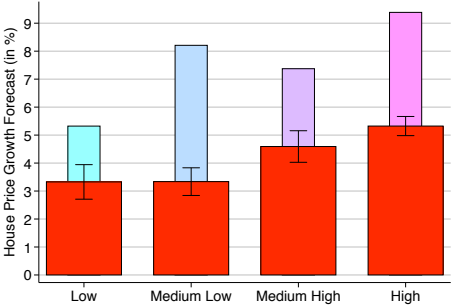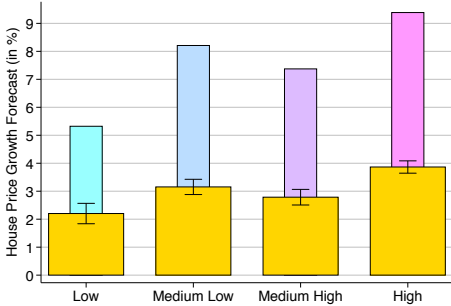# Forecasts By Growth Region Over Time (2014)

Renter
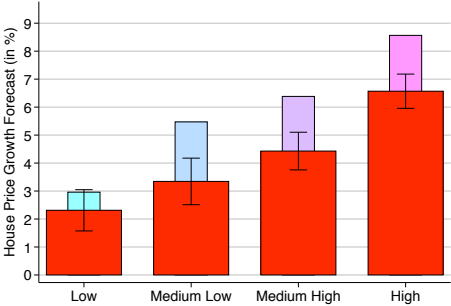
Owner
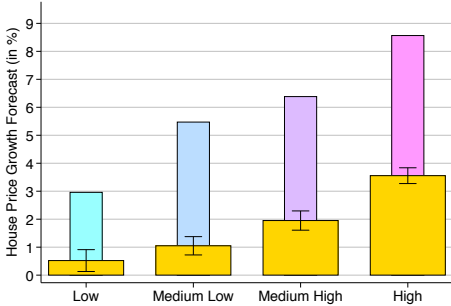
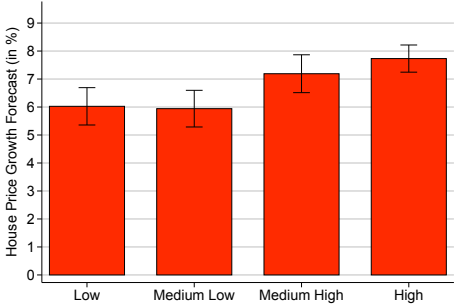# Forecasts By Growth Region Over Time (2017)
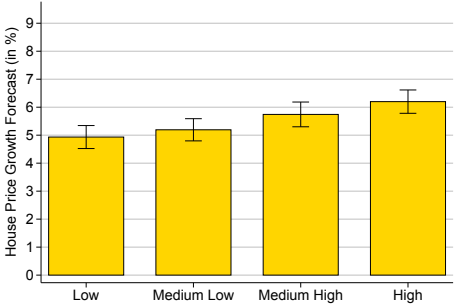

Renter

Owner

Forecasts By Growth Region Over Time (2019)
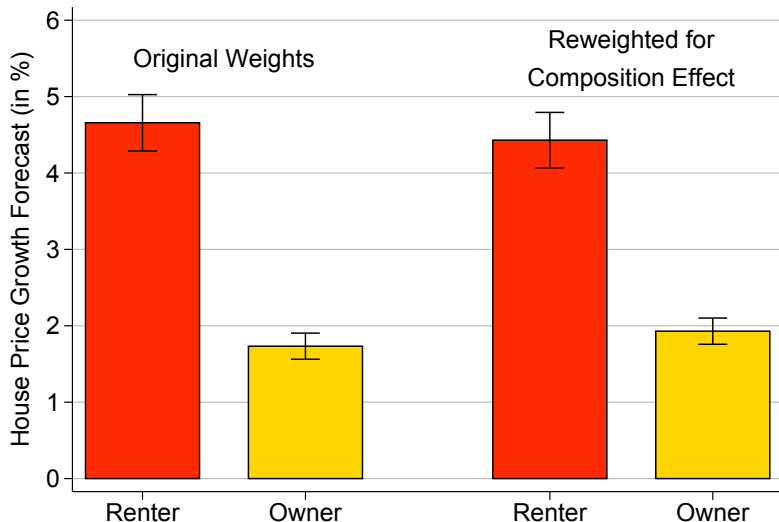

Renter

Owner

Aggregation Across Tenure Types

Aggregation Across Tenure Types

Growth Region	Original Weights		Total	Reweighted for Composition Effect	
	Renter	Owner		Renter	Owner
Low Growth	17.45	21.14	19.23	19.23	19.23
Medium Low Growth	20.44	28.92	24.51	24.51	24.51
Medium High Growth	24.90	28.79	26.77	26.77	26.77
High Growth	37.21	21.15	29.49	29.49	29.49
Sample Share	51.95	48.05	100.00	51.95	48.05

Extreme Observations?

Renter
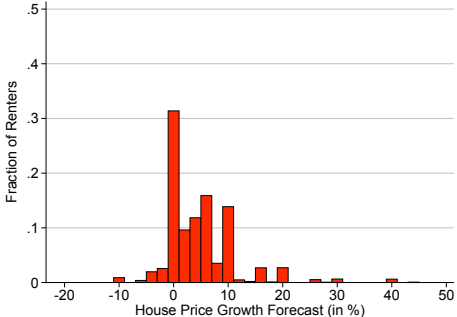
Owner
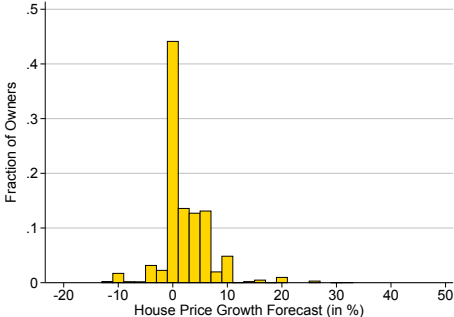
Forecasts and incentives

2017

House Price Growth Forecasts in 2019

Renter

Owner

Back

Rent Price Growth Forecasts in 2019

Renter

- one year ahead
- five years ahead (annualized)

Rent Price Growth Forecast (in %)

Owner

- one year ahead
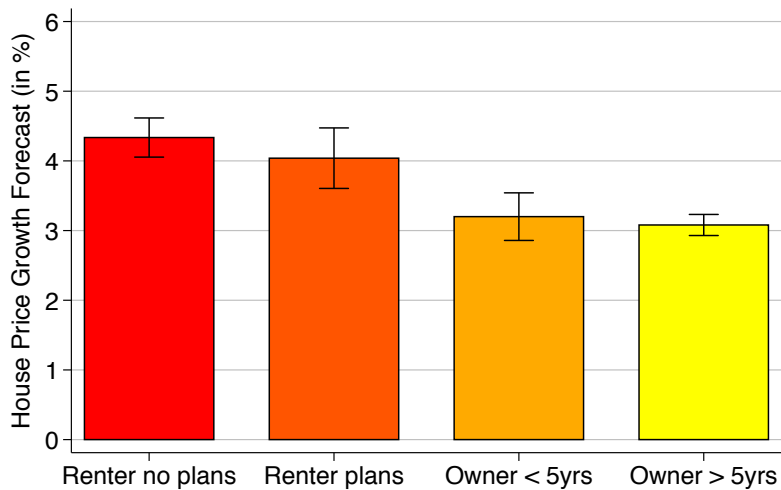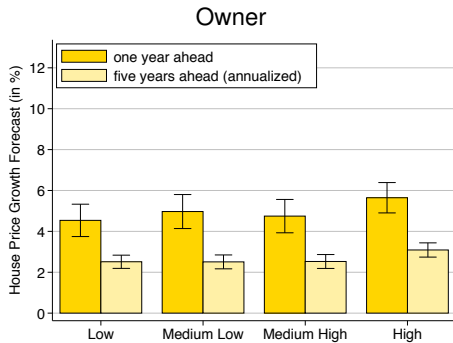- five years ahead (annualized)

Rent Price Growth Forecast (in %)

Back
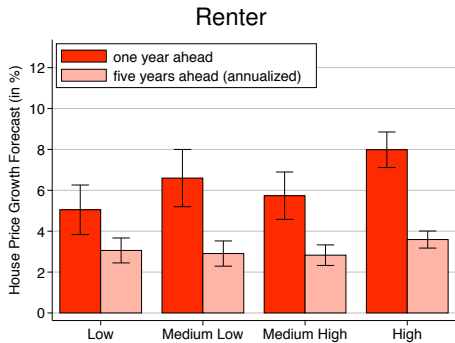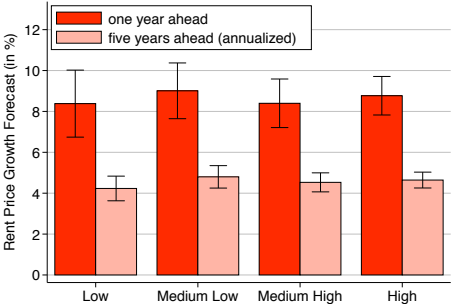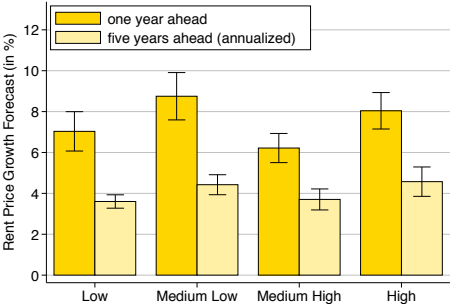
Factor Analysis: Low Growth Region

First principal component factor loadings

	Full Sample	Renter	Owner
HP growth 1yr	0.7316	0.7329	0.7348
RP growth 1yr	0.8031	0.8364	0.7829
HP growth 5yr	0.7841	0.7350	0.8098
RP growth 5yr	0.8004	0.8426	0.7722
Variance explained	0.6089	0.6218	0.6012
Eigenvalue	2.4357	2.4871	2.4049

Details

Factor Analysis: Medium Low Growth Region

First principal component factor loadings

	Full Sample	Renter	Owner
HP growth 1yr	0.7746	0.6637	0.7888
RP growth 1yr	0.6593	0.7163	0.6841
HP growth 5yr	0.8014	0.7350	0.7995
RP growth 5yr	0.6122	0.7487	0.5916
Variance explained	0.5129	0.5524	0.5218
Eigenvalue	2.0517	2.0544	2.0793

Details

Factor Analysis: Medium High Growth Region

First principal component factor loadings

	Full Sample	Renter	Owner
HP growth 1yr	0.7376	0.6346	0.8181
RP growth 1yr	0.7205	0.8113	0.6408
HP growth 5yr	0.7208	0.6203	0.8193
RP growth 5yr	0.6590	0.7876	0.5866
Variance explained	0.5042	0.5165	0.5238
Eigenvalue	2.0169	2.0660	2.0952

Details

Factor Analysis: High Growth Region

First principal component factor loadings

	Full Sample	Renter	Owner
HP growth 1yr	0.7524	0.6929	0.7836
RP growth 1yr	0.7229	0.7258	0.7220
HP growth 5yr	0.7629	0.7928	0.7696
RP growth 5yr	0.6211	0.7802	0.5144
Variance explained	0.5129	0.5524	0.4981
Eigenvalue	2.0565	2.2441	1.9922

Details