Betting on the House
Subjective Expectations and Market Choices

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Introduction

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  - ▶ Magnitude of that effect.

- ▶ Our contribution: provide direct causal evidence from a large-scale, high-stakes field experiment.

Thought Experiment

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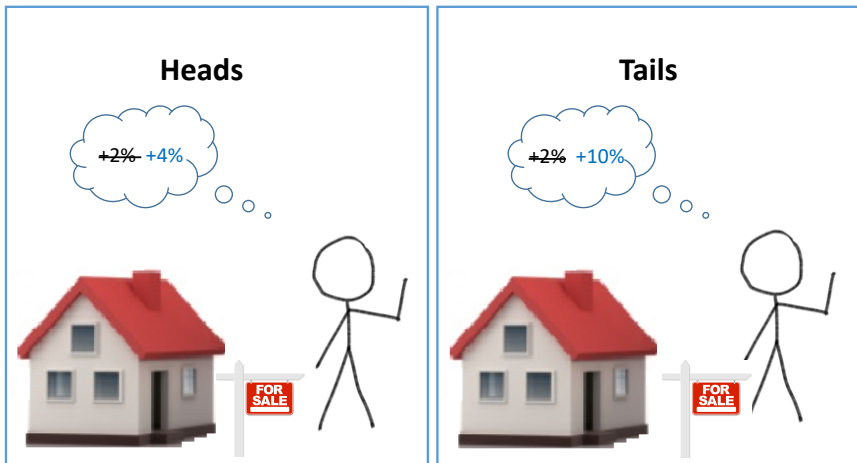
Our Contribution

- ▶ Conducted a field experiment that gets close to this ideal experiment.
  - ▶ Full design pre-registered in AEA RCT Registry (#0003663).

- ▶ In a nutshell:
  1. Contact 57,910 individuals who recently listed a property.
  2. Randomize non-deceptive information to create exogenous shocks to their home price expectations.
  3. Measure if shocks to expectations affect the subsequent sales probability.

Preview of Findings

- Expectations have a significant effect on decision to sell the home.
  - Favorite estimate (TOT): ↑ 1 pp expectation causes 2.44 pp ↓ in probability of selling the home within six months.

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- ▸ The results are robust to a number of checks.
    - ▸ E.g. binned scatterplots, event-study analysis, falsification tests.

Preview of Findings

- Expectations have a significant effect on decision to sell the home.
    - Favorite estimate (TOT): ↑ 1 pp expectation causes 2.44 pp ↓ in probability of selling the home within six months.

- The results are robust to a number of checks.
    - E.g. binned scatterplots, event-study analysis, falsification tests.

- Evidence of optimization frictions.
   - Non-owner occupied are three times as elastic as owner-occupied.

Related Literature

▶ Home price expectations in macroeconomics, finance and real estate (Shiller, 2005; Glaeser & Nathanson, 2015; **Bailey et al., 2018**; Gennaioli & Shleifer, 2018; **Armona et al., 2019**; Kaplan et al., 2019).

Related Literature

- Home price expectations in macroeconomics, finance and real estate (Shiller, 2005; Glaeser & Nathanson, 2015; **Bailey et al., 2018**; Gennaioli & Shleifer, 2018; **Armona et al., 2019**; Kaplan et al., 2019).

- Broader literature on macroeconomic expectations and information-provision experiments (e.g., Coibion et al., 2015, 2018, 2020; Armantier et al., 2016; Cavallo et al., 2017; Fuster et al., 2018).

Research Design

4-Step Recipe

1 Identify a sample of properties on the market.

Step 1: Identify Recent Listings
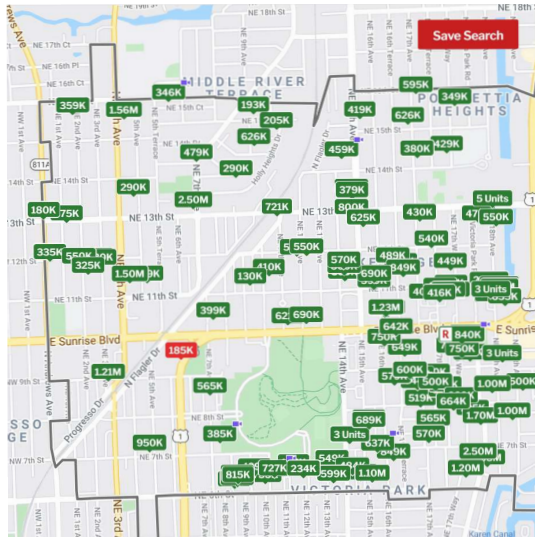
Step 1: Identify Recent Listings

1408 NE 17th Ave
Fort Lauderdale, FL 33304
Status: Active

$380,000	2	1	1,026 Sq. Ft.
Price	Beds	Bath	$370 / Sq. Ft.

4-Step Recipe

1 Identify a sample of properties on the market.

2 Identify the name and address of the owner.

Step 2: Identify Their Owners

Public Facts for 1408 Northeast 17th Ave

Home Facts

Beds	—	Lot Size	6,750 Sq. Ft.
Baths	—	Style	**Single Family Residential**
Finished Sq. Ft.	**1,026**	Year Built	**1951**
Unfinished Sq. Ft.	—	Year Renovated	**1968**
Total Sq. Ft.	**1,026**	County	**Broward County**
Stories	**1**	APN	494234019540

Home facts updated by county records on Apr 4, 2020.

Step 2: Identify Their Owners

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Step 2: Identify Their Owners

🏠 **ASSESSOR'S OFFICE**

| Online Services | | Dispute Assessment | | Assessment Roll Search |

Assessment Roll Search

Parcel #: 494234019540

Or

Street #:

Street Name:

City:

Search   Reset

Step 2: Identify Their Owners

ASSESSOR'S OFFICE

Assessment Roll Search

Parcel #	494234019540
Address	1408 NE 17th Ave, Fort Lauderdale, FL 33304
Owner/s	Axel Foley
Mailing Address	1408 NE 17th Ave, Fort Lauderdale, FL 33304
School District	
Status	Active
Zoning Code	RE4
Total size	1,026
Assessed Value	$350,000

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4-Step Recipe

1. Identify a sample of properties on the market.
2. Identify the name and address of the owner.
3. Mail information on home prices to the owner.

Step 3: Mail Information to Owners

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UCLA

Los Angeles, May 31st 2019

Dear Axel Foley,

We are researchers at UCLA and we are reaching out to you as part of a research study about decision making of homeowners.

According to our records, you may be considering selling a property. We know these decisions can be difficult, so we want to share some information that we hope can be helpful:

4-Step Recipe

1. Identify a sample of properties on the market.

2. Identify the name and address of the owner.

3. Mail information on home prices to the owner.

4. Track whether the house was sold and when.

Step 4: Track Sales Outcome

Property History for 1408 Northeast 17th Ave

Today

| Dec 29, 2019 | Sold (Public Records) | $382,000 |
| Date | Public Records | Price |

| Nov 29, 2019 | Listed (Active) | $380,000 |
| Date | Beaches MLS #F10203412 | Price |

See all property history ⌄

Step 4: Track Sales Outcome

Property History for 1408 Northeast 17th Ave

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Information Experiment

- ▶ Goal: use randomization to induce exogenous "information shocks."

- ▶ Two sources of exogenous variation:
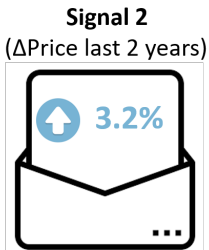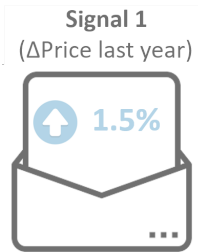 1. Source-randomization.
  2. Disclosure-randomization.
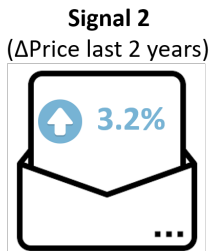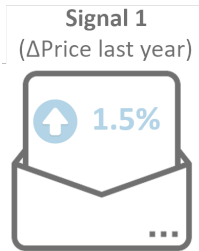
Source-Randomization

Signal 1
(ΔPrice last year)
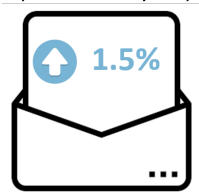
Source-Randomization

Δ = +1.7%

Signal 1
(ΔPrice last year)

Signal 2
(ΔPrice last 2 years)

1.5%

3.2%

Source-Randomization +

Δ = +1.7%

Signal 1
(ΔPrice last year)

Signal 2
(ΔPrice last 2 years)

⬆ 1.5%

⬆ 3.2%

Source-Randomization +

Δ = +3.6%

Signal 1	Signal 2	**Signal 3**
(ΔPrice last year)	(ΔPrice last 2 years)	**(Forecast Model 1)**
⬆ 1.5%	⬆ 3.2%	⬆ 5.1%
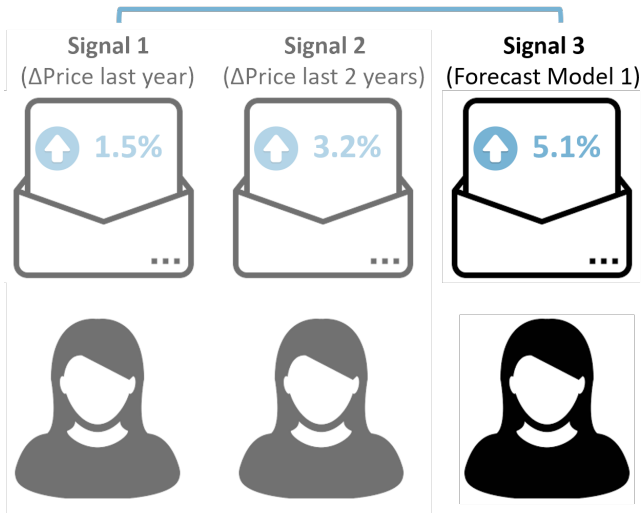
Econometric Model

$$Y_i^{post} = \nu_0 + \nu_1 \cdot \underbrace{(E_i^{j_i^*} - E_i^1)}_{\textbf{Information Shock}} + \sum_j \beta_j \cdot E_i^j + \varepsilon_i$$

- Y_i^{post}: post-treatment outcome.
- E_i^j: signal from source j.
- j_i^*: source selected for i.
- See paper for general case. +

Sample Letter

Left letter:

UCLA

Los Angeles, May 31st 2019

Dear Ricky Fort,

We are researchers at UCLA and we are reaching out to you as part of a research study about decision making of homeowners.

According to our records, you may be considering selling a property. We know these decisions can be difficult, so we want to share some information that we hope can be helpful:

<<INFORMATION>>

If you would like to help us with our study, we kindly ask you fill out the following 2-minute survey:

Visit **www.surveyhousing.com** and enter validation code

Participation is voluntary and responses are 100% confidential. The results of this study can provide valuable insights to homeowners across the country. Your participation in the survey is greatly appreciated.

110 Westwood Plaza, Suite C515
Los Angeles, CA 90095-1481

Website: http://www.anderson.ucla.edu/housingstudy

Please recycle

Right letter:

Your household was randomly chosen to receive this letter. *We will not send you any more letters in the future.*

If you have any questions about the study, you can find contact information on our website: www.anderson.ucla.edu/housingstudy.

Thank you for your attention!

Ricardo Perez-Truglia
Assistant Professor of Economics
University of California, Los Angeles

Nicolas Bottan
Post-Doctoral Associate
Cornell University

If you have questions about your rights as a research subject, or you have concerns or suggestions and you want to talk to someone other than the researchers, you may contact the UCLA Office of the Human Research Protection Program by phone: (310) 206-2040; by email: participants@research.ucla.edu or by mail: Box 951406, Los Angeles, CA 90095-1406.

Methodological Notes:

<<INFORMATION DETAILS>>

Ricky Fort
123 Sunscreen Dr
Miami, FL 33155

Sample Table: Past-1

Median Price

2-bedroom home in ZIP Code 33308

May 2018: $339,000

                                         ⬆ +1.2%

May 2019: $343,000

Notes: for more details, see the notes in the back of this page.

Sample Table: Past-2

Median Price

2-bedroom home in ZIP Code 33308

May 2017:	$320,000
May 2018:	$339,000
May 2019:	$343,000

⬆ +5.9% Annual average:
⬆ +1.2% +3.6%

<u>Notes:</u> for more details, see the notes in the back of this page.

Sample Table: Forecast-1

Median Price

2-bedroom home in ZIP Code 33308

May 2019: $343,000

⬆ +2.6%

May 2020: $352,000
(forecast)

<u>Notes:</u> for more details, see the notes in the back of this page. The forecasts originate from our own statistical models and as such are subject to error.

Sample Table: Forecast-2

Median Price

2-bedroom home in ZIP Code 33308

May 2019: $343,000

⬆ +4.1%

May 2020: $357,000
(forecast)

<u>Notes:</u> for more details, see the notes in the back of this page. The forecasts originate from our own statistical models and as such are subject to error.

Sample Table: Forecast-3

Median Price

2-bedroom home in ZIP Code 33308

May 2019: $343,000

↑ +3.5%

May 2020: $355,000
(forecast)

Notes: for more details, see the notes in the back of this page. The forecasts originate from our own statistical models and as such are subject to error.

Heterogeneity in Signals
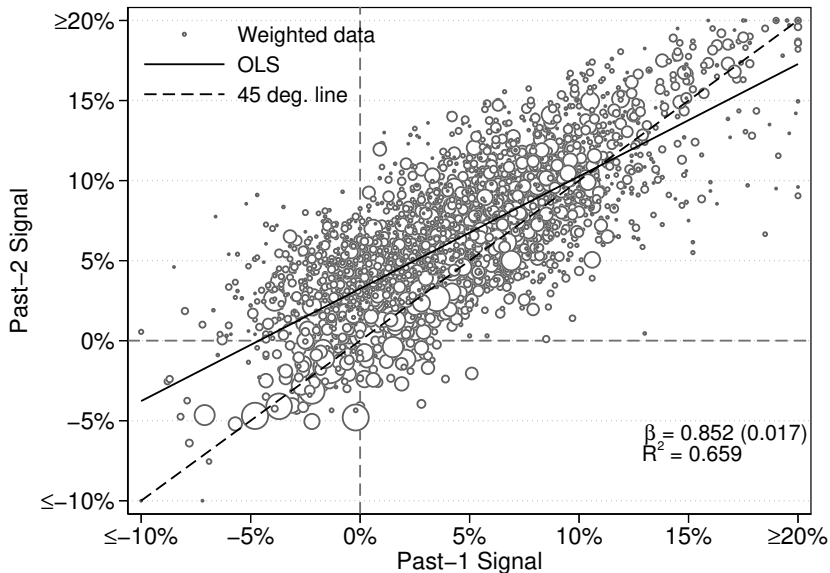
Supplementary Online Survey

- ▶ We wanted survey data to:
  - ▶ Validate the identification strategy.
  - ▶ Quantify the "strength" of the first stage.
  - ▶ Included a survey link in the letter but expected few responses.

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  - Validate the identification strategy.
  - Quantify the "strength" of the first stage.
  - Included a survey link in the letter but expected few responses.

- Complementary survey experiment on Amazon Mechanical Turk (mTurk).
  - Collected 1,404 responses simultaneously with field experiment. +
  - Included in RCT pre-registry.
  - Identical information-provision experiment. +

Implementation Details

Timing

- Mailed letters to 57,910 unique homeowners.
    - From 36 different counties.
    - Properties valued at $34 billion.

- Mailed letters on June 10 2019.

Timing
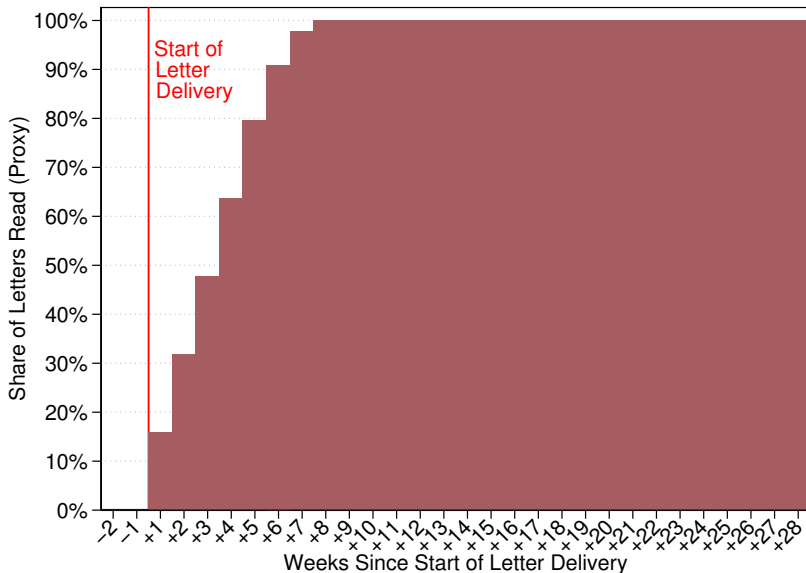
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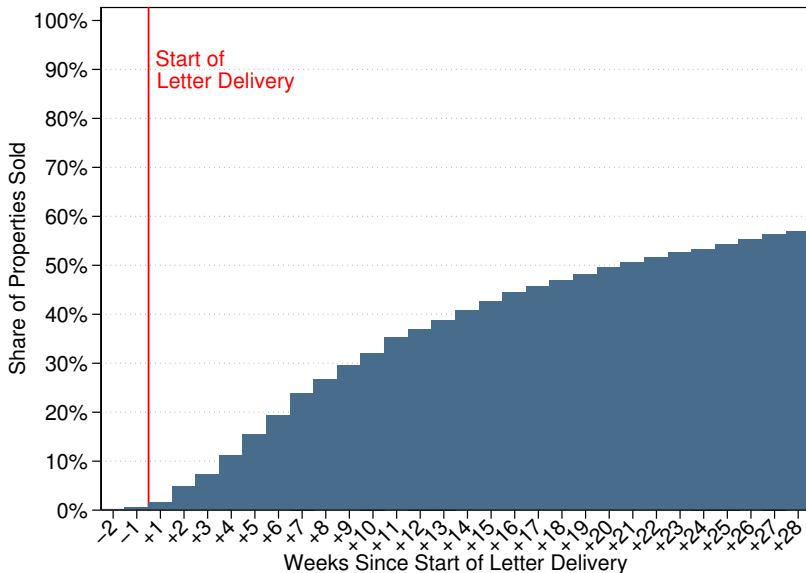
Results

First Stage (Online Survey)

	Survey Data
Information Shock	
Mean Outcome	
Std. Dev. Outcome	
Observations	

First Stage (Online Survey)

	Survey Data
	(1) H_{1y}^{post}
Information Shock	0.205***
	(0.064)
Mean Outcome	3.86
Std. Dev. Outcome	4.42
Observations	1,404

First Stage (Online Survey)

	Survey Data	
	(1) H_{1y}^{post}	(2) H_{5y}^{post}
Information Shock	0.205***	0.167**
	(0.064)	(0.070)
Mean Outcome	3.86	2.31
Std. Dev. Outcome	4.42	4.36
Observations	1,404	1,404

First Stage (Online Survey)

	Survey Data		
	(1) H_{1y}^{post}	(2) H_{5y}^{post}	(3) H_{1y}^{prior}
Information Shock	0.205*** (0.064)	0.167** (0.070)	-0.014 (0.066)
Mean Outcome	3.86	2.31	3.88
Std. Dev. Outcome	4.42	4.36	5.39
Observations	1,404	1,404	1,404

First Stage (Online Survey)

	Survey Data			
	(1) H_{1y}^{post}	(2) H_{5y}^{post}	(3) H_{1y}^{prior}	(4) M_{1y}^{post}
Information Shock	0.205***	0.167**	-0.014	0.017
	(0.064)	(0.070)	(0.066)	(0.134)
Mean Outcome	3.86	2.31	3.88	3.58
Std. Dev. Outcome	4.42	4.36	5.39	9.05
Observations	1,404	1,404	1,404	1,404

Effects on Posterior Belief ⊕

Effects on Posterior Belief

Slope = 0.205 (0.055)

N=1,404
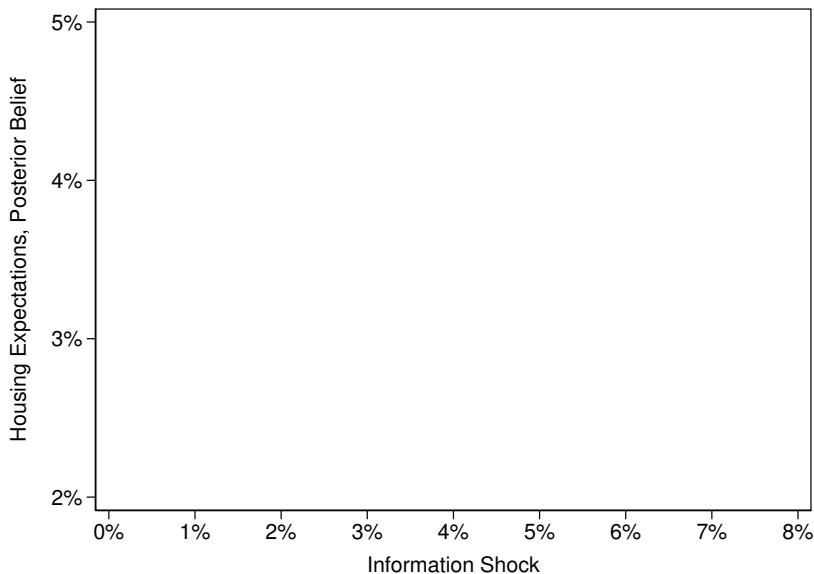
X-axis: Information Shock
Y-axis: Housing Expectations, Posterior Belief
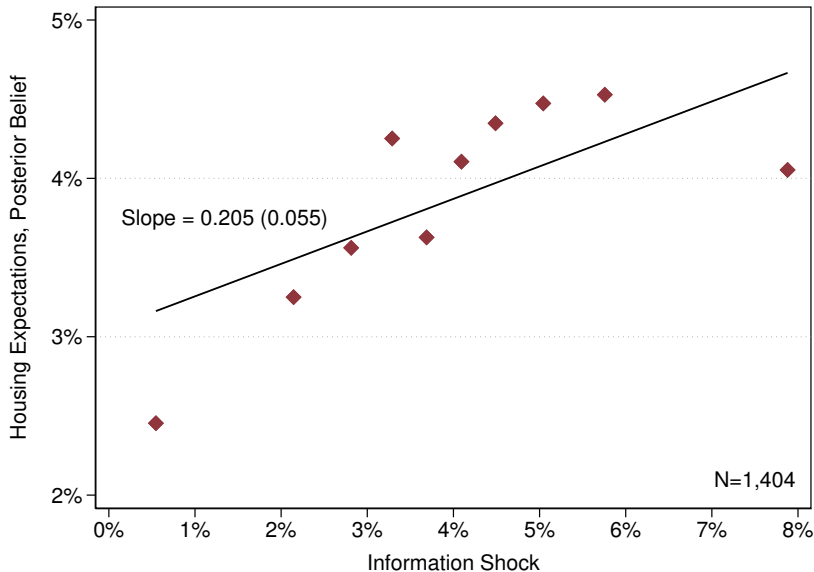
Effects on Behavioral Outcomes

	Behavioral Data
Information Shock	
Mean Outcome	
Std. Dev. Outcome	
Observations	

Effects on Behavioral Outcomes

	Behavioral Data
	(1) S_{+12w}
Information Shock	-0.330***
	(0.103)
Mean Outcome	36.99
Std. Dev. Outcome	48.28
Observations	57,910

Effects on Behavioral Outcomes

	Behavioral Data	
	(1) S_{+12w}	(2) S_{+28w}
Information Shock	-0.330*** (0.103)	-0.325*** (0.107)
Mean Outcome	36.99	56.90
Std. Dev. Outcome	48.28	49.52
Observations	57,910	57,910

Effects on Behavioral Outcomes

	Behavioral Data		
	(1) S_{+12w}	(2) S_{+28w}	(3) S_{-1w}
Information Shock	-0.330***	-0.325***	0.014
	(0.103)	(0.107)	(0.019)
Mean Outcome	36.99	56.90	0.58
Std. Dev. Outcome	48.28	49.52	7.61
Observations	57,910	57,910	57,910

Effects on Behavioral Outcomes

	Behavioral Data			
	(1) S_{+12w}	(2) S_{+28w}	(3) S_{-1w}	(4) D_{pre}
Information Shock	-0.330***	-0.325***	0.014	0.001
	(0.103)	(0.107)	(0.019)	(0.003)
Mean Outcome	36.99	56.90	0.58	3.81
Std. Dev. Outcome	48.28	49.52	7.61	1.28
Observations	57,910	57,910	57,910	57,910

Effects on Behavioral Outcomes
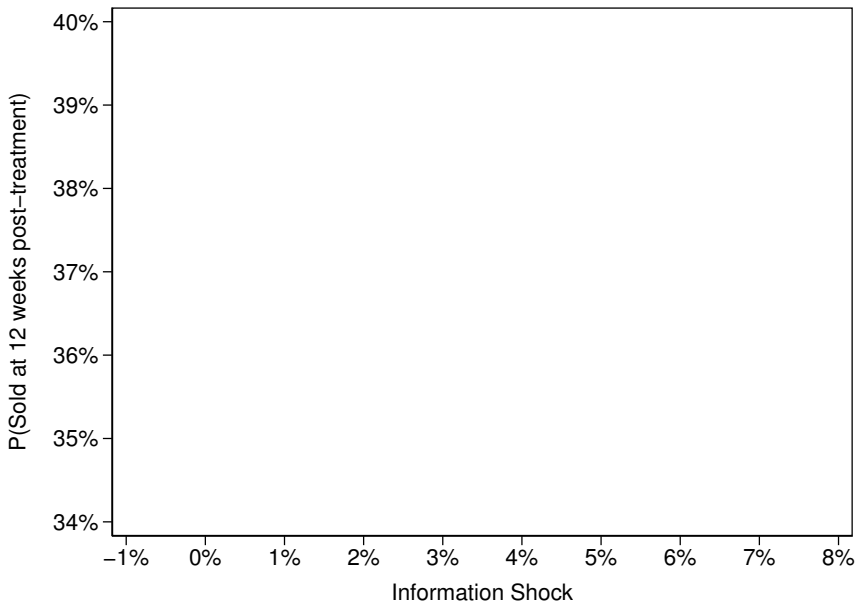
Effects on Behavioral Outcomes

Event-Study Analysis ⊕
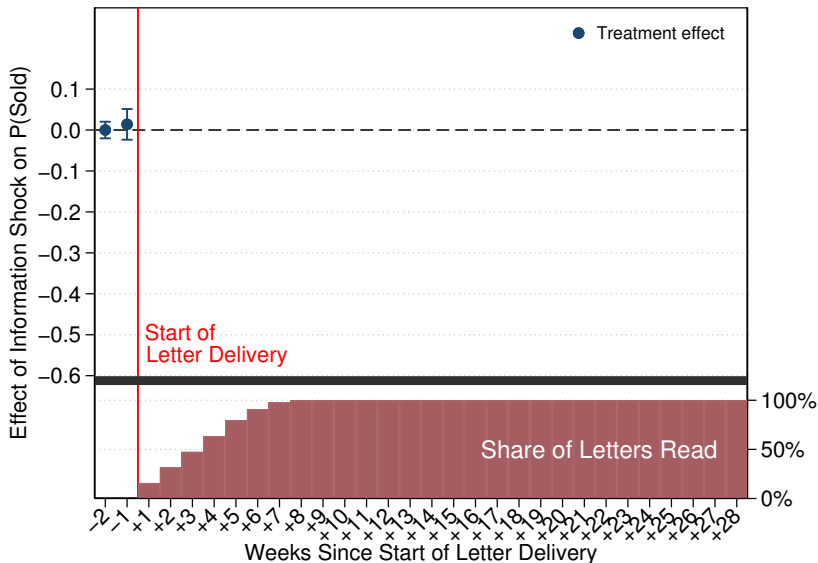
Note: 90% Confidence Intervals in brackets

Event-Study Analysis •+

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Event-Study Analysis

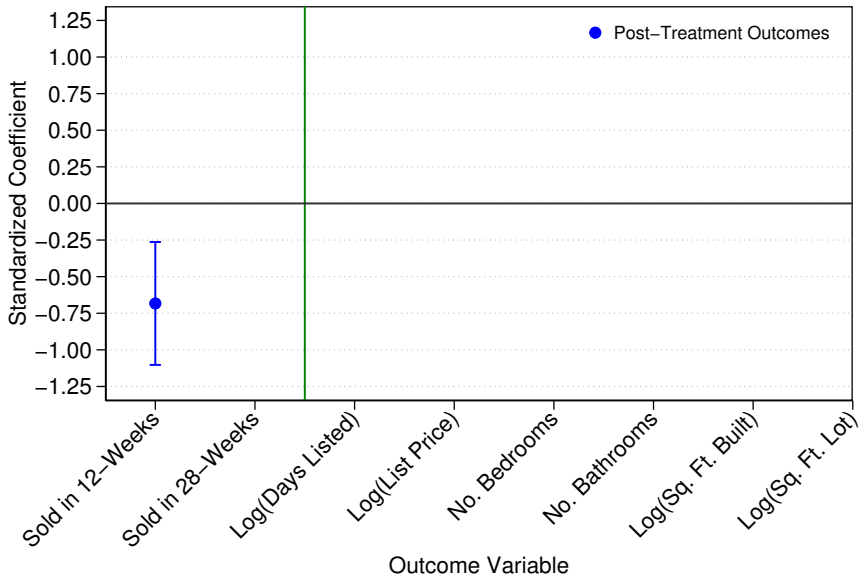**Note:** 90% Confidence Intervals in brackets

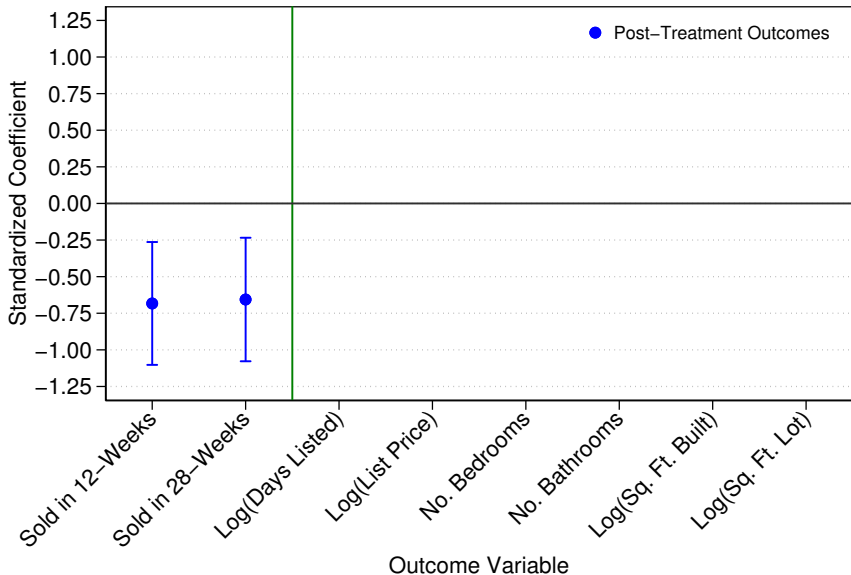# Event-Study Analysis ⊕

Falsification Tests

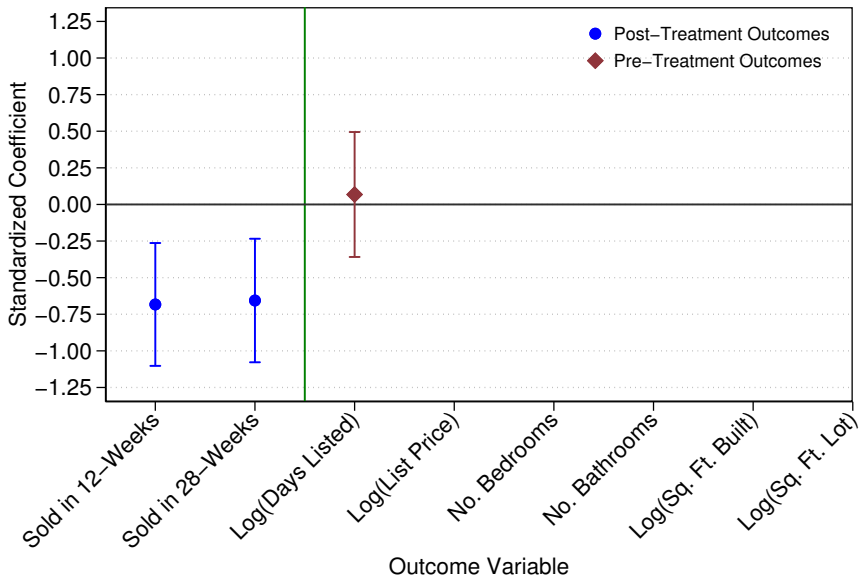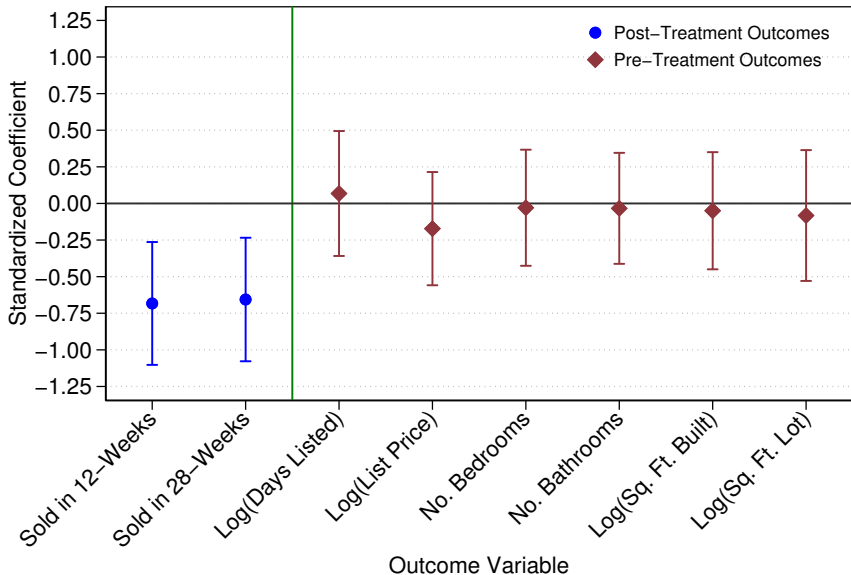**Note:** 90% Confidence Intervals in brackets

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Betting on the House

How Elastic are Sellers?

- ▶ A 1 pp higher information shock increases sales probability (within 6 months) by 0.325 pp.

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How Elastic are Sellers?

- A 1 pp higher information shock increases sales probability (within 6 months) by 0.325 pp.

- This is an intention-to-treat effect.
    - Imperfect pass-through from information shocks to expectations.
    - Some subjects may not read the letter on time.

How Elastic are Sellers?

- Effects of 1% higher information shock:
  - Expectations ↑ 0.205 pp .
  - Sales probability ↓ 0.325 pp.

How Elastic are Sellers?

- Effects of 1% higher information shock:
  - Expectations ↑ 0.205 pp .
  - Sales probability ↓ 0.325 pp.

- Implied elasticity of -1.59 ($= \frac{-0.325}{0.205}$).
  - ↑ 1 pp expectation causes ↓ 1.59 pp in sales probability.

How Elastic are Sellers?

- We estimate that 64.9% of subjects read the letter on time.
    - 95% of letters are delivered.
    - 74% of letters are not discarded.
    - 92.5% of letters are opened before property is sold.

How Elastic are Sellers?

- We estimate that 64.9% of subjects read the letter on time.
    - 95% of letters are delivered.
    - 74% of letters are not discarded.
    - 92.5% of letters are opened before property is sold.

- Final elasticity of -2.44 ($= \frac{-0.325}{0.205 \cdot 0.649}$).
   - ↑ 1 pp expectation causes ↓ of 2.44 pp in sales probability.

Heterogeneity Analysis

- We study (pre-registered) heterogeneity on:
    - Owner-occupied (66.99% of subjects).
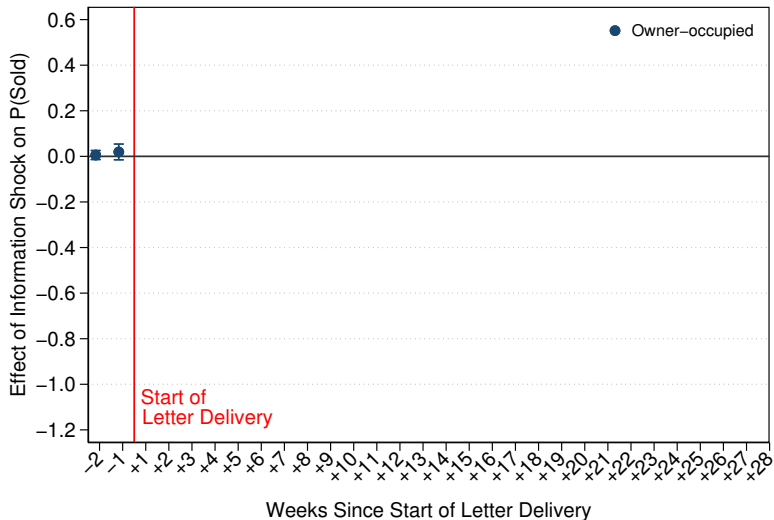   - Non-owner-occupied (33.01% of subjects).

Heterogeneity Analysis

- We study (pre-registered) heterogeneity on:
  - Owner-occupied (66.99% of subjects).
  - Non-owner-occupied (33.01% of subjects).

- Relative to non-owner-occupied, owner-occupied face optimization frictions.
  - They need to move out of the home after selling it.
  - May face deadlines to move out (e.g., school, work).
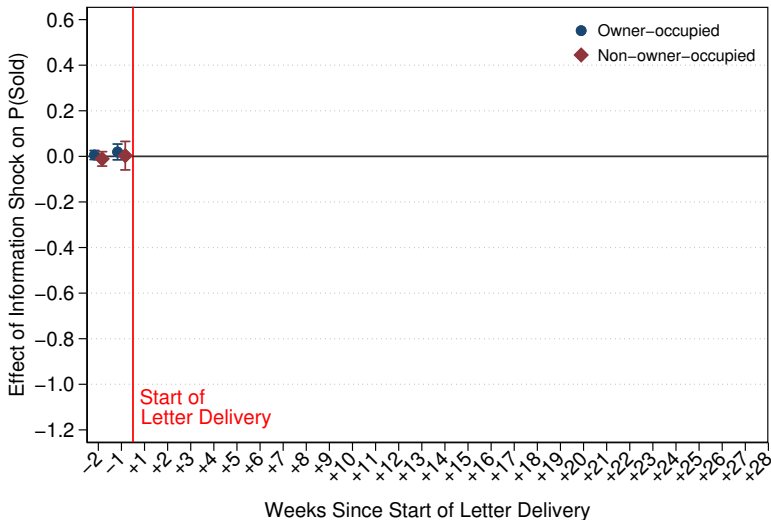
Owner vs. Non-Owner Occupied
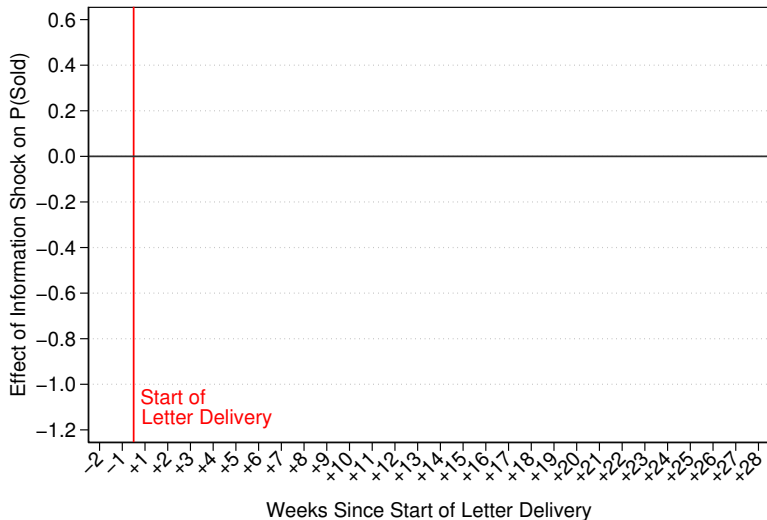
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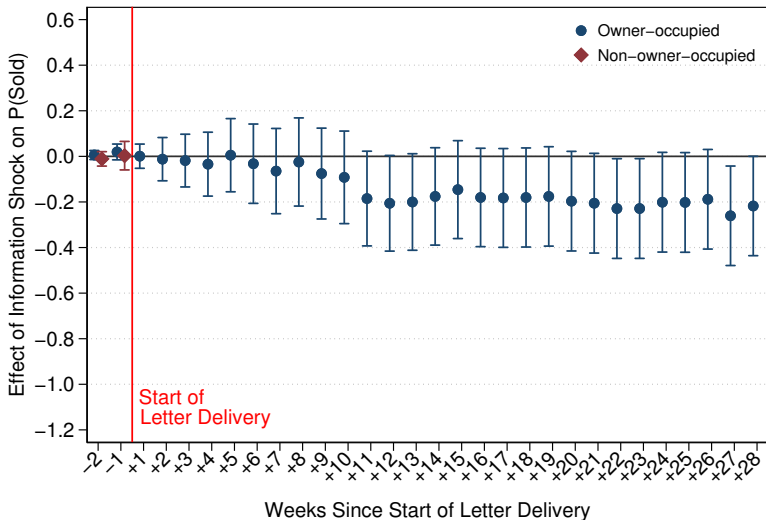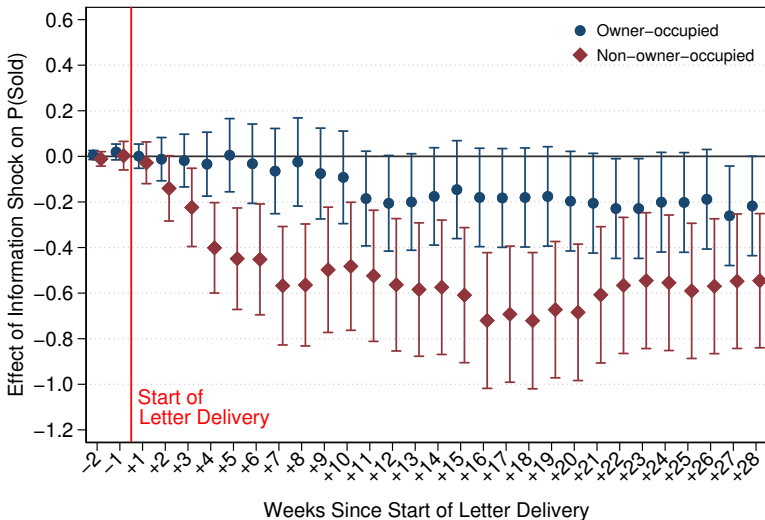
Owner vs. Non-Owner Occupied

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Owner vs. Non-Owner Occupied

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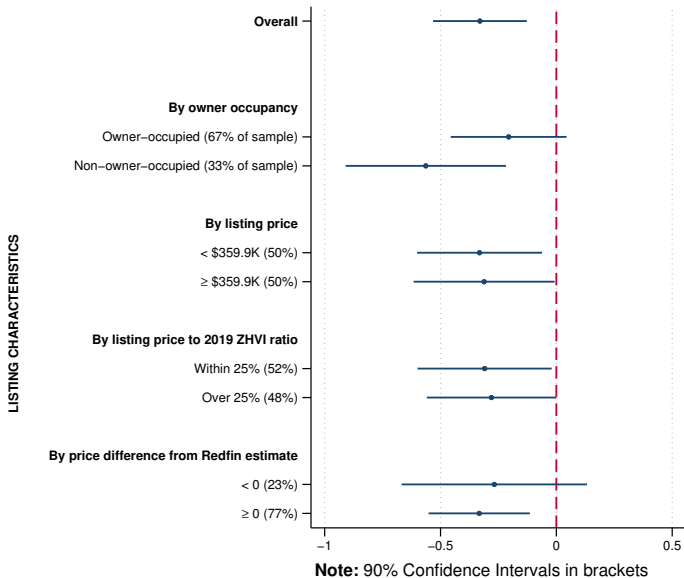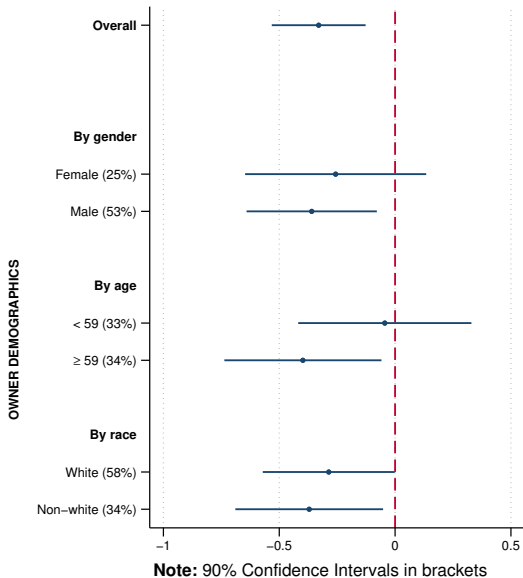# Owner vs. Non-Owner Occupied

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Heterogeneity Analysis

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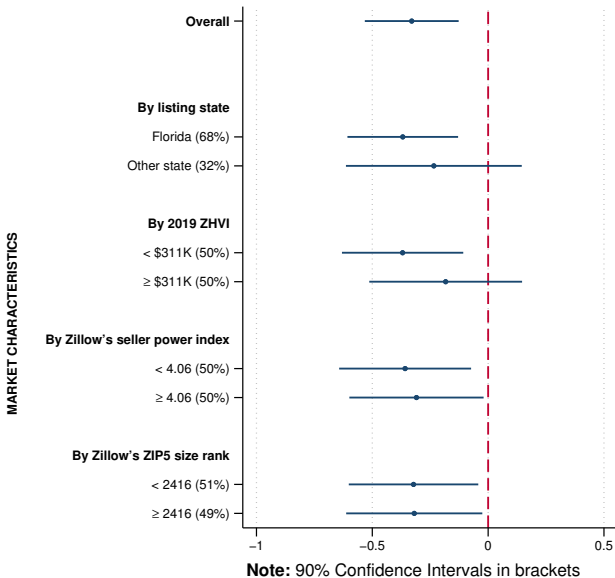
Non-Owner Occupied by ZIP code
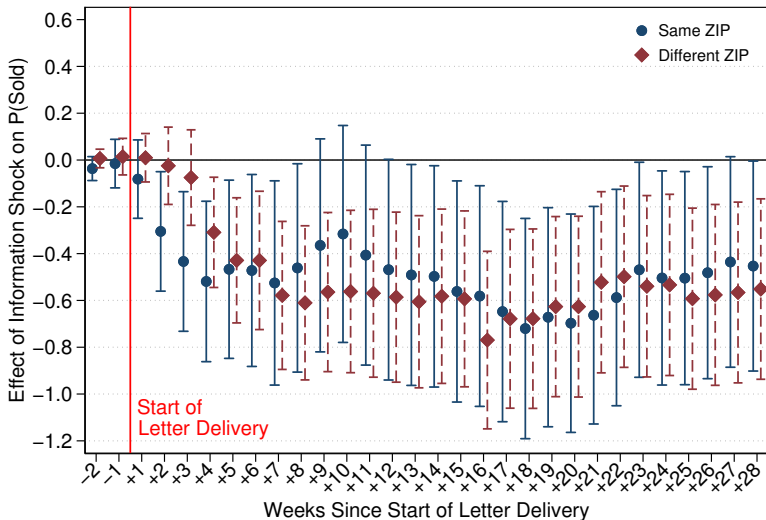
Note: 90% Confidence Intervals in brackets

Owner vs. Non-Owner Occupied

- Our evidence supports conjecture that non-owner occupied contribute disproportionately to housing speculation.

- Favorite interpretation: differences due to information frictions.
    - We provide evidence against some alternative explanations.

- Non-owner-occupied provide a more accurate picture of the relevant elasticity.
    - Implied elasticity of -4.23.

Additional Results

- Symmetric reaction to pessimistic/optimistic signals. +

- Estimates nearly identical using disclosure-randomization and source-randomization separately.

- Suggestive evidence of backward-looking expectations. +

- Suggestive evidence that changes to listing prices was one of the mechanisms. +

Conclusions

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- ▸ In addition to information frictions, we provide evidence of optimization frictions.

    - ▸ Heterogeneity by owner- and non-owner-occupied.

Conclusions

- ▸ This methodology can be applied to explore other hypotheses from behavioral economics, urban economics, finance and others.

  - ▸ Hard outcome measured with administrative data.

  - ▸ Naturally-occurring, high-stakes, context.

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- ► We are documenting the implementation carefully.

  - ► Email us if you need help with implementation.
  - ► Happy to share data/code/tips.