The Appraisal Mechanism

Spillover Effects of All-Cash Sales on Local Housing Markets

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Research Question

Cash Sales Depress Nearby Home Sales via Lower Appraisals

- All else equal, mortgage-financed buyers pay **an 11% premium** over cash buyers (Reher and Valcanov, JF 2024; Han and Hong, RF 2024)

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- Three facts on home appraisals
  1. Residential appraisals mainly rely on recent **comparable sales**
  2. In mortgage approval, lenders determine **loan amount** based on appraisals
  3. By regulations, the source or type of financing **must not** influence an appraisal's outcome

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  2. In mortgage approval, lenders determine **loan amount** based on appraisals
  3. By regulations, the source or type of financing **must not** influence an appraisal's outcome
- Consider a mortgage-financed home surrounded by cash sales
  - Cash sales pull down comparable sales $\Rightarrow$ **lower appraisal values** $\Rightarrow$ with a fixed leverage, less lending unless buyers put more down
  - Sellers **lower the ask price** $\Rightarrow$ sales anchored to the depressed appraised value

    (Note: Assume no **unconstrained** buyers)

Research Question

Do nearby all-cash home sales depress the transaction price of a mortgage-financed home through lower appraisals?

- If so, how big is the magnitude?
- How do the spillover effects vary across different home buyers and neighborhoods?
- What are the implications for housing market dynamics and affordability?

Preview

Preview of Results

- A ring-based spatial identification strategy (Bayer et al., AER 2021)
  - Concentric rings for 5+ million transactions during 2018-2022
  - Evidence supporting the internal validity
- One SD (15.24 pp) increase in nearby cash purchase market share $\Rightarrow$
  - Baseline: 0.75 pp or \$2,315 lower appraisal values and 0.73 pp or \$2,252 lower transaction prices ($\simeq$ having a home two years' older)
  - More pronounced ($\times$1.6-2) if nearby cash sales are more recent
  - Stronger ($\times$2) effects for high-LTV transactions
  - Stronger ($\times$7) effects for low-income home buyers
  - Less pronounced ($\times$0.6) effects for neighborhoods with high growth in house prices
- Discussion: reasons why the appraisal friction persists

Roadmap

1. Contribution & literature
2. Data
3. Research design & internal validity
4. Baseline results
5. Heterogeneity
6. Discussion & further work

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- The role of financial frictions in local house price discovery

  Stein, 1995; Genesove and Mayer, 2001; Landvoigt et al.; 2015; Guren, 2018

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- Assessment gaps and inequality in property taxation

  Avenancio-Leon and Howard, 2022 $\times 2$

  - I show that market-driven appraisals also cause **structural frictions in housing evaluation**

Data

Primary Sample

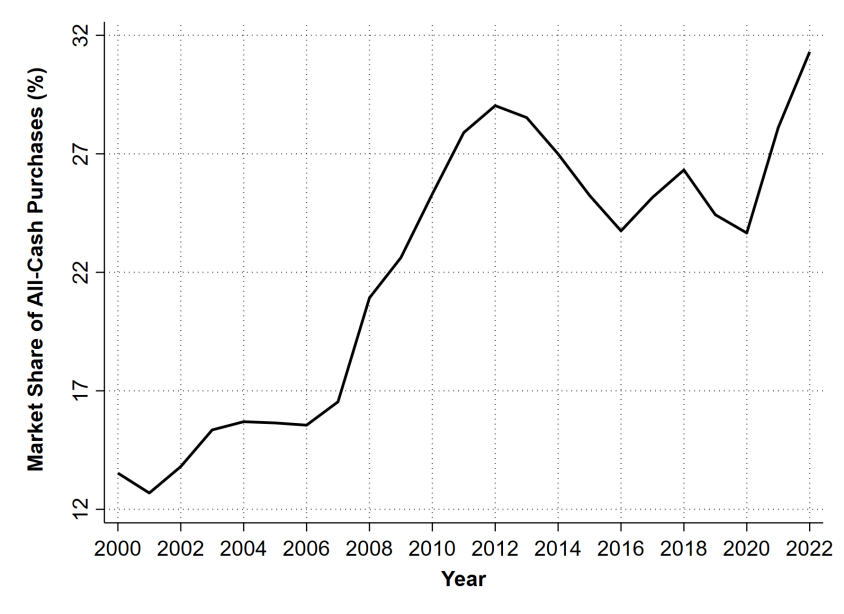
- **Data Sources:** CoreLogic deed and tax records merged with HMDA mortgage originations **at the transaction level**
- **Sample:** 2018–2022
  - Selection of deeds similar to Reher and Valcanov (2024)
  - Arms-length transactions on single-family and town homes
  - No foreclosures, intrafamily transfers, and extremely low or high prices, building size, etc.
- **Overview**
  - 6.2+ million records with detailed transaction and loan information
  - 2,074 counties and 76k tracts (90+% population)

Primary Sample

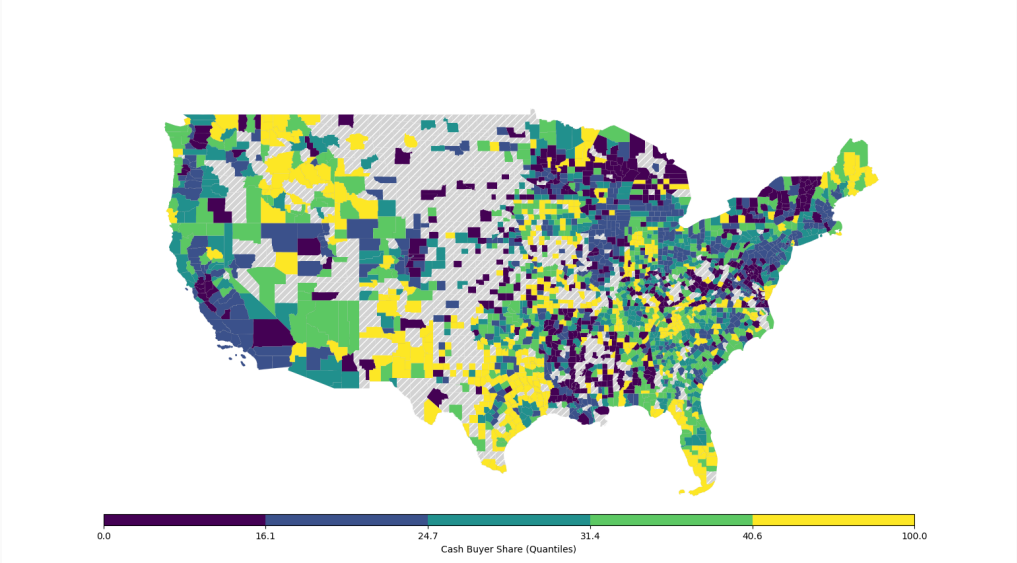
Table 1: Primary Sample Summary Statistics (2018–2022)

Variable	Mean	SD	Min	P25	P50	P75	Max
Sale Amount ($)	307,654	167,512	6,351	187,000	269,900	386,765	1,300,000
Appraisal Values ($)	308,224	166,754	5,000	185,000	265,000	385,000	1,005,000
Age	33	26	0	14	31	47	122
No. Bed	3.28	1	1	3	3	3	6
No. Bath	2.30	0	1	2	2	2	5
No. Stories	1.45	0	1	1	1	2	3
Land (Sqft)	16,776	21,350	1,065	6,599	9,749	16,553	168,577
Building (Sqft)	2,377	812	825	1,877	2,377	2,592	5,773
Parking (Sqft)	481	120	193	440	481	491	1281
Basement (Sqft)	750	120	120	750	750	750	1926
Income (000s)	99	61	23	57	83	124	409
LTV (%)	85	12	37	80	92	97	102
No. Observations			6,216,851				

Temporal and Cross-Sectional Variations



National Cash Purchase Share



Cash Purchase Share by County

- Generally **upward trending** cash market share
- Pronounced variations **across geographies**

Research Design

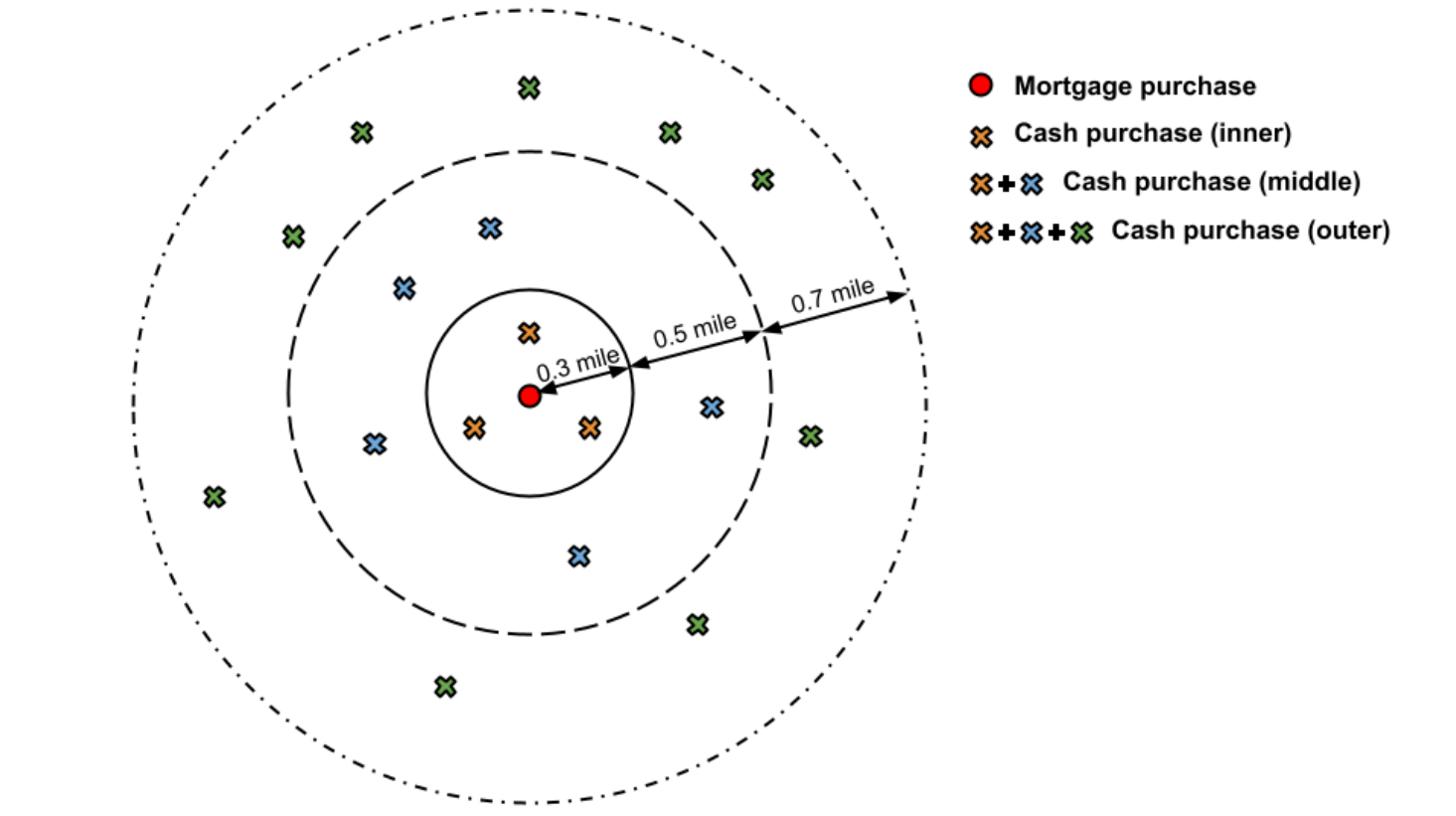
Ring Analysis

A **ring-based** spatial identification strategy similar to Bayer et al. (2021) and Gupta (2019)

- Leverage **very local variation** in exposure to cash purchases
- Compare the influence of hyper-local cash activity (e.g., only a few city blocks away) to nearby but slightly more distant areas

Ring Analysis

Rationale: The focal transaction is more directly affected by **nearby** cash sales than by broader market trends, so differencing across rings isolates the causal impact of local cash purchases from broader shocks



Ring Analysis

$$Y_{i,t} = \beta_1 \text{CashShare}^{(\text{inner})}_{i,t-1} + \beta_2 \text{CashShare}^{(\text{middle})}_{i,t-1} + \beta_3 \text{CashShare}^{(\text{outer})}_{i,t-1} + \gamma X_i + \delta_{c(i),t} + \varepsilon_{i,t} \quad (1)$$

- $Y_{i,t}$: appraised values or transaction prices for property i on date t
- $\text{CashShare}^{(\text{inner})}_{i,t-1} = \frac{\#\text{ cash sales within 0.1 miles of property } i \text{ in year } t-1}{\#\text{ all sales within 0.1 miles of } i \text{ in year } t-1}$
- $\text{CashShare}^{(\text{middle})}_{i,t-1} = \frac{\#\text{ cash sales within 0.3 miles of property } i \text{ in year } t-1}{\#\text{ all sales within 0.3 miles of } i \text{ in year } t-1}$
- $\text{CashShare}^{(\text{outer})}_{i,t-1} = \frac{\#\text{ cash sales within 0.5 miles of property } i \text{ in year } t-1}{\#\text{ all sales within 0.5 miles of } i \text{ in year } t-1}$
  - The ring radii are also specified at alternative distances, such as 0.2–0.4–0.6 miles, 0.3–0.5–0.7 miles, ..., 0.8-1.0-1.2 miles
- $X_{i,t}$: property, buyer, and other transaction characteristics (cash selection)
- $\delta_{c(i),t}$: tract-by-year fixed effects (unobserved neighborhood-level factors, like housing demand)

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  - The ring radii can also be specified at alternative distances, such as 0.2–0.4–0.6 miles, 0.3–0.5–0.7 miles, etc.

β_1 is the **net spillover effect** on a property of having cash sales in its immediate vicinity, beyond the **area-wide trends** captured by β_2 and β_3

Identification Assumption

Assumption: The inner ring shares **similar endogeneity** with the outer rings, such that the broader influence of nearby cash purchases on appraisals and prices is appropriately absorbed by the controls in the wider areas

- However, cash sales may systematically occur in micro-areas experiencing local market declines, precisely where the focal mortgage-financed transaction takes place

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Testable hypotheses:

- # 1: Comps are predominantly drawn from the immediate vicinity
  - Neighborhood interactions tend to occur in hyperlocal geographies (Bayer et al., 2021)
  - Simulate the comps selection process
- # 2: Cash selection or other unobserved predictors of cash activity do not vary in a significant way across the geographic scale

Summary Statistics for Each Ring

Table 2: Exposure to Nearby Cash Sales

	Panel A: Exposure to Cash Purchases (%)		Panel B: Number of Housing Transactions	
Distance (miles)	**Mean**	**SD**	**Mean**	**SD**
0.1	17.96	26.91	7	6.69
0.2	18.02	21.02	16	21
0.3	18.22	18.63	28	34
0.4	18.39	17.36	41	46
0.5	18.54	16.54	58	60
0.6	18.65	15.96	78	77
0.7	18.75	15.52	98	96
0.8	18.84	15.16	121	118
0.9	18.91	14.86	147	139
1.0	18.98	14.62	170	162
1.1	19.03	14.40	207	191
1.2	19.09	14.22	236	218
No. Observations		5,023,195		

- The cash purchase share increases only slightly with the ring radius
- The number of nearby housing transactions increases exponentially with distance

Hypothesis #1: Comps Drawn from Immediate Vicinity?

The industry standard (e.g., Zillow) of choosing comps focus on location, recency, and property attributes:

- $\geq$3 transactions within 0.25–0.5 mile (up to 1 mile) in the past 3–6 months (up to 1 year) with similar characteristics

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An algorithm to manually construct comps for each focal transaction:

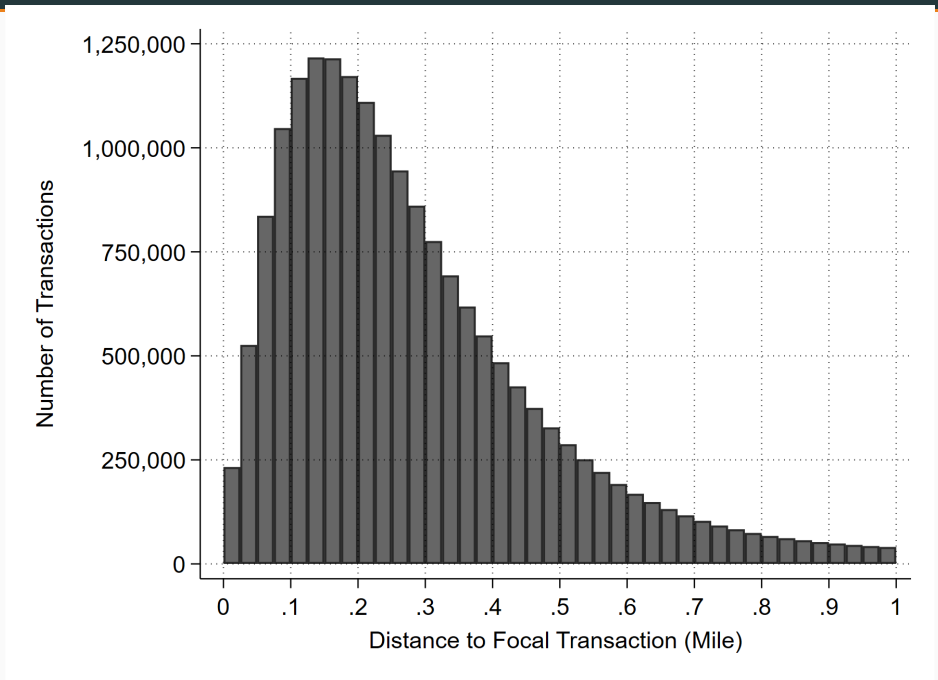
1. Narrow down to potential comps traded within 1 mile & 1 year
2. Compute (dis-)similarity scores based on property attributes
   - $$S(i,j) = \sum_{k=1}^{K} w_k \cdot \frac{|x_{k,i} - x_{k,j}|}{\Delta_k} \tag{3}$$
   - $S(i,j)$: how dissimilar property j is to the subject property i
3. Selecting 3-4 final comps with top rankings
   - Prioritize closer, more recent candidates in the event of very close scores and similar key attributes (e.g., # bed, # stories must match)

Hypothesis #1: Comps Drawn from Immediate Vicinity?

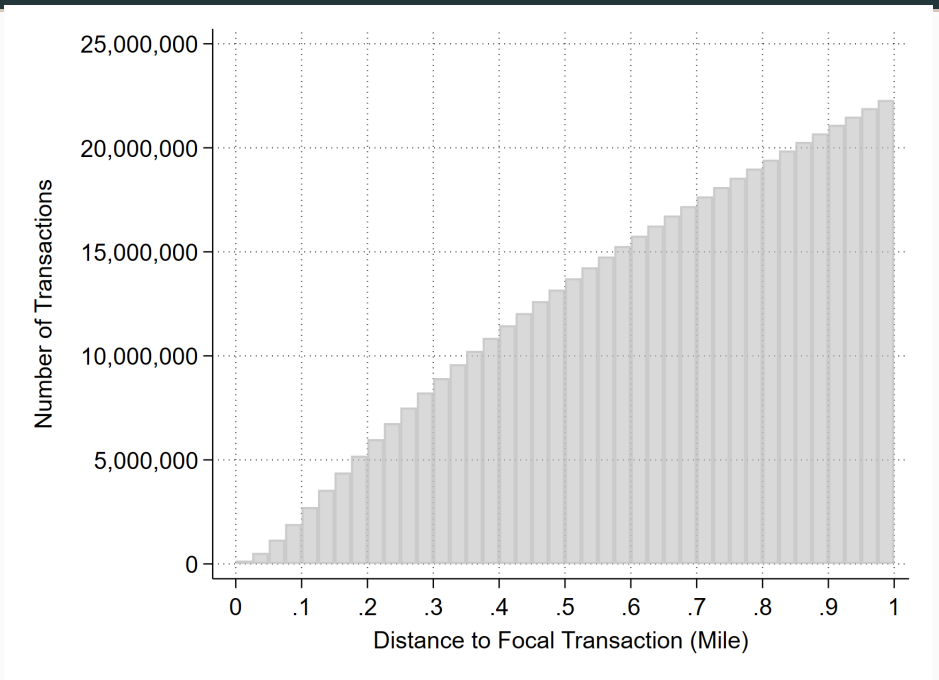
Table 3: Imputed Comps vs. Other Nearby Candidates

Panel A: Summary Counts					
No. Unique Pairwise Combinations				609,622,168	
No. Unique Focal Transactions				3,816,516	
Panel B: No. Nearby Transactions Matched Per Focal Transaction					
	Mean	**Std. Dev.**	**Min.**	**Max.**	**N**
Imputed Comps	3.61	0.73	1	6	3,816,516
Other Nearby	156.11	123.57	1	2,373	3,816,516
Panel C: The Difference from Focal Transaction					
	Mean	**Std. Dev.**	**Min.**	**Max.**	**N**
Group 1: Imputed Comps					
Similarity Score	0.38	0.35	0.01	3.72	13,683,225
Distance (Mile)	0.27	0.19	0	1	13,683,225
Recency (Day)	178.17	107.09	1	365	13,683,225
Building Age	5.21	9.99	0	125	13,683,225
Land Sq. ft.	4,011	19,186	0	145,547	13,683,225
Building Sq. ft.	348	396	0	2,390	13,683,225
No. Bed	0.19	1.26	0	5	13,683,225
No. Bath	0.18	0.50	0	4	13,683,225
Group 2: Other Nearby Transactions					
Similarity Score	1.19	0.50	0.01	3.72	595,938,943
Distance (Mile)	0.73	0.24	0	1	595,938,943
Recency (Day)	183.05	106.16	1	365	595,938,943
Building Age	15.24	19.09	0	125	595,938,943
Land Sq. ft.	7,583	29,128	0	189,150	595,938,943
Building Sq. ft.	831	827	0	4,727	595,938,943
No. Bed	0.72	1.90	0	5	595,938,943
No. Bath	0.73	0.94	0	4	595,938,943

Hypothesis #1: Comps Drawn from Immediate Vicinity?



A: Histogram of Imputed Comps



B: Histogram of Other Nearby Transactions

- 90% imputed comps are within the 0.5-mile radius, while # other nearby transactions increases almost linearly with distance

CDF of Imputed Comps

- Why? Most focal sales are matched with more than 10 nearby candidates with 1 mile $\rightarrow$ prioritizing closer candidates in the final step

Hypothesis #2: No Strong Selection across Geographic Scale

- Column (1): mortgage-cash premium $\approx 11.3\%$
- Column (2): property attributes predictive of cash purchases
  - Cheaper, younger homes with fewer bedrooms, larger living space, more land and parking (conditional on tract-level characteristics)

	(1) Log(Price)	(2) Cash Indicator
Cash Indicator	-0.113***	
	(0.001)	
Log(Price) Std		-0.124***
		(0.001)
Age Std	-0.091***	-0.006***
	(0.001)	(0.000)
Bed Std	0.017***	-0.005***
	(0.000)	(0.000)
Building Sqft Std	0.188***	0.038***
	(0.001)	(0.000)
Land Sqft Std	0.032***	0.009***
	(0.000)	(0.000)
Stories Std	-0.001	-0.015***
	(0.000)	(0.000)
Parking Sqft Std	0.030***	0.008***
	(0.000)	(0.000)
Basemen Sqft Std	-0.002***	-0.003***
	(0.000)	(0.000)
Observations	8,303,958	8,303,958
Tract-by-Year FE	Y	Y
Other Hedonic Controls	Y	Y
R-squared	0.795	0.161

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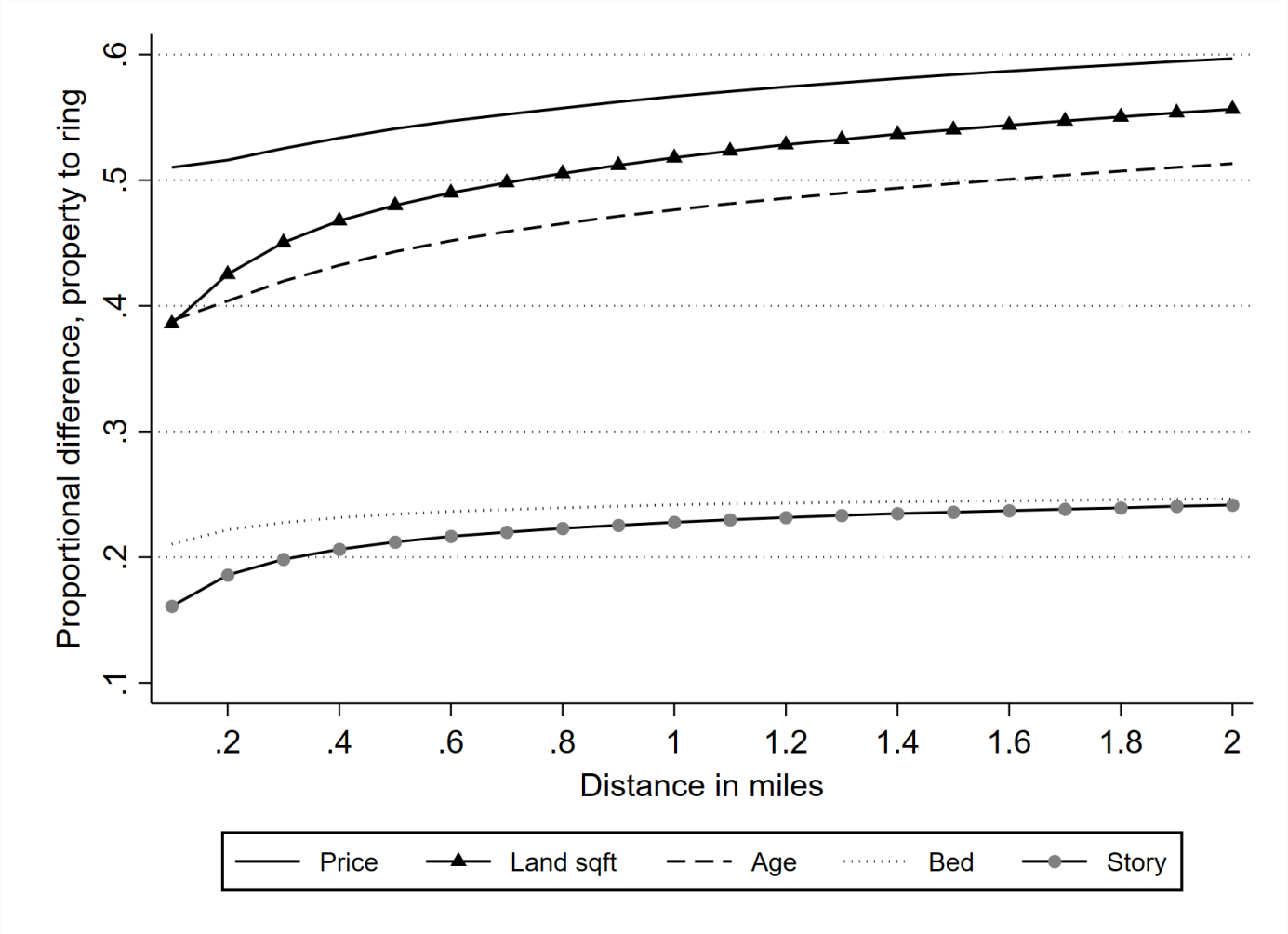


- The key predictors increase only gradually along the geographic scale, similar to Bayer et al. (2021)

Summary: Evidence Supporting Internal Validiity

- Simulated comparable sales are distributed largely around the 0.25-mile radius
  - In comparison, other nearby comps candidates are farther away and have more differences in property characteristics from the focal property
- Though cash buyers select at the property level, they don't significantly sort across the geographic scale as the ring expands

Baseline Results

Baseline: Appraisal Values

One SD increase in cash share $\Rightarrow$ 0.75 pp or \$2,315 lower appraisal values

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-11,357***	-14,049***	-16,024***	-17,349***	-16,990***	-16,146***
	(641)	(886)	(1,146)	(1,368)	(1,570)	(1,803)
Middle Share	-4,582***	-3,125**	-731	1,475	1,115	932
	(1,159)	(1,375)	(1,629)	(1,897)	(2,147)	(2,432)
Outer Share	5,465***	8,219***	9,136***	9,733***	11,242***	12,031***
	(1,543)	(1,801)	(2,013)	(2,208)	(2,410)	(2,648)
Townhome	-1,607	-1,627	-1,654*	-1,673*	-1,691*	-1,703*
	(996)	(996)	(996)	(996)	(996)	(996)
Building Age	-1,091***	-1,092***	-1,093***	-1,093***	-1,094***	-1,094***
	(7)	(7)	(7)	(7)	(7)	(7)
No. Bed	30,655***	30,667***	30,678***	30,689***	30,698***	30,705***
	(200)	(200)	(200)	(200)	(201)	(201)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	(0)
No. Story	23,249***	23,249***	23,261***	23,270***	23,278***	23,284***
	(288)	(288)	(288)	(288)	(288)	(288)
Parking Sqft	141***	141***	141***	141***	141***	141***
	(1)	(1)	(1)	(1)	(1)	(1)
Basement Sqft	59***	59***	59***	59***	59***	59***
	(1)	(1)	(1)	(1)	(1)	(1)
High LTV	-12,097***	-12,097***	-12,094***	-12,092***	-12,089***	-12,087***
	(148)	(148)	(148)	(148)	(148)	(148)
Low Income	-43,169***	-43,169***	-43,175***	-43,179***	-43,183***	-43,187***
	(184)	(184)	(184)	(184)	(184)	(184)
Observations	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.814	0.814	0.814	0.814	0.814	0.814

Baseline: Transaction Prices

One SD increase in cash share $\Rightarrow$ 0.73 pp or $2,252 lower appraisal values

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-11,045***	-13,809***	-15,567***	-16,554***	-16,379***	-16,061***
	(663)	(918)	(1,187)	(1,429)	(1,637)	(1,866)
Middle Share	-4,455***	-2,605*	-604	752	1,168	2,414
	(1,191)	(1,428)	(1,677)	(1,943)	(2,200)	(2,496)
Outer Share	5,921***	8,359***	9,557***	10,833***	11,671***	11,506***
	(1,614)	(1,881)	(2,110)	(2,312)	(2,512)	(2,773)
Townhome	-2,682***	-2,701***	-2,728***	-2,746***	-2,764***	-2,776***
	(1,006)	(996)	(1,006)	(1,006)	(1,006)	(1,006)
Building Age	-1,131***	-1,131***	-1,132***	-1,133***	-1,133***	-1,134***
	(7)	(7)	(7)	(7)	(7)	(7)
No. Bed	31,737***	31,748***	31,759***	31,769***	31,778***	31,785***
	(207)	(207)	(207)	(207)	(207)	(207)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	(0)
No. Story	24,122***	24,135***	24,146***	24,155***	24,163***	24,168***
	(300)	(300)	(300)	(300)	(300)	(300)
Parking Sqft	144***	144***	144***	144***	144***	144***
	(1)	(1)	(1)	(1)	(1)	(1)
Basement Sqft	62***	62***	62***	62***	62***	62***
	(1)	(1)	(1)	(1)	(1)	(1)
High LTV	-9,755***	-9,756***	-9,754***	-9,754***	-9,754***	-9,754***
	(125)	(125)	(125)	(125)	(125)	(125)
Low Income	-40,697***	-40,703***	-40,708***	-40,712***	-40,716***	-40,720***
	(181)	(181)	(181)	(181)	(180)	(180)
Observations	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.811	0.811	0.811	0.811	0.811	0.811

Heterogeneity

More Pronounced Effects (×1.6-2) w/ Recent Cash Sales

Appraisals

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-7,350***	-9,843***	-11,710***	-13,030***	-12,614***	-11,708***
	(675)	(910)	(1,164)	(1,384)	(1,585)	(1,818)
× High Recency	-7,362***	-7,795***	-8,100***	-8,303***	-8,492***	-8,614***
	(437)	(448)	(454)	(457)	(456)	(456)
× Medium Recency	-4,721***	-4,897***	-4,996***	-4,892***	-4,889***	-4,854***
	(441)	(455)	(459)	(462)	(463)	(465)
Middle Share	-4,604***	-3,182**	-783	1,487	1,140	898
	(1,159)	(1,375)	(1,629)	(1,897)	(2,147)	898
Outer Share	5,326***	8,101***	9,015***	9,565***	11,051***	11,853***
	(1,544)	(1,802)	(2,014)	(2,208)	(2,410)	(2,648)
Townhome	-1,615	-1,635	-1,662*	-1,680*	-1,699*	-1,711*
	(996)	(996)	(996)	(996)	(996)	(996)
Building Age	-1,091***	-1,092***	-1,093***	-1,093***	-1,094***	-1,094***
	(7)	(7)	(7)	(7)	(7)	(7)
No. Bed	30,653***	30,664***	30,675***	30,686***	30,695***	30,702***
	(200)	(200)	(200)	(200)	(200)	(201)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	(0)
No. Story	23,234***	23,247***	23,259***	23,268***	23,276***	23,282***
	(288)	(288)	(288)	(288)	(288)	(288)
Parking Sqft	141***	(288)	141***	141***	141***	141***
	(1)	141***	(1)	(1)	(1)	(1)
Basement Sqft	59***	59***	59***	59***	59***	59***
	59***	(1)	(1)	(1)	(1)	(1)
High LTV	-12,092***	-12,092***	-12,088***	-12,086***	-12,084***	-12,082***
	(148)	(148)	(148)	(148)	(148)	(148)
Low Income	-43,167***	-43,174***	-43,180***	-43,185***	-43,189***	-43,193***
	(184)	(184)	(184)	(184)	(184)	(184)
Observations	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.814	0.814	0.814	0.814	0.814	0.814

More Pronounced Effects (×1.6-2) w/ Recent Cash Sales

Prices

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-6,921***	-9,473***	-11,134***	-12,129***	-11,905***	-11,512***
	(697)	(941)	(1,202)	(1,440)	(1,648)	(1,879)
× High Recency	-7,493***	-7,943***	-8,201***	-8,360***	-8,537***	-8,679***
	(448)	(461)	(469)	(472)	(471)	(472)
× Medium Recency	-4,950***	-5,156***	-5,285***	-5,194***	-5,180***	-5,165***
	(452)	(466)	(471)	(474)	(476)	(477)
Middle Share	-4,480***	-2,666*	-659	763	1,189	2,376
	(1,191)	(1,428)	(1,677)	(1,943)	(2,200)	898
Outer Share	5,774***	8,233***	9,426***	9,565***	11,051***	11,320***
	(1,614)	(1,881)	(2,110)	(2,312)	11,472***	11,320***
Townhome	-2,691***	-2,710***	-2,736***	-2,754***	-2,772***	-2,784***
	(1,006)	(1,006)	(1,006)	(1,006)	(1,006)	(1,006)
Building Age	-1,131***	-1,131***	-1,132***	-1,133***	-1,133***	-1,134***
	(7)	(7)	(7)	(7)	(7)	(7)
No. Bed	31,734***	31,745***	31,756***	31,766***	31,775***	31,782***
	(207)	(207)	(207)	(207)	31,775***	(207)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	1***	(0)	(0)	(0)	(0)
No. Story	24,120***	24,133***	24,144***	24,153***	24,160***	24,166***
	(300)	(300)	(300)	(300)	(300)	(300)
Parking Sqft	144***	144***	144***	144***	144***	144***
	(1)	(1)	(1)	(1)	(1)	(1)
Basement Sqft	62***	62***	62***	62***	62***	62***
	59***	(1)	(1)	(1)	(1)	(1)
High LTV	-9,750***	-9,750***	-9,749***	-9,749***	-9,749***	-9,748***
	(125)	(125)	(125)	(125)	(125)	(125)
Low Income	-40,701***	-40,708***	-40,714***	-40,718***	-40,722***	-40,726***
	(181)	(181)	(181)	(181)	(180)	(180)
Observations	4,991,271	4,769,776	4,769,776	4,769,776	4,769,776	4,769,776
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.808	0.808	0.808	0.808	0.808	0.808

Stronger Effects ($\times 2$) for High-LTV Transactions

Appraisals

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-5,402***	-6,927***	-8,353***	-9,228***	-8,570***	-7,539***
	(863)	(1,120)	(1,375)	(1,588)	(1,782)	(2,003)
Inner Share × High LTV	-11,009***	-13,133***	-14,076***	-14,807***	-15,266***	-15,538***
	(823)	(928)	(995)	(1,044)	(1,079)	(1,107)
Middle Share	-4,538***	-3,050**	-651	1,539	1,148	968
	(1,158)	(1,374)	(1,628)	(1,896)	(2,146)	(2,431)
Outer Share	5,588***	8,342***	9,252***	9,850***	11,371***	12,131***
	(1,542)	(1,799)	(2,011)	(2,205)	(2,406)	(2,643)
Townhome	-1,729*	-1,764*	-1,795*	-1,816*	-1,833*	-1,844*
	(997)	(997)	(997)	(997)	(997)	(997)
Building Age	-1,091***	-1,092***	-1,093***	-1,093***	-1,094***	-1,094***
	(7)	(7)	(7)	(7)	(7)	(7)
No. Bed	30,665***	30,677***	30,687***	30,697***	30,705***	30,712***
	(200)	(201)	(201)	(201)	(201)	(201)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	(0)
No. Story	23,228***	23,239***	23,250***	23,258***	23,266***	23,271***
	(288)	(288)	(288)	(288)	(288)	(288)
Parking Sqft	141***	141***	141***	141***	141***	141***
	(1)	(1)	(1)	(1)	(1)	(1)
Basement Sqft	59***	59***	59***	59***	59***	59***
	(1)	(1)	(1)	(1)	(1)	(1)
High LTV	-10,132***	-9,736***	-9,546***	-9,397***	-9,297***	-9,232***
	(195)	(208)	(217)	(224)	(230)	(235)
Low Income	-43,091***	-43,087***	-43,090***	-43,092***	-43,096***	-43,101***
	(184)	(184)	(184)	(184)	(184)	(184)
Observations	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.814	0.814	0.814	0.814	0.814	0.814

Stronger Effects ($\times 2$) for High-LTV Transactions

Prices

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-6,697***	-8,595***	-9,806***	-10,316***	-9,869***	-9,400***
	(788)	(1,053)	(1,320)	(1,555)	(1,755)	(1,976)
Inner Share × High LTV	-11,170***	-13,282***	-14,534***	-15,529***	-16,194***	-16,560***
	(768)	(868)	(932)	(979)	(1,013)	(1,039)
Middle Share	-4,365***	-2,477*	-519	757	1,214	2,515
	(1,191)	(1,427)	(1,676)	(1,941)	(2,198)	(2,494)
Outer Share	6,076***	8,497***	9,745***	11,067***	11,896***	11,685***
	(1,614)	(1,879)	(2,108)	(2,310)	(2,509)	(2,769)
Townhome	-2,753***	-2,780***	-2,810***	-2,830***	-2,846***	-2,856***
	(1,006)	(1,006)	(1,006)	(1,007)	(1,007)	(1,007)
Building Age	-1,131***	-1,131***	-1,132***	-1,133***	-1,133***	-1,134***
	(7)	(7)	(7)	(7)	(7)	(7)
No. Bed	31,747***	31,759***	31,771***	31,780***	31,788***	31,795***
	(207)	(207)	(207)	(207)	(207)	(207)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	(0)
No. Story	24,116***	24,126***	24,137***	24,145***	24,152***	24,158***
	(300)	(300)	(300)	(300)	(300)	(300)
Parking Sqft	144***	144***	144***	144***	144***	144***
	(1)	(1)	(1)	(1)	(1)	(1)
Basement Sqft	62***	62***	62***	62***	62***	62***
	(1)	(1)	(1)	(1)	(1)	(1)
High LTV	-7,774***	-7,384***	-7,142***	-6,948***	-6,814***	-6,734***
	(186)	(200)	(210)	(218)	(224)	(229)
Low Income	-40,643***	-40,641***	-40,643***	-40,644***	-40,646***	-40,650***
	(180)	(180)	(180)	(180)	(180)	(180)
Observations	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.808	0.808	0.808	0.808	0.808	0.808

Stronger Effects ($\times 7$) for Low-Income Home Buyers

Appraisals

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-2,848***	-4,121***	-5,349***	-6,194***	-5,622***	-4,675**
	(922)	(1,187)	(1,442)	(1,654)	(1,844)	(2,068)
Inner Share × Low Income	-16,270***	-18,863***	-20,046***	-20,745***	-21,081***	-21,193***
	(1,005)	(1,152)	(1,251)	(1,325)	(1,381)	(1,427)
Middle Share	-4,427***	-2,920**	-612	1,518	1,151	949
	(1,158)	(1,373)	(1,627)	(1,892)	(2,143)	(2,428)
Outer Share	5,707***	8,436***	9,368***	9,965***	11,478***	12,263***
	(1,540)	(1,794)	(2,005)	(2,199)	(2,400)	(2,637)
Townhome	-1,700*	-1,725*	-1,771*	-1,771*	-1,787*	-1,796*
	(997)	(997)	(997)	(997)	(997)	(998)
Building Age	-1,091***	-1,092***	-1,753*	-1,093***	-1,094***	-1,094***
	(7)	(7)	(997)	(7)	(7)	(7)
No. Bed	30,671***	30,684***	30,695***	30,704***	30,713***	30,719***
	(200)	(200)	(201)	30,704***	(201)	(201)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	(0)
No. Story	23,240***	23,252***	23,263***	23,271***	23,278***	23,283***
	(288)	(288)	(288)	(288)	(288)	(288)
Parking Sqft	141***	141***	141***	141***	141***	141***
	(1)	(1)	(1)	141***	(1)	(1)
Basement Sqft	59***	59***	59***	59***	59***	59***
	(1)	(1)	59***	(1)	(1)	(1)
High LTV	-11,998***	-11,985***	-11,978***	-11,976***	-11,974***	-11,974***
	(148)	(148)	(148)	(148)	(148)	(148)
Low Income	-40,303***	-39,829***	-39,602***	-39,461***	-39,385***	-39,351***
	(243)	(262)	(276)	(288)	(298)	(306)
Observations	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.814	0.814	0.814	0.814	0.814	0.814

Stronger Effects ($\times 7$) for Low-Income Home Buyers

Prices

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-3,767***	-5,461***	-6,745***	-7,509***	-7,352***	-7,135***
	(951)	(1,228)	(1,493)	(1,725)	(1,919)	(2,139)
Inner Share × Low Income	-13,917***	-15,864***	-16,572***	-16,826***	-16,743***	-16,494***
	(1,032)	(1,184)	(1,286)	(1,362)	(1,420)	(1,467)
Middle Share	-4,324***	-2,434*	-505	788	1,195	2,427
	(1,190)	(1,426)	(1,675)	(1,939)	(2,196)	(2,492)
Outer Share	6,128***	8,541***	9,748***	11,021***	11,859***	11,686***
	(1,612)	(1,875)	(2,103)	(2,305)	(2,505)	(2,765)
Townhome	-2,768***	-2,791***	-2,817***	-2,833***	-2,847***	-2,854***
	(1,007)	(1,007)	(1,007)	(1,007)	(1,007)	(1,007)
Building Age	-1,130***	-1,131***	-1,132***	-1,132***	-1,133***	-1,134***
	(7)	(7)	(997)	(7)	(7)	(7)
No. Bed	31,749***	31,761***	31,772***	31,781***	31,789***	31,795***
	(207)	(207)	(207)	30,704***	(207)	(207)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	(0)
No. Story	24,125***	24,137***	24,148***	24,155***	24,163***	24,168***
	(300)	(300)	(300)	(300)	(300)	(300)
Parking Sqft	144***	144***	144***	144***	144***	144***
	(1)	(1)	(1)	144***	(1)	(1)
Basement Sqft	62***	62***	62***	62***	62***	62***
	(1)	(1)	59***	(1)	(1)	(1)
High LTV	-9,691***	-9,684***	-9,682***	-9,682***	-9,684***	-9,686***
	(125)	(125)	(125)	(125)	(125)	(125)
Low Income	-38,254***	-37,898***	-37,759***	-37,700***	-37,703***	-37,738***
	(252)	(273)	(288)	(301)	(311)	(320)
Observations	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271	4,991,271
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.808	0.808	0.808	0.808	0.808	0.808

Weaker Efects ($\times$0.6) for High-Growth Neighborhoods

Appraisals

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-11,454***	-14,050***	-15,787***	-17,265***	-17,433***	-16,857***
	(662)	(913)	(1,174)	(1,399)	(1,607)	(1,845)
Inner Share × High Growth	4,542***	6,056***	7,767***	8,630***	8,852***	8,818***
	(937)	(1,128)	(1,298)	(1,503)	(1,687)	(1,904)
Middle Share	-3,910***	-2,770**	-1,309	710	853	1,831
	(1,171)	(1,386)	(1,644)	(1,913)	(2,087)	(2,449)
Outer Share	4,575***	7,275***	8,669***	9,450***	10,455***	10,511***
	(1,558)	(1,815)	(2,027)	(2,222)	(2,426)	(2,666)
Townhome	-1,692*	-1,713*	-1,740*	-1,757*	-1,774*	-1,785*
	(1,014)	(1,014)	(1,014)	(1,014)	(1,014)	(1,014)
Building Age	-1,095***	-1,096***	-1,097***	-1,097***	-1,098***	-1,098***
	(7)	(7)	(7)	(7)	(7)	(7)
No. Bed	30,070***	30,081***	30,093***	30,103***	30,112***	30,120***
	(206)	(206)	(206)	30,103***	(206)	(206)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	(0)
No. Story	24,621***	24,635***	24,646***	24,655***	24,663***	24,669***
	(296)	(296)	(296)	(296)	(296)	(296)
Parking Sqft	138***	138***	138***	138***	138***	138***
	(1)	(1)	(1)	(1)	(1)	(1)
Basement Sqft	59***	59***	59***	59***	59***	59***
	(1)	(1)	(1)	(1)	(1)	(1)
High LTV	-17,921***	-17,921***	-17,920***	-17,920***	-17,920***	-17,920***
	(137)	(137)	(137)	(137)	(137)	(137)
Low Income	-41,483***	-41,488***	-41,494***	-41,498***	-41,502***	-41,506***
	(185)	(185)	(185)	(185)	(185)	(185)
Observations	4,681,495	4,681,495	4,681,495	4,681,495	4,681,495	4,681,495
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.814	0.814	0.814	0.814	0.814	0.814

Weaker Efects ($\times$0.6) for High-Growth Neighborhoods

Prices

	(1) 3-5-7	(2) 4-6-8	(3) 5-7-9	(4) 6-8-10	(5) 7-9-11	(6) 8-10-12
Inner Share	-11,154***	-13,876***	-15,536***	-16,732***	-16,887***	-16,824***
	(684)	(947)	(1,216)	(1,459)	(1,676)	(1,910)
Inner Share × High Growth	4,211***	5,771***	7,298***	8,132***	8,382***	8,471***
	(945)	(1,140)	(1,324)	(1,528)	(1,711)	(1,923)
Middle Share	-3,984***	-2,460*	-1,028	225	1,198	3,050
	(1,204)	(1,439)	(1,695)	(1,962)	(2,222)	(2,517)
Outer Share	5,011***	7,435***	8,861***	10,275***	10,698***	9,993***
	(1,630)	(1,894)	(2,123)	(2,329)	(2,530)	(2,791)
Townhome	-3,385***	-3,406***	-3,432***	-3,448***	-3,465***	-3,476***
	(1,021)	(1,021)	(1,021)	(1,021)	(1,021)	(1,021)
Building Age	-1,135***	-1,136***	-1,137***	-1,137***	-1,138***	-1,138***
	(7)	(7)	(7)	(7)	(7)	(7)
No. Bed	31,135***	31,146***	31,157***	31,167***	31,177***	31,184***
	(213)	(213)	(213)	(213)	(213)	(213)
Land Sqft	1***	1***	1***	1***	1***	1***
	(0)	(0)	(0)	(0)	(0)	1***
No. Story	25,472***	25,485***	25,496***	25,505***	25,513***	25,519***
	(309)	(309)	(309)	(309)	(309)	(309)
Parking Sqft	141***	141***	141***	141***	141***	141***
	(1)	(1)	(1)	(1)	141***	(1)
Basement Sqft	63***	63***	63***	63***	63***	63***
	(1)	(1)	(1)	(1)	(1)	(1)
High LTV	-9,732***	-9,732***	-9,730***	-9,730***	-9,730***	-9,730***
	(128)	(128)	(128)	(128)	(128)	(128)
Low Income	-40,838***	-40,844***	-40,850***	-40,854***	-40,857***	-40,861***
	(186)	(186)	(186)	(186)	(186)	(186)
Observations	4,681,495	4,681,495	4,681,495	4,681,495	4,681,495	4,681,495
Tract-by-Year FE	Y	Y	Y	Y	Y	Y
Other Hedonic Controls	Y	Y	Y	Y	Y	Y
R-squared	0.807	0.807	0.807	0.807	0.807	0.807

High-Growth Versus Low-Growth Neighborhoods

Table 4: Comparison of Neighborhood Characteristics (2020)

	Low-Growth Tracts		High-Growth Tracts		
	Mean	SD	Mean	SD	Difference
Median Rent	1,125	597	1,070	503	-55***
Median Home Value	341,510	287,462	293,872	227,797	-47,637***
Median Household Income	85,796	41,572	73,613	33,858	-12,182***
Unemployment Rate	0.05	0.04	0.06	0.05	0.01***
College	0.36	0.20	0.29	0.18	-0.06***
Poverty	0.12	0.10	0.14	0.11	0.02***
Median Age	41	8	40	9	-1.23***
Vacancy	0.10	0.10	0.11	0.11	0.01***
New Homes	0.07	0.10	0.09	0.12	0.01***
Black	0.11	0.19	0.15	0.22	0.03***
Asian	0.05	0.10	0.04	0.08	-0.02***
Hispanic	0.11	0.16	0.15	0.19	0.04***
Single Family Homes	0.64	0.26	0.64	0.26	-0.00
No. Obs in Each Group			33,233		

Summary

- I identify a new appraisal mechanism through which nearby cash sales depress the transaction price of the mortgage-financed home via lower appraisals
- Evidence supports the internal validity of the ring-based spatial research design
- One SD (15.24 pp) increase in nearby cash purchase market share $\Rightarrow$
  - Baseline: 0.75 pp or \$2,315 lower appraisal values and 0.73 pp or \$2,252 lower transaction prices ($\simeq$ having a home two years' older)
  - More pronounced ($\times$1.6-2) if nearby cash sales are more recent
  - Stronger ($\times$2) effects for high-LTV transactions
  - Stronger ($\times$7) effects for low-income home buyers
  - Less pronounced ($\times$0.6) effects for neighborhoods with high growth in house prices

Discussion & Further Work

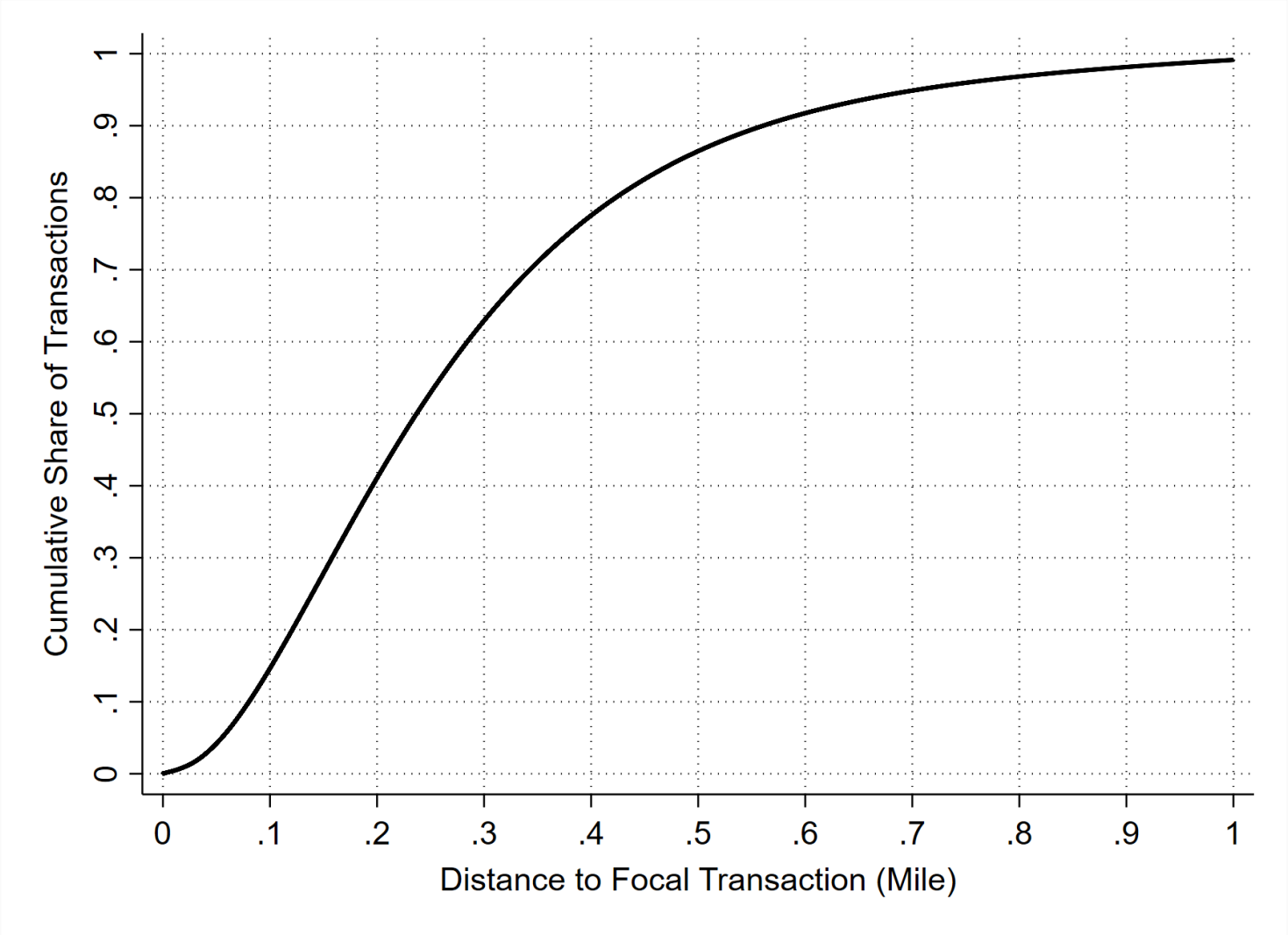
- Why don't buyers already take into account appraisals when bidding?
  - Inattention or naïveté
  - The sequential nature of appraisals lets buyers postpone dealing with low appraisals (e.g., Calem et al. REE 2021; NAR Report, 2021)
  - Financial literacy
- A direct test using the simulated comps - see lower appraisals or transaction prices with more nearby cash buyers?

Thank you!

Zhu (2025)

Appendix

CDF of Imputed Comparables Sales



This graph shows the cumulative share of imputed comparable sales across different geographic scales from 0 to 1 mile. Back

Summary Statistics of HPI Growth (2018-2022)

Table 5:

Year	Mean	SD	P10	P25	P50	P75	P90	N
2018	0.064	0.211	-0.120	-0.009	0.061	0.135	0.248	66,466
2019	0.051	0.208	-0.126	-0.021	0.048	0.122	0.238	66,466
2020	0.087	0.203	-0.084	0.016	0.083	0.156	0.268	66,466
2021	0.158	0.195	-0.021	0.079	0.154	0.232	0.341	66,466
2022	0.128	0.192	-0.059	0.049	0.128	0.210	0.314	66,466
Average	0.092	0.069	0.042	0.065	0.089	0.116	0.147	66,466

This table summarizes the house price indices (HPIs) estimated from hedonic regressions and aggregated to the annual level. The last row shows the summary statistics of the five-year average price growth across all 66,466 tracts.

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