

An aerial photograph of Seattle, Washington, at dusk. The city skyline is illuminated with lights, and the sky is a mix of orange and blue. In the foreground, the Lumen Field stadium is visible, with its name "LUMEN FIELD" written on the building. The stadium is surrounded by parking lots and other buildings. The text "HOUSING MARKETS, SHORT-TERM RENTALS, AND THE 2026 FIFA WORLD CUP" is overlaid in large, white, bold letters across the center of the image.

HOUSING MARKETS, SHORT-TERM RENTALS, AND THE 2026 FIFA WORLD CUP

SEATTLE 2026

CHIKUMBUSO SHELLY NAMUCHILE

PRESENTATION ROADMAP



SEATTLE 2026
FIFA WORLD CUP™

- 01**  RESEARCH MOTIVATION >
- 02**  DATASETS AND VARIABLES >
- 03**  SPATIAL ANALYSIS >
- 04**  ECONOMETRIC MODEL >
- 05**  REGRESSION RESULTS >
- 06**  POLICY IMPLICATIONS >
- 07**  CONCLUSIONS AND REFLECTIONS >
- 08**  BUILDING A STRONGER SEATTLE FOR 2026 AND BEYOND >

A panoramic view of the Seattle skyline and waterfront. The city's skyscrapers, including the Space Needle, are visible in the background under a blue sky with scattered clouds. In the foreground, the dark blue water of the waterfront is visible, with a large white Ferris wheel on the right side. A dark blue rounded rectangle is overlaid on the center of the image, containing white text.

RESEARCH QUESTION

**Does Airbnb density influence
detached housing prices in Seattle?**

WHY THIS MATTERS

An aerial photograph of Seattle, Washington, showing the city skyline with various skyscrapers and the waterfront. The Great Wheel is prominent in the foreground on the right, situated on a pier. The water is blue, and the sky is clear with some clouds. The city extends into the background with a mix of residential and commercial buildings.

Understanding the link between short-term rentals and housing prices in Seattle.

01

GLOBAL PRESSURE

Seattle will host matches during the **2026 FIFA World Cup**, increasing tourism and temporary accommodation demand.

RESEARCH QUESTION

Does Airbnb density influence detached housing prices in Seattle?

WHY THIS MATTERS

An aerial view of Seattle, Washington, showing the city skyline with various skyscrapers and the iconic Space Needle. In the foreground, the waterfront is visible with a large Ferris wheel (the Seattle Great Wheel) and a marina with several boats. The sky is blue with some white clouds.

Understanding the link between short-term rentals and housing prices in Seattle.

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GLOBAL PRESSURE

Seattle will host matches during the **2026 FIFA World Cup**, increasing tourism and temporary accommodation demand.

02

LOCAL HOUSING PRESSURE

Seattle already faces rising housing costs and uneven neighborhood affordability.

RESEARCH QUESTION

Does Airbnb density influence detached housing prices in Seattle?

WHY THIS MATTERS

An aerial view of the Seattle skyline, featuring the Space Needle, various high-rise buildings, and a large Ferris wheel in the foreground. The city is situated along a waterfront with a marina and boats.

Understanding the link between short-term rentals and housing prices in Seattle.

01

GLOBAL PRESSURE

Seattle will host matches during the **2026 FIFA World Cup**, increasing tourism and temporary accommodation demand.

02

LOCAL HOUSING PRESSURE

Seattle already faces rising housing costs and uneven neighborhood affordability.

03

SHORT-TERM RENTALS

Airbnb activity is concentrated near tourism and downtown corridors where housing demand is already high.

RESEARCH QUESTION

Does Airbnb density influence detached housing prices in Seattle?



THE DATA BEHIND SEATTLE

DATASETS AND VARIABLES

SEATTLE 2026
FIFA WORLD CUP™



Inside Airbnb Listings Dataset

Geocoded listings, availability, and pricing information

EXTERNAL SOURCE



Detached Housing Prices

Transaction-level data for detached homes

SEATTLE OPEN DATA



Business Licenses

Business activity and commercial density

SEATTLE OPEN DATA



Population Estimates

Neighborhood-level population controls

SEATTLE OPEN DATA



Rent Proxy Data

Market rent estimates by neighborhood

SEATTLE OPEN DATA



Condo Market Data

Condo sales and inventory indicators

SEATTLE OPEN DATA



THE DATA BEHIND SEATTLE

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SEATTLE 2026
FIFA WORLD CUP™



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Condo sales and inventory indicators

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INTEGRATED. LOCAL. IMPACTFUL.

Combining Seattle Open Data (citywide public datasets) with Inside Airbnb data to understand how short-term rentals relate to detached housing prices across Seattle neighborhoods.

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DATASETS AND VARIABLES



SEATTLE 2026
FIFA WORLD CUP™



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SPATIAL COVERAGE

89%

of Seattle's
census tracts
covered by
integrated datasets



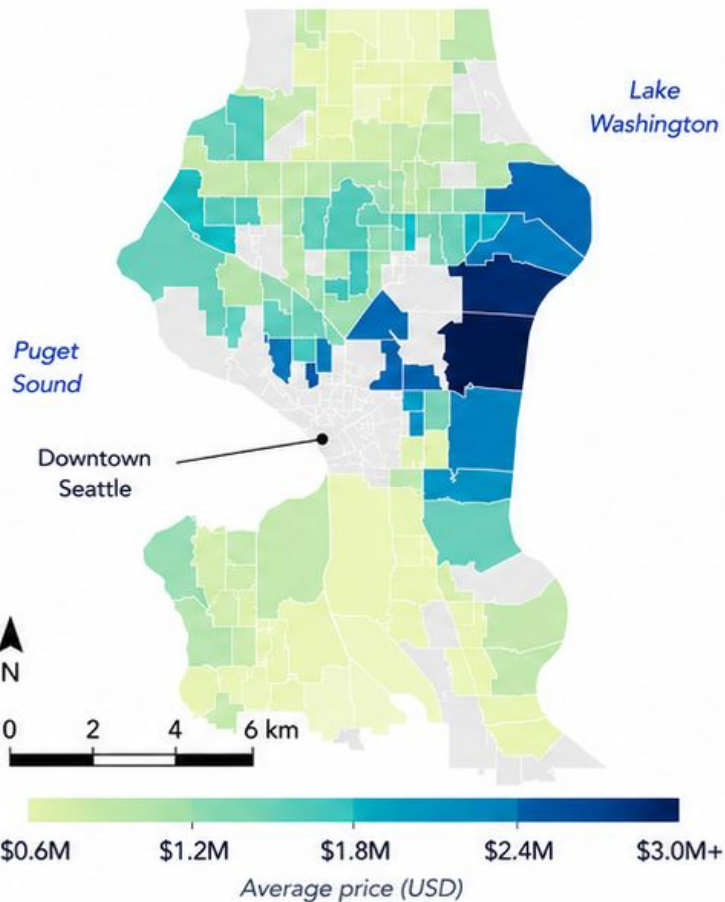
SPATIAL OVERLAP IN SEATTLE

Seattle Census Tracts, 2022–2024 | Ahead of the 2026 FIFA World Cup™

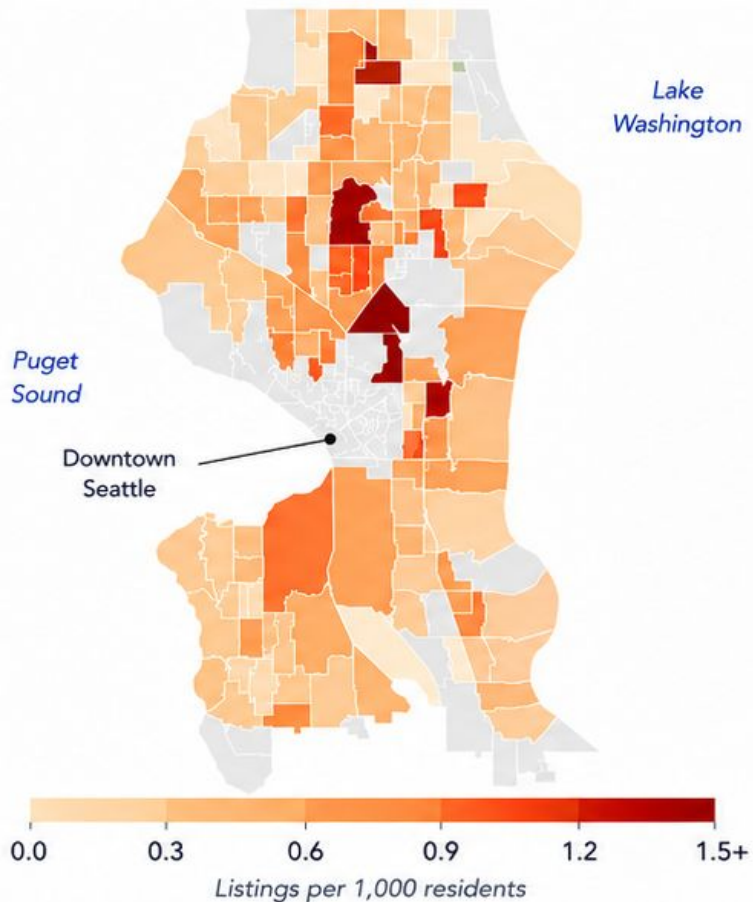
SEATTLE 2026
FIFA WORLD CUP™



AVERAGE DETACHED HOUSING PRICES (USD) 2022–2024



AVERAGE AIRBNB LISTINGS PER 1,000 RESIDENTS 2022–2024



KEY INSIGHTS



Housing prices concentrate near **eastern and waterfront neighborhoods**, particularly near Lake Washington.



Airbnb density clusters near **central and tourism-oriented corridors**.



Spatial **overlap** appears strongest in select high-demand neighborhoods rather than uniformly across Seattle.

Gray areas represent census tracts with no data or tracts excluded from analysis.

Sources: Inside Airbnb (2022–2024) | Redfin (2022–2024) | U.S. Census Bureau | City of Seattle Open Data



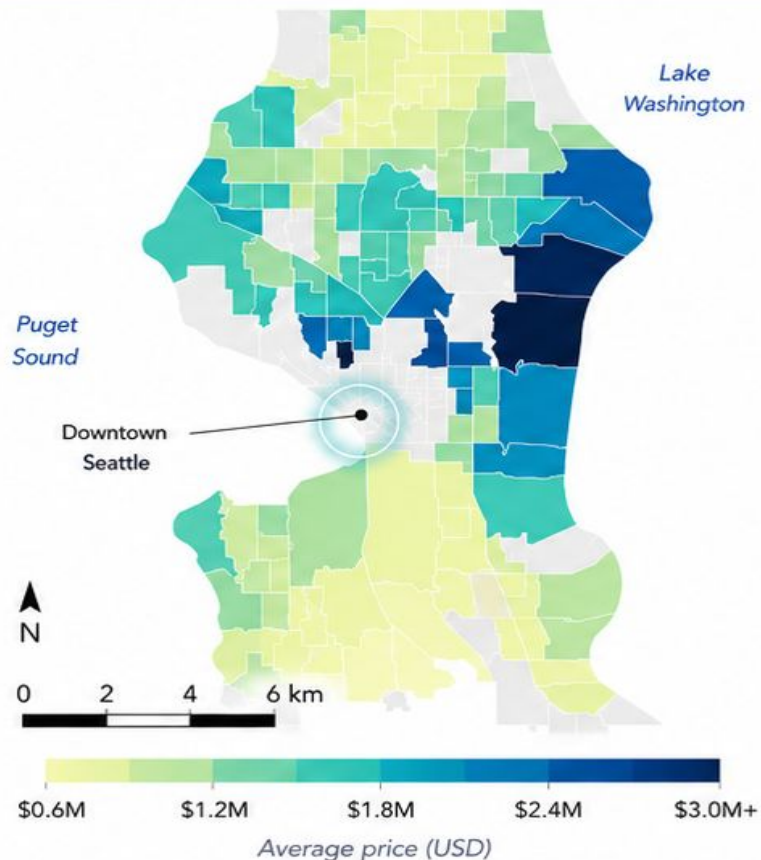
HOUSING PRICES & RENT PROXIES IN SEATTLE

Seattle Census Tracts, 2022–2024

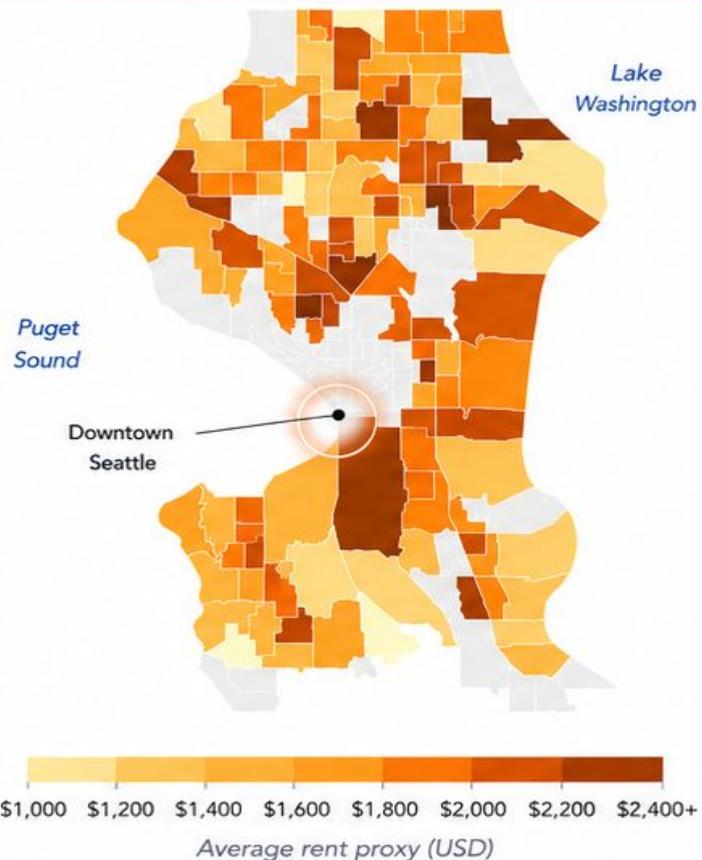
SEATTLE 2026
FIFA WORLD CUP™



AVERAGE DETACHED HOUSING PRICES (USD) 2022–2024



AVERAGE RENT PROXY (USD) 2022–2024



← →
COMPARING
AFFORDABILITY
PATTERNS

DIFFERENT METRICS,
SAME TRENDS

KEY INSIGHTS



Housing prices are highest in eastern and waterfront tracts, especially near Lake Washington.



Rent proxies are elevated across central and southern tracts, indicating higher rental market demand.



Overlap exists between high housing prices and high rent proxies, reflecting strong market pressure.



These patterns suggest localized affordability challenges rather than citywide uniformity.

Gray areas represent census tracts with no data or tracts excluded from analysis.

Sources: Redfin (2022–2024) | Zillow Rent Index (2022–2024)
City of Seattle Open Data | U.S. Census Bureau



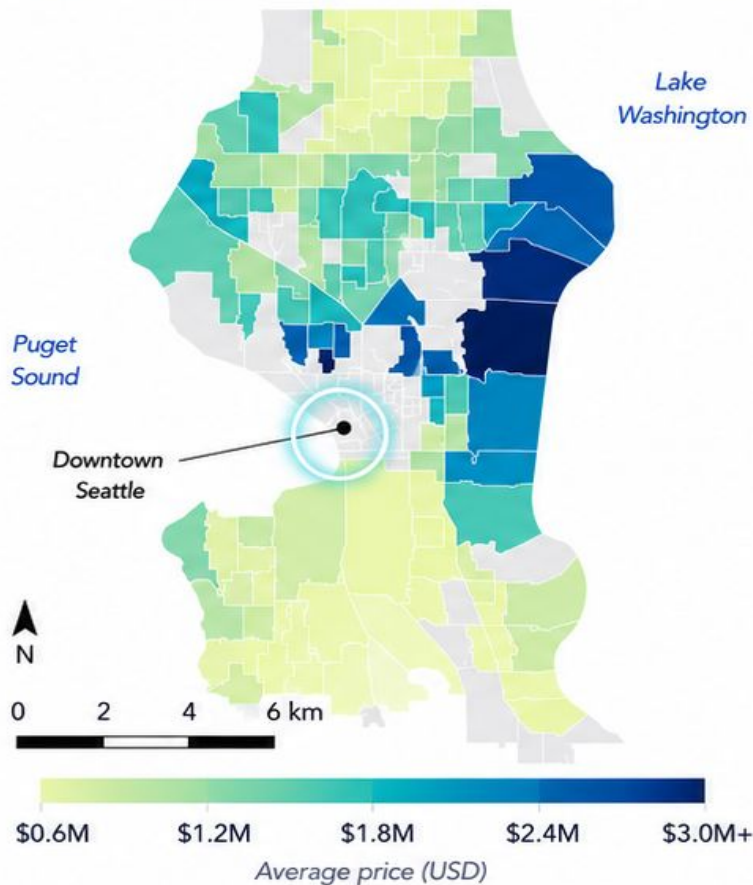
HOUSING AND COMMERCIAL CLUSTERS

Seattle Census Tracts, 2022–2024 | Urban pressure ahead of the **2026 FIFA World Cup™**

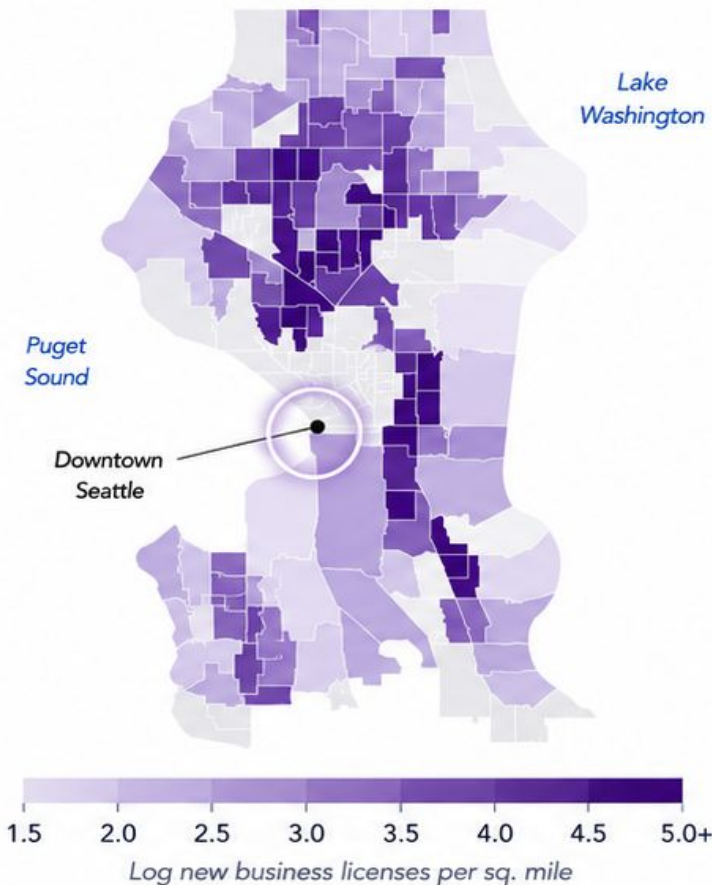
SEATTLE 2026
FIFA WORLD CUP™



AVERAGE DETACHED HOUSING PRICES (USD) 2022–2024



COMMERCIAL DENSITY Log New Business Licenses per Sq. Mile, 2022–2024



←→

**ECONOMIC
PRESSURE**

COMPARING
SPATIAL PATTERNS

KEY INSIGHTS



Detached housing prices are highest in **eastern and waterfront tracts**, particularly along Lake Washington.



Commercial activity is concentrated in **central corridors** including Downtown and along major transit routes.



Overlap exists in select **central and eastern neighborhoods**, indicating areas of strong demand on both fronts.

Gray areas represent census tracts with no data or tracts excluded from analysis.

Sources: Redfin (2022–2024) | City of Seattle Open Data (2022–2024)
Washington State Department of Licensing | U.S. Census Bureau

Econometric Model

$$\ln(\text{HousingPrice}_{it}) = \beta_0 + \beta_1 \ln(\text{AirbnbDensity}_{it}) + \beta_2 \ln(\text{Rent}_{it}) + \beta_3 \ln(\text{CommercialDensity}_{it}) \\ + \beta_4 \ln(\text{Population}_{it}) + \beta_5 \ln(\text{Condo}_{it}) + \varepsilon_{it}$$



OLS regression with robust standard errors

Standard errors are clustered at the census tract level.



Log-log specification enables elasticity interpretation

Coefficients can be interpreted as elasticities.



Census tract-year panel observations (2022–2024)

Unit of analysis: Seattle census tract-year observations.



Controls include rent, commercial activity, population, and condo density

These variables account for key local market and demographic factors.

Regression Results: Determinants of Detached Housing Prices

Dependent Variable: Log Detached Housing Prices (USD), 2022–2024

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Log Airbnb_Density	0.101 (0.064)	0.093 (0.062)	0.126** (0.064)	0.128*** (0.064)	0.128** (0.048)
log Rents		0.283*** (0.098)	0.367*** (0.096)	0.371*** (0.096)	0.370*** (0.097)
Log Commercial Density			-0.077*** (0.029)	-0.077*** (0.029)	-0.077*** (0.029)
Log Population				0.015 (0.061)	0.013 (0.060)
Log Condo Price					-0.059 (0.216)
Constant	13.868*** (1.672)	11.769*** (1.657)	11.412*** (1.518)	11.412*** (1.517)	11.511*** (1.646)
R ²	0.024	0.127	0.127	0.127	0.129
Observations	346	346	346	346	346

Notes: Coefficients shown with robust standard errors in parentheses.

Source: Inside Airbnb, Seattle Open Data, Redfin, U.S. Census Bureau

Significance Key

*** p < 0.01

** p < 0.05

* p < 0.10

Finding: After adding controls, Airbnb density remained positively associated with housing prices and became statistically significant.

Policy Implications

◆ Airbnb density is positively associated with detached housing prices



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- ◆ Neighborhood-level monitoring may be more effective

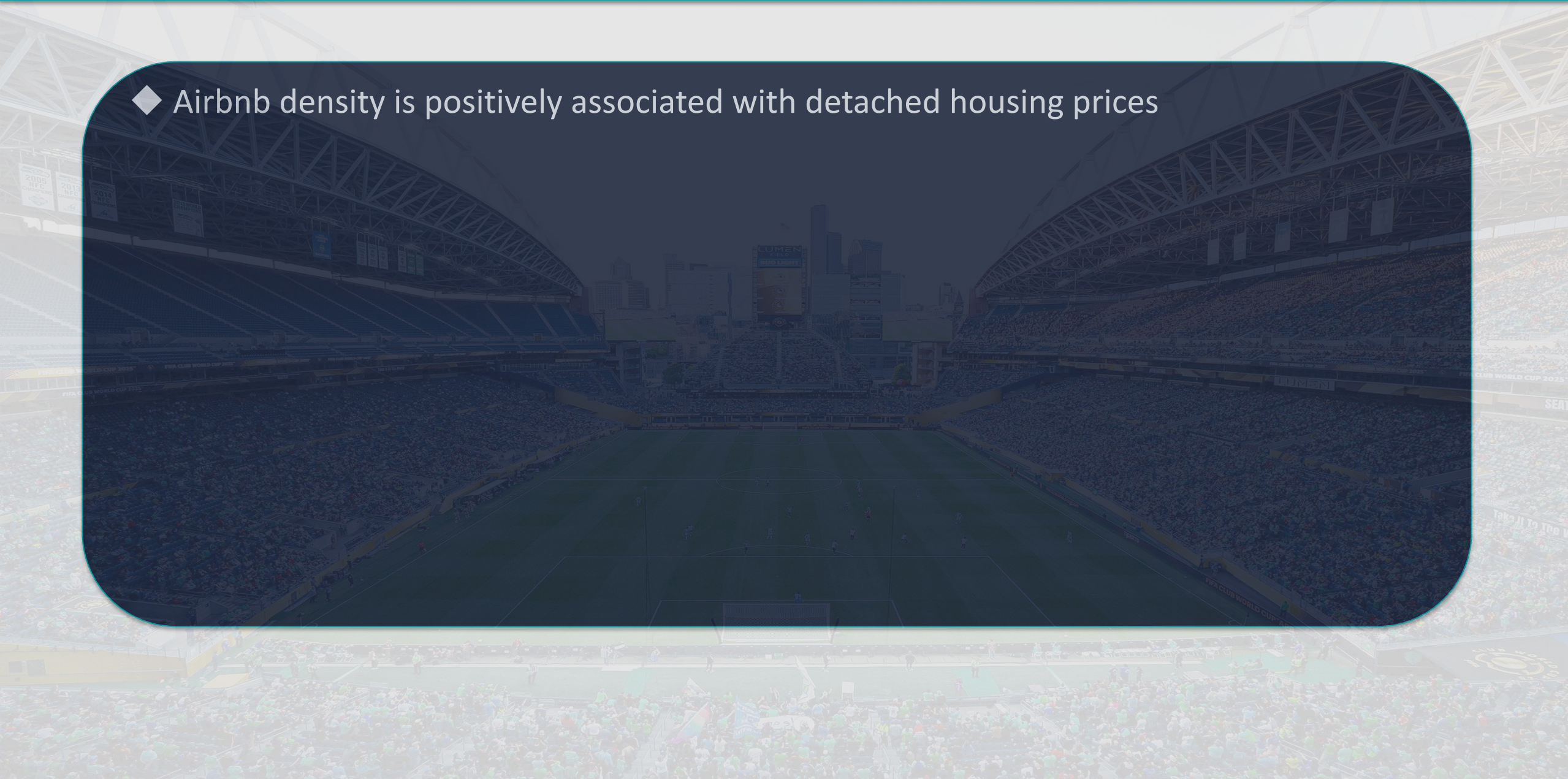
Policy Implications

An aerial night view of a city, likely Seattle, showing the waterfront, a large stadium (Lumen Field) with its distinctive blue and white roof, and various city buildings illuminated at night. The sky is dark with some light clouds, and the water reflects the city lights.

- ◆ Airbnb density is positively associated with detached housing prices
- ◆ Findings suggest localized housing market pressure
- ◆ Neighborhood-level monitoring may be more effective
- ◆ Housing supply strategies should complement STR regulation

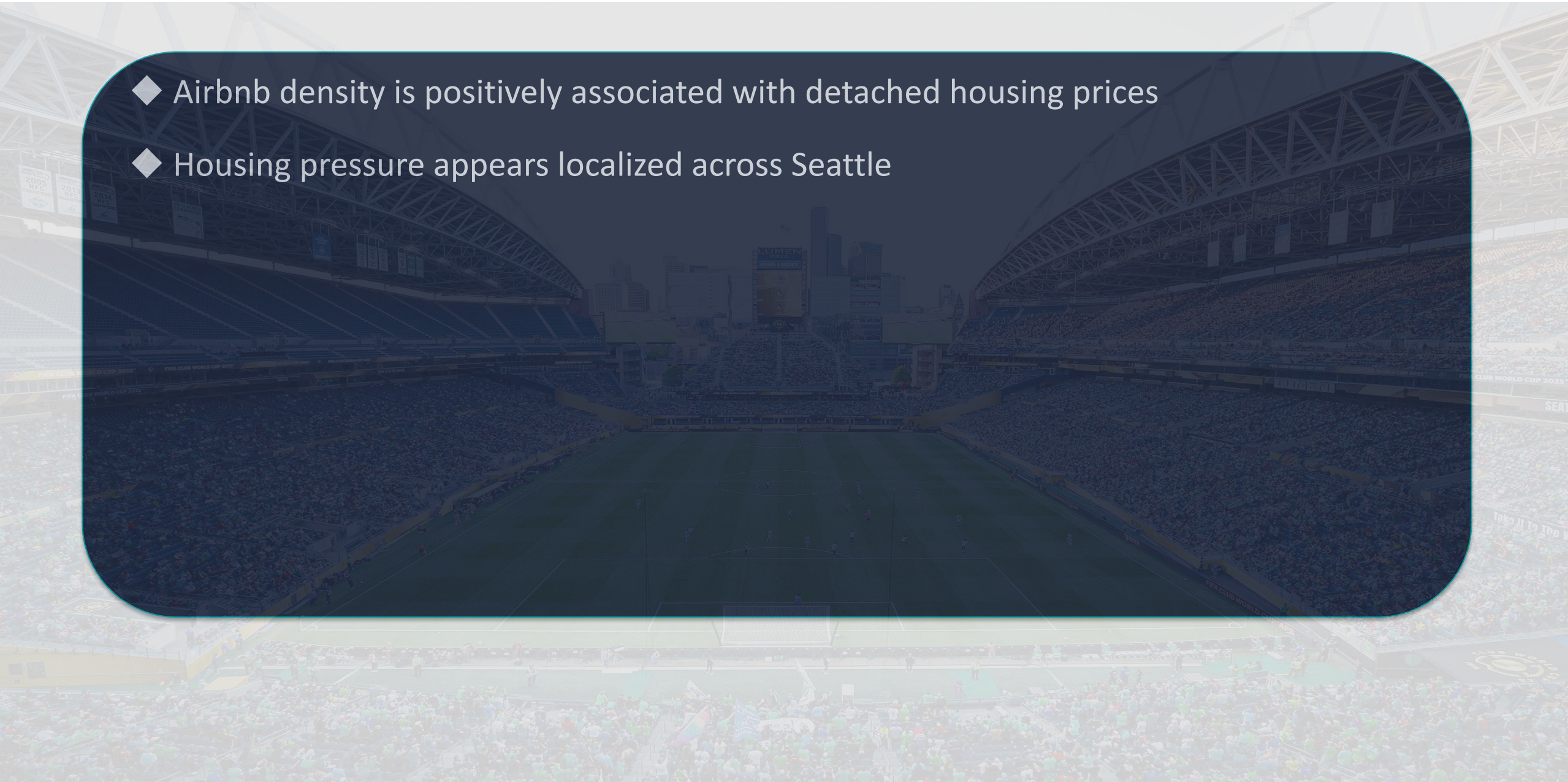
Conclusion

- ◆ Airbnb density is positively associated with detached housing prices



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- ◆ Housing pressure appears localized across Seattle



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- ◆ Findings support neighborhood-level policy analysis

Conclusion

- ◆ Airbnb density is positively associated with detached housing prices
- ◆ Housing pressure appears localized across Seattle
- ◆ Findings support neighborhood-level policy analysis
- ◆ Future research could include zoning and transit variables

REFERENCES

DATA SOURCES

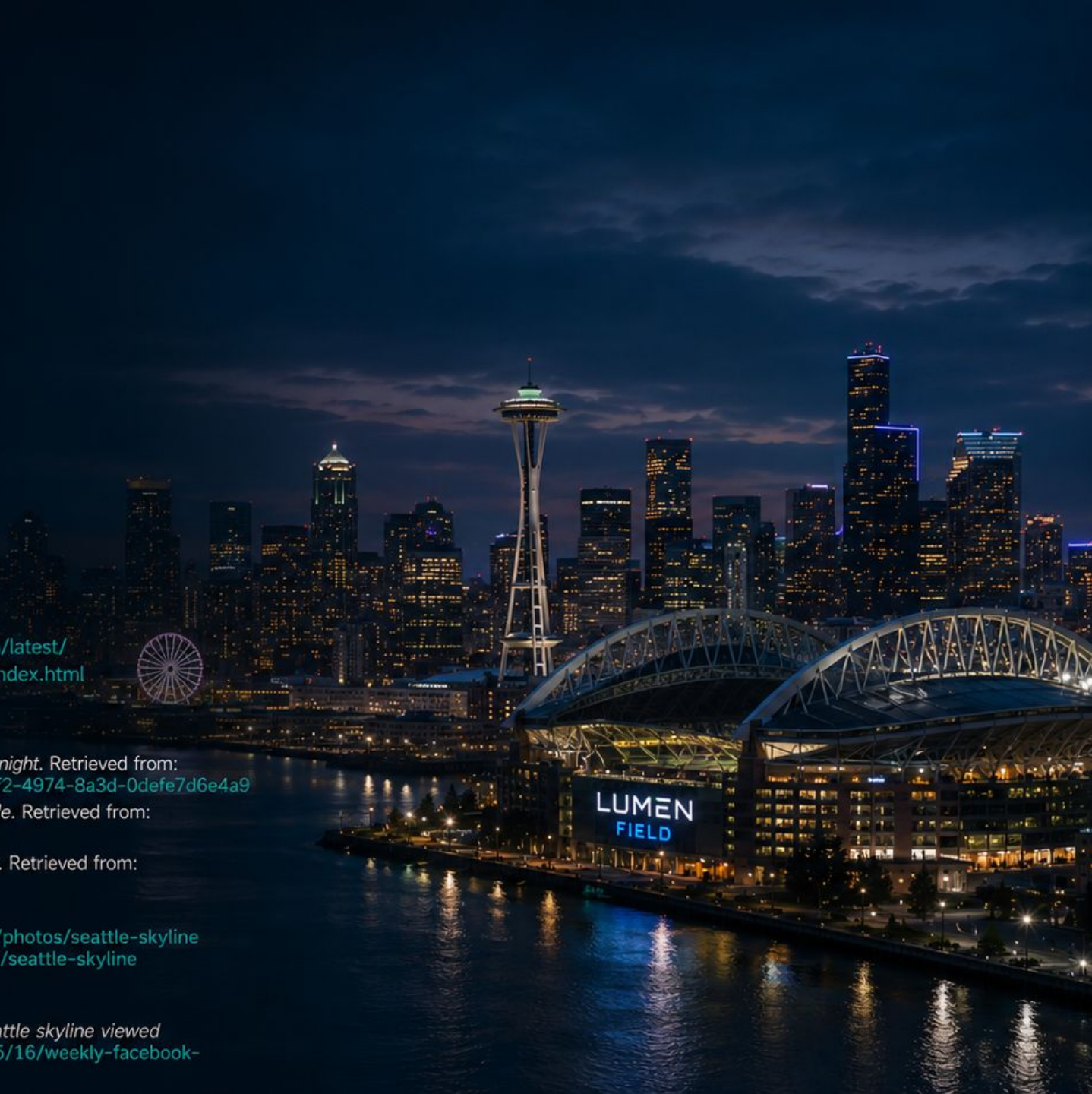
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MAPPING & SPATIAL ANALYSIS

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An aerial view of the Seattle skyline, featuring the Space Needle and various skyscrapers, with a large Ferris wheel in the foreground on the right. A dark blue rounded rectangle is overlaid in the center, containing the text 'THANK YOU' in large white letters, followed by a horizontal line and the text 'Thank you for your time and attention.' in smaller white letters.

THANK YOU

Thank you for your time and attention.

APPENDIX

Research Reflections

- ◆ Strengthened GIS, Python, and econometrics skills
- ◆ Spatial joins and data cleaning were major challenges
- ◆ Maps and regressions revealed different parts of the story
- ◆ Correlation does not automatically imply causation

Data and Methods

- **Datasets:** Airbnb listings, detached home sales, population data, business licenses, condos, and rent data.
 - Approximately 89% of Seattle census tracts were included in the analysis.
- **Spatial Method:** GIS spatial joins were used to connect Airbnb listings and business activity to detached housing sales census tracts.
- **Normalization:** Densities standardized using population.
- **Regression:** OLS regressions

Data and Methods

A	B	C	D	E	F	G	H	I	J	K	L	M
Business Leg	Trade Name	Ownership T	NAICS Code	NAICS Descr	License Start	Street Address	City	State	Zip	Business Ph	City Account	UBI
ABDURAKHM	RASULZHON	Sole propriet	485320	Limousine Se	20140814	706 UNION S	SEATTLE	WA	98101	2.063E+09	7.748E+12	
AHMED MUS	MUSTAFE FA	Sole propriet	485999	All Other Tra	20141107	14203 42ND	TUKWILA	WA	98168	2.064E+09	7.761E+12	
BUI PHUONG	BUI PHUONG	Sole propriet	721191	Bed-and-Bre	20190827	2324 1ST AV	SEATTLE	WA	98121	4.256E+09	8.41E+12	6.045E+15
CRUZ BREND	PHENOMEN	Sole propriet	311811	Retail Bakeri	20220801	4130 PALATI	SEATTLE	WA	98103	2.154E+09	8.622E+12	604913720
DAVID ANTH	DAVID ANTH	Corporation	611699	All Other Mis	20220203	8707 16TH A	SEATTLE	WA	98106-2377	2.066E+09	8.59E+12	6.035E+15
GATES FOUN	GATES FOUN	Other	813211	Grantmaking	20000101	500 5TH AVE	SEATTLE	WA	98109-4636	2.067E+09	5.33E+12	6.016E+15
INDERJIT TAX	INDERJIT TAX	Sole propriet	485310	Taxi and Ride	20250730	2464 S 296T	FEDERAL WA	WA	98003	9.162E+09	8.853E+12	
JUGRAJ BRAJ	JUGRAJ BRAJ	Sole propriet	485999	All Other Tra	20141210	30036 65TH	AUBURN	WA	98001	2.064E+09	7.778E+12	7.778E+12
LYKKEN JOSE	JOSEPH A LY	Sole propriet	721191	Bed-and-Bre	20191215	519 32ND AV	SEATTLE	WA	98112	2.063E+09	8.44E+12	6.045E+15
MANGASTO Z	MANGSTO ZE	Sole propriet	485320	Limousine Se	20150520	17210 30TH	SEATAC	WA	98188	2.065E+09	7.834E+12	
MERKEL JR JC	MERKEL JR JC	Sole propriet	721191	Bed-and-Bre	20161001	7353 16TH A	SEATTLE	WA	98117	2.067E+09	8.371E+12	6.043E+15
MOTS LLC	LOAD RUNNE	LLC - Single M	812990	All Other Pers	20201022	1012 S HENL	SEATTLE	WA	98108-4768	2.063E+09	8.503E+12	6.043E+15
PERKINS EAS	PERKINS EAS	Corporation	541310	Architectural	20130101	115 5TH AVE	NEW YORK	NY	10003-1004	8.664E+09	8.36E+12	6.032E+15

HOW I DID THIS ON NEXT PAGE

Data and Methods

- Use the street address to geocode each business using geopy
- Convert addresses into latitude and longitude. Create full addresses
- Convert addresses to latitude and longitude
- Turn businesses into map points
- Load detached housing census tracts
- Assign each business to a tract
- Calculate business density
- Log the density
- Merge with housing data

Commercial density = new business licenses per square mile
because **per square mile** because census tracts are different sizes.



Apartment Market Rent Prices by Census Tract

Private Member

Attributes

[Learn about charts](#)

abc	GEOID		∨
abc	Tract Label		∨
abc	Tract Name		∨
abc	Community Reporting Area Name		∨
abc	Community Reporting Area ID		∨
123	Year		∨
123	Tract Median Apartment Contract Rent per Square Foot		∨
123	Tract Median Apartment Contract Rent per Unit		∨
123	Year over Year Change in Rent per Square Foot		∨
123	Year over Year Change in Rent per Unit		∨
abc	Cost Category		∨
abc	Year over Year Change in Rent Category		∨
123	Mixed-Rate or Mixed-Income Apartment in Tract		∨
abc	Level of Concern		∨
123	PROPERTIES		∨
123	Shape__Area		∨
123	Shape__Length		∨



Detached Home Sale Prices by Census Tract

Private Member

Attributes

[Learn about charts](#)

abc	GEOID		▼
abc	Tract Label		▼
abc	Tract Name		▼
abc	Community Reporting Area Name		▼
abc	Community Reporting Area ID		▼
123	Year		▼
123	Sales		▼
abc	Cost Category		▼
abc	Change in Cost Category		▼
123	Price per Square Foot		▼
123	Nominal Price		▼
123	Year-over-Year Change in Price per Square Foot		▼
123	Year-over-Year Change in Nominal Price		▼
abc	Level of Concern		▼
123	Shape__Area		▼
123	Shape__Length		▼

CALCULATION FOR REAL PRICE

Real Price = Nominal Price × Current Year / CPI Base Year CPI

Cpi using the FRED WHICH WAS 344.9

Model Breakdown

OUTCOME

Dependent Variable

Log detached housing price

KEY PREDICTOR

Main Independent Variable

Log Airbnb density

CONTROLS

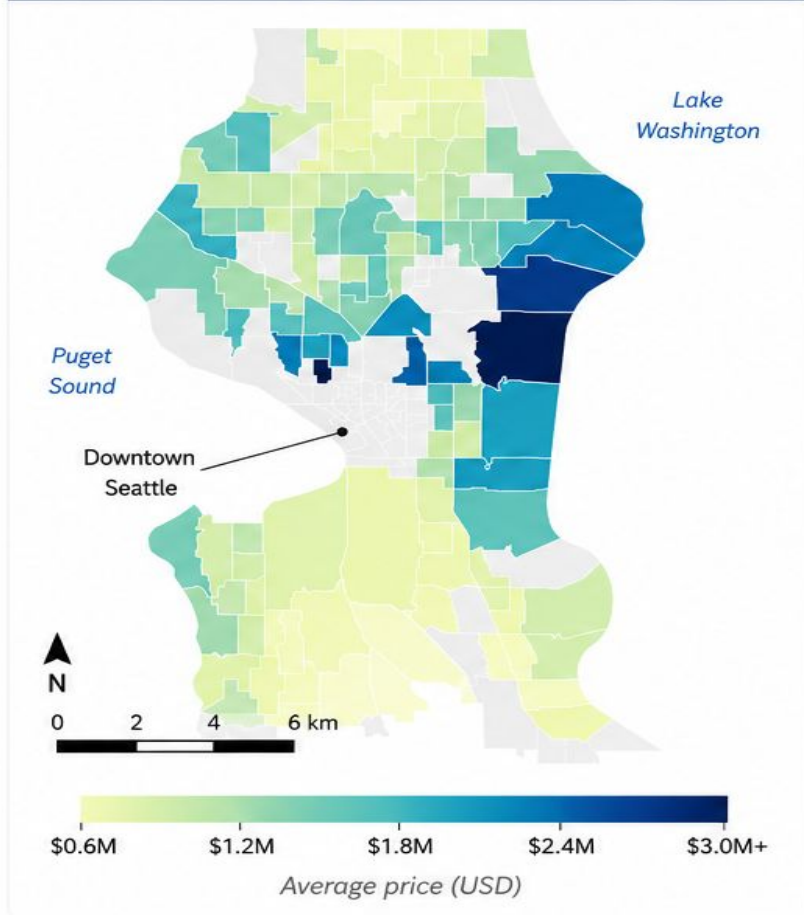
- Rent
- Log commercial density
- Log population density
- Log condo density

Airbnb activity was measured using listing review activity between 2022 and 2024.

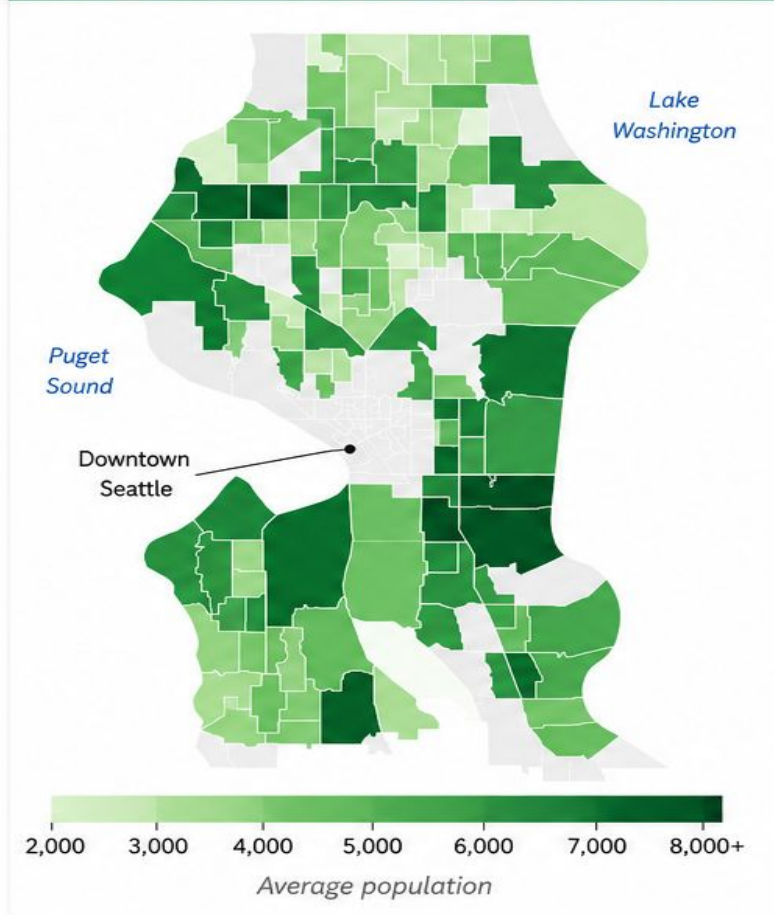
Higher Housing Prices Concentrated in East and Waterfront Areas; Population Centers Cluster in Core and Southern Neighborhoods

Seattle Census Tracts, 2022–2024

Average Detached Housing Prices (USD), 2022–2024



Average Population 2022–2024



KEY INSIGHTS



Detached housing prices are **highest in eastern and waterfront tracts**, especially near Lake Washington.



Population is concentrated in **central and southern neighborhoods**, including Downtown and along major transit corridors.



Some high-price areas have **lower population**, indicating lower density residential neighborhoods.



Population clusters align with urban amenities, employment centers, and housing affordability.

Gray areas represent census tracts with no data or tracts excluded from analysis.

Main Findings

+0.13%

housing price increase per 1% rise in
Airbnb density

- Airbnb density is positively associated with detached housing prices.
- Rent conditions are strongly and positively associated with housing prices.
- Commercial density shows a negative association.
- Population and condo density were not statistically significant.

Interpretation and Policy Implications

- **Key Takeaway:** Airbnb concentration appears connected to broader neighborhood housing dynamics.
- **Policy Relevance:** Short-term rental concentration may contribute to localized housing price pressure .
- **Future Research:** Future work could incorporate zoning, income, tourism and neighborhood amenities.

```
...: print(output_dir)
Housing rows: 391
Housing tracts: 131
Housing years: [2022, 2023, 2024]
Population rows: 537
Population tracts: 179
Population years: [2022, 2023, 2024]
Airbnb before spatial join: 836
Airbnb matched to tracts: 836
Airbnb not matched: 0
Airbnb rows: 320
Airbnb tracts: 166
Airbnb years: [2022, 2023, 2024]
Missing Airbnb population: 0
Business rows after year filter: 11631
Business matched to tracts: 11360
Business not matched: 271
Commercial density rows: 530
Commercial density tracts: 177
Commercial density years: [2022, 2023, 2024]
Condo rows: 540
Condo tracts: 180
Condo years: [2022, 2023, 2024]
Missing condo population: 3
Rent/vacancy rows: 480
Rent/vacancy tracts: 160
Rent/vacancy years: [2022, 2023, 2024]
Missing rent/vacancy before drop: 45

FINAL DATASET
Rows: 346
Tracts: 116
Years: [2022, 2023, 2024]
```

```
=====
```

IPython Console History

conda: base (Python 3.12.4) Completions: conda(base) LSP: Python Line 888, Col 22 UTF-8