Does Airbnb impact housing costs?

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Summary

Airbnb has disrupted the travel industry and likely impacted the housing market. While its impact on hotels has been studied previously, its effect on the housing market has been overlooked. Our project aimed to understand the relationship, if any, between housing in the sharing economy and traditional homes. This information could be used by both investors and policy makers to benefit the public and foment investment.

Data Collection

Using Python's Beautiful Soup library & Selenium, we scraped airbnb.com and city-data.com. From Airbnb, we collected location (in latitude/longitude form), average rating, and price, among several other indicators. From City Data, we collected demographic information such as median household income, zip code, and gross rent. We then used R, its Zipcode package, and Python to devise an algorithm linking data sourced from Airbnb to the zip code level data from City Data.

Airbnb Analysis

Descriptive Regression

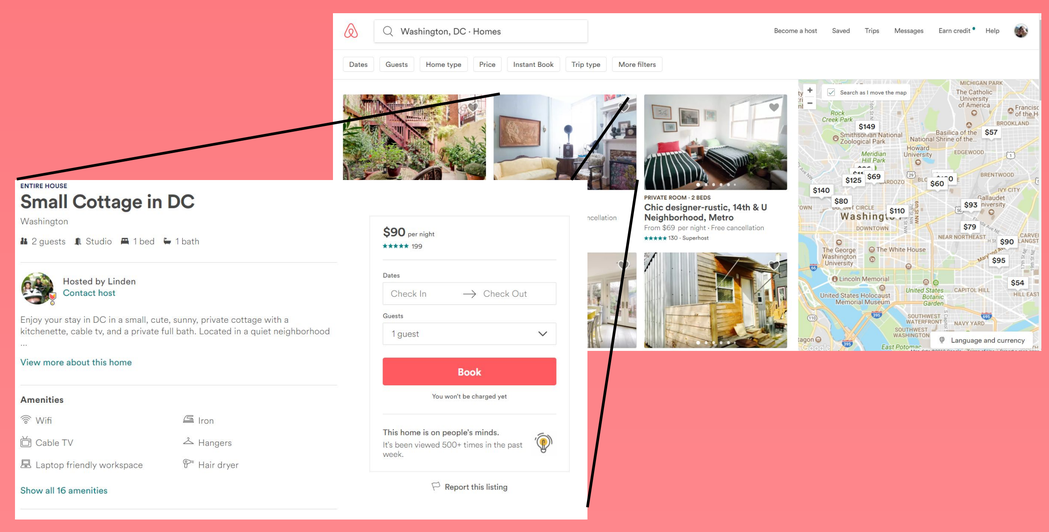
- *Goal*: Determine Airbnb and demographic factors driving home values across all zip codes.
- *Method*: Box-Cox transformation was used to normalize the data. Elastic Net regression was used for feature selection as it returns the minimal MSE.
- *Results*: Across all zip codes, Airbnb density and monthly price appear to be statistically insignificant.

K-Means Clustering

- *Goal*: Determine if any inherent underlying groupings existing in the data.
- *Method*: K-means and an elbow plot were generated using demographic, housing, and Airbnb measures.
- *Results*: Three clusters were found.

Branched Regression

- *Goal*: Determine whether Airbnb density affects house values differently for different markets.
- *Method*: Branched regression on each cluster to understand their respective drivers and predict median house value for each cluster.
- *Results*: Demographic data such as cost of living index and income were significant across the three clusters.



Visualization

A sample of our visualization, created in Tableau.

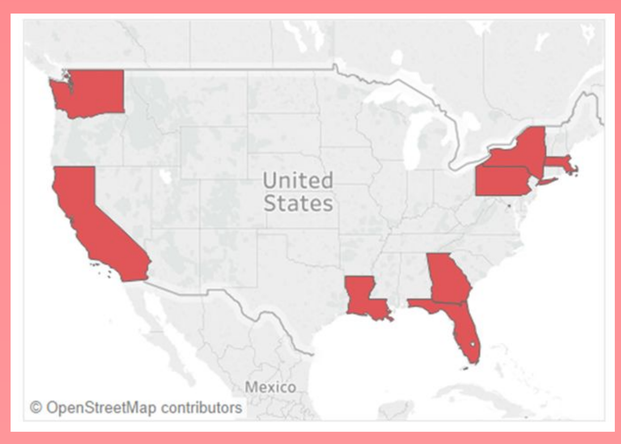
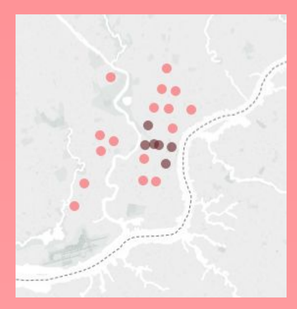
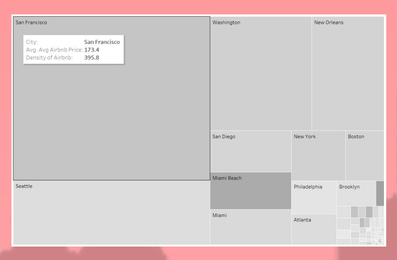


Tableau visualization describing the project, and displaying both results and summary statistics upon hovering over a zipcode

The above is a screenshot of the tool tip that appears when the user hovers over a zipcode. It displays descriptive statistics, as well as a bar chart comparing the actual vs. predicted median house value for the zipcode.

The below is a zoomed-in view of the zipcodes from Philadelphia, PA included in this analysis. The center of the city's market behaves differently from the edges.





This is a treeplot displaying, by city, the average Airbnb price by color (light is low price, high is dark), and the sum of Airbnb density by block size.

End Results

Our results showed Airbnb to impact one cluster, but otherwise showed no impact to market rents. This information is useful to policy makers and investors as the dynamics in property markets remain largely unchanged, despite such innovation coming into play. While this study provides a solid piece of evidence against a biased report, it could be further improved by adding controls for local rental and housing markets (minimum rent terms, average mortgage length), and analyzing the trends in rent and Airbnb price over time.

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