Data Science for All (DS4A)

Investigating Technology-Driven Gentrification in Miami, Austin, and Atlanta

Team 28
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Overview

Cities across the United States are continuously evolving, with some cities undergoing dramatic changes due to the process of gentrification. Generally speaking, gentrification is a "process where wealthy college-educated individuals begin to move into poor or working-class communities, often originally occupied by communities of color."[1] Research has shown that "gentrification usually leads to negative impacts such as forced displacement, a fostering of discriminatory behavior by people in power, and a focus on spaces that exclude low-income individuals and people of color."[2]

In order to combat these negative impacts of gentrification, it is critical that local law and policymakers understand the factors that contribute to gentrification and the socio-economic. This report aims to equip those groups with insights into how the advent of the digital age and the movement of technology workers around the United States has led to gentrification in emerging technology cities such as Miami, Austin, and Atlanta.

Data Overview

To examine the impacts of technology-driven gentrification, this report uses time-series data on Median Home Value Growth, Technology Worker Population Growth and Salary, Technology Worker Education and Salary Levels, and Luxury Coffee Shop Growth. A linear regression model was used to both explore the relationship between variables and also generate a "gentrification score" that enabled the team to explore the following hypotheses:

- Growth in the population of affluent tech workers in cities like Miami, Austin, and Atlanta contributes to increases in housing prices making neighborhoods inaccessible and displacing pre-existing communities

- Growth in the population of tech workers leads to a rise in the presence of luxury coffee shops; this may be because there is a new demand for goods that are at a higher price point than previously experience

The team collected, cleaned, and modified data where appropriate to create a cohesive data frame. The final dataframe relied on zip code as the basic unit for data merging. This data frame was then used as the input for regression analysis. Based on the outputs of the regression analysis, a gentrification equation where select variables are weighted based on their impact was created. See below for more information on the synthesized data frame:

[1] National Geographic Society. "Gentrification." National Geographic Society, September 9, 2019. https://www.nationalgeographic.org/encyclopedia/gentrification/.

[2] Chong, Emily. "Examining the Negative Impacts of Gentrification." *Georgetown Law*, Georgetown Journal on Poverty Law & Policy, 17 Sept. 2017, https://www.law.georgetown.edu/poverty-journal/blog/examining-the-negative-impacts-of-gentrification/.

Home Value Growth Data

Source: Redfin
Description: Data includes data on the number of new listings, number of sales pending sales, number of homes sold, listing price, median sale price, and other information.

This data provides a weekly view of housing figures and encompasses data from Q1 2012-Q3 2021. For the purposes of our analysis, the team chose to pull information for Miami, Florida, Austin, Texas, and Atlanta, Georgia as these cities have experienced shifts in people movement and growth in their technology sectors.

Field	Data Type	Description
zip	integer	5-digit zip code
latitude	float	Geocoordinate assigned to select zip code, original latitude information obtained from US Census data
longitude	float	Geocoordinate assigned to select zip code, original longitude information obtained from US Census data
parent_metro_region	object	Region name (e.g., Los Angeles, CA, metro area)
median_sale_price	integer	Sales price data for single-family residential property types in US dollars (e.g., $495K)
percent_change_home_price	integer	Percent change in median home price for single-family residential properties between Q2-Q3 2021 This field was created by the tame based on median_sale_price and time-series data
period_begin	datetime	Month and year values (the period used for analysis account for 09/01/2021-11/30/2021)

Technology Worker Population Growth Data

Source: 2019 Census Data
Description: Data includes a comprehensive view of key demographic indicators such as the total population over the age of 16, the number of individuals available to participate in the workforce

The data provides a view of key demographic indicators

total_population_over_16	integer	Total population over 16 years of age
labor_force	integer	Number of individuals available to participate in workforce
percent_in_labor_vs_population	integer	Percentage comparison of Labor Force vs the Total Population over 16

unemployment	integer	Percentage of individuals who are unemployed
information_industry_population	integer	Number of workforce people in the Professional, Scientific, and Tech industry
information_as_percent_of_labor	integer	Percentage comparison of the number of workforce people in the Professional, Scientific, and Tech industry vs Labor Force

Technology Worker Education and Salary Levels

Source: [Miami-Fort Lauderdale-West Palm Beach, FL - May 2020 OEWS Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates](#) (as a narrowed example)

Description: Data includes a comprehensive view of industry workers and their wages based on target cities/locations. The data provides an overall view and comparison of tech industry wages as it correlates to location and other key demographic indicators.

occupation	string	Category of occupation, the data collected was narrowed down using the Computer and Mathematical Occupations field
total_employment	float	Total number of technology industry workers
jobs_per_1000	float	Total number of technology industry jobs per 1,000
annual_mean_salary	float	Mean salary amount for technology industry workers (Miami, Austin, Atlanta)
annual_median_salary	float	Median salary amount for technology industry workers for select locations (Miami, Austin, Atlanta)

Luxury Coffee Shop Store Growth

Source: [Starbucks Locations](#)
Description: Data includes comprehensive data that provides insight into the number of starbucks stores active within certain zip codes in 2021

total_stores	string	Sum of the number of stores present within a zip code (the sum was created by grouping by zip, latitude, longitude, etc.)

Model and Analysis

To complete the analysis on combined data, we joined each dataset on zip code and selected the most recent data. Using the combined data, we conducted multiple linear regressions to understand the relationships between the variables we hypothesized would have the most impact on gentrification. The regression was used to inform the weights used to create the gentrification score.

Regression Modeling

We selected median home price as the independent variable. Percentage change in home price, information jobs as a percentage of the total labor market, total Starbucks stores, and annual median salary were the dependent variables. The objective of our regression was to determine the relationship between our gentrification indicators and home prices.

```
                         OLS Regression Results
========================================================================
Dep. Variable:        median_sale_price   R-squared:                0.362
Model:                            OLS     Adj. R-squared:           0.346
Method:                 Least Squares     F-statistic:              22.98
Date:                Tue, 15 Mar 2022     Prob (F-statistic):    4.71e-15
Time:                        13:09:55     Log-Likelihood:          -2503.0
No. Observations:                 167     AIC:                      5016.
Df Residuals:                     162     BIC:                      5032.
Df Model:                           4
Covariance Type:             nonrobust
==============================================================================
======
                              coef     std err        t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
------
Intercept                   2.01e+06    8.54e+05    2.354     0.020     3.24e+05     3.
69e+06
percent_change_home_price   6.601e+05   7.27e+04    9.081     0.000     5.17e+05     8.
04e+05
annual_median_salary        -18.3810     10.635    -1.728     0.086     -39.383
2.620
information_as_percent_of_labor  2.36e+04  5.14e+04    0.459     0.647    -7.79e+04     1.
25e+05
total_stores                1.819e+04   3.65e+04    0.499     0.619    -5.38e+04     9.
02e+04
```

Weighted Sum Application

We applied the weighted to the top 5 gentrification indicators we identified as follows:

Variable	Weight	Rationale
Median Home Sale Price	50%	Applied 50% weight because it's the primary indicator we are using to observe change.

Percentage Change in Home Price	20%	P value is 0 indicating the observed difference is unlikely due to chance.
Information as a Percentage of the Total Labor Market	10%	Selected 10% weight due to a high p value.
Total Starbucks Stores	10%	Selected 10% weight because data was less complete and p value is high.
Annual Median Salary	10%	Selected 10% weight due to a high p value.

Gentrification Score Output

We created a new column to derive the gentrification score based on the weight sum model percentages above. Gentrification scores vary from 1 (lowest gentrification) to 146 (highest gentrification) across zip codes in Miami, Atlanta, and Austin.

	zip	gentrification_score
38	30350	146
106	78610	145
11	30291	144
24	30317	143
135	78742	142
...	...	...
68	33140	5
66	33138	4
67	33139	3
75	33149	2
55	33109	1
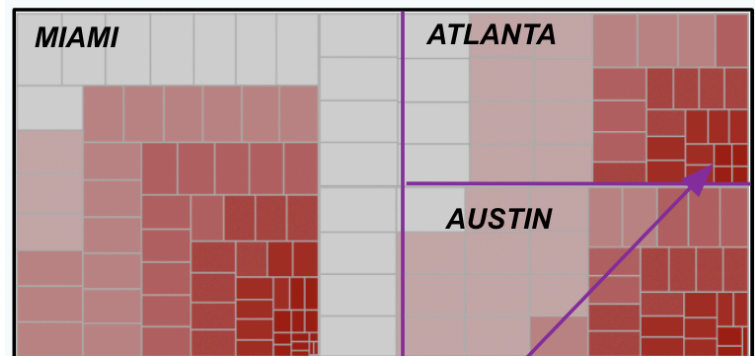
The zip code with the highest **gentrification score** has a rank of **#1.** The deeper the red, the closer to the #1 rank.

Miami's zip code 33109 (Fisher Island) yielded a score of #1

Outputs

The team created an interactive dashboard via Tableau to visualize key findings. The dashboard includes the following 6 components from left to right:

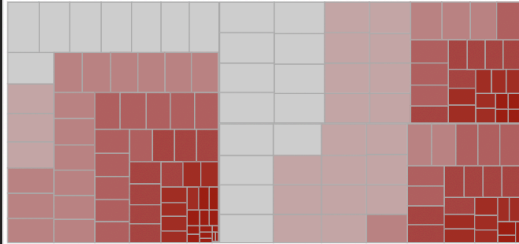| Component	Description	Interactive Feature
Gentrification Score Card	View of the gentrification score for each zip code within Miami, Austin, and Atlanta A rank of #1 represents the zip code with the highest score The darkest color red also indicates the zip codes with the highest scores	Filter by parent metro region
Gentrification Hot Spots	Map view of gentrification hot spots. Those marked with deeper red represent the highest gentrification scores while those marked with green have the lowest scores. The size of the circle is indicative of the medium sales price for single family residential homes within that zip code	Filter by gentrification score and zip code Zoom in and zoom out to visualize geographies
Total Labor Force and Technology Labor Force	Bar chart view of the current Total Labor Force in Miami, Austin, and Atlanta Highlights the number of workers who make up the Technology Labor Force	Filter by parent metro region
Annual Mean Salary for Technology Workers and Total Number of Starbucks Stores	Bar chart view of the average salary for the Technology Labor force in Miami, Austin, and Atlanta Includes a view of the number of total Starbucks stores within the city	Filter by parent metro region
Median Home Sales Price vs Technology Worker Percentage in Labor Force	Map view of the median sales prices for single family homes within Miami, Austin, and Atlanta	Filter by the percentage of Technology Workers in the Labor Force
Percent Change in Home Prices	Line chart of the percent change in home prices experienced by each zip code between Q3-Q4 2021	Filter by zip code

Investigating Technology-Driven Gentrification in Miami, Austin, and Atlanta
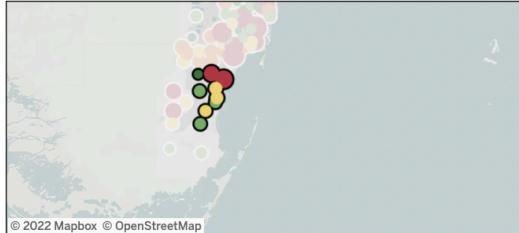## A snapshot of 2021

Gentrification Score Card:
Miami, Austin, and Atlanta each contain zip codes with high gentrification scores (a ranking between #1-#30)

The visual outlines the Gentirication Score assigned for each zip code within Miami, Austin, and Atlanta. The gentrifcation score ranges from 1 to 147. A score of 1 represents the zip code with the highest gentrification score

Gentrification Hot Spots:
Hot spots align with areas where technology worker populations and technology companies are relocating (e.g., East Austin's 78703 zip code ranks as #27 and is in proximity of Tesla's new gigafactory)

© 2022 Mapbox © OpenStreetMap

The visual highlights gentrification hot spots, which are indicated via red circle. The size of each circle shows the sum of the median home sale price within each zip code (the median home sale price filter ranges from $51.612 - 1.5000.000)
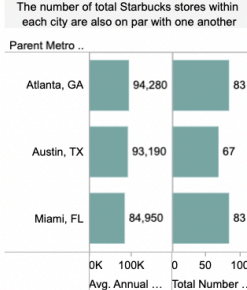
In 2021, Miami had the highest Labor Force
Miami also had the highest number of Technology Workers per the Population
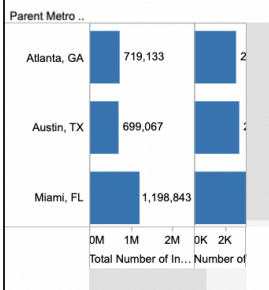
The Annual Mean Salary for Technology Workers is fairly consistent across Miami, Austin, and Atlanta
The number of total Starbucks stores within each city are also on par with one another

Median Home Sales Price vs Technology Worker Percentage in Labor Force
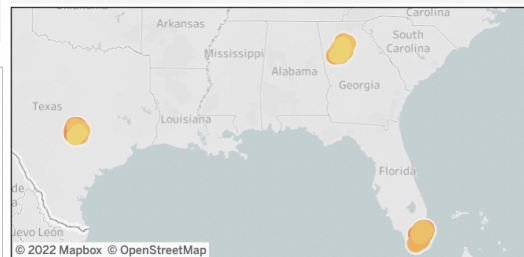
The visual outlines the average median sale price for single family residental homes within each zip code. The higher the sales price, the stronger the color red. The data is is filtered on the precent of technology workers within the labor populaiton, which ranges from 0.00 to 6.70.

Gentrification Score
1 — 146

Gentrification Score
7.0 — 146.0

Median Sale Price
- 51,612
- 500,000
- 1,000,000
- 1,410,000

Information Population as Percent Of Labor
0.00 — 6.70
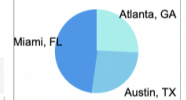
Percent Change in Home Prices (Q3-Q4 2021)
Across the board, prices generally increased in the later half of 2021
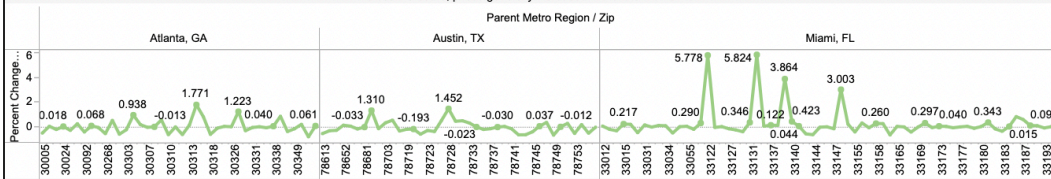
Average Sale Price for Single Family Residential Homes in Q4 2021

Key Insights

1 Austin's Gentrification Hot Spots

Key Insights
- **7** of Austin's zip codes fall within the **top 30 gentrification scores**
- The **East Austin** zip code of 78702 ranks as **#27**

2 Miami's Growing Tech Worker Population

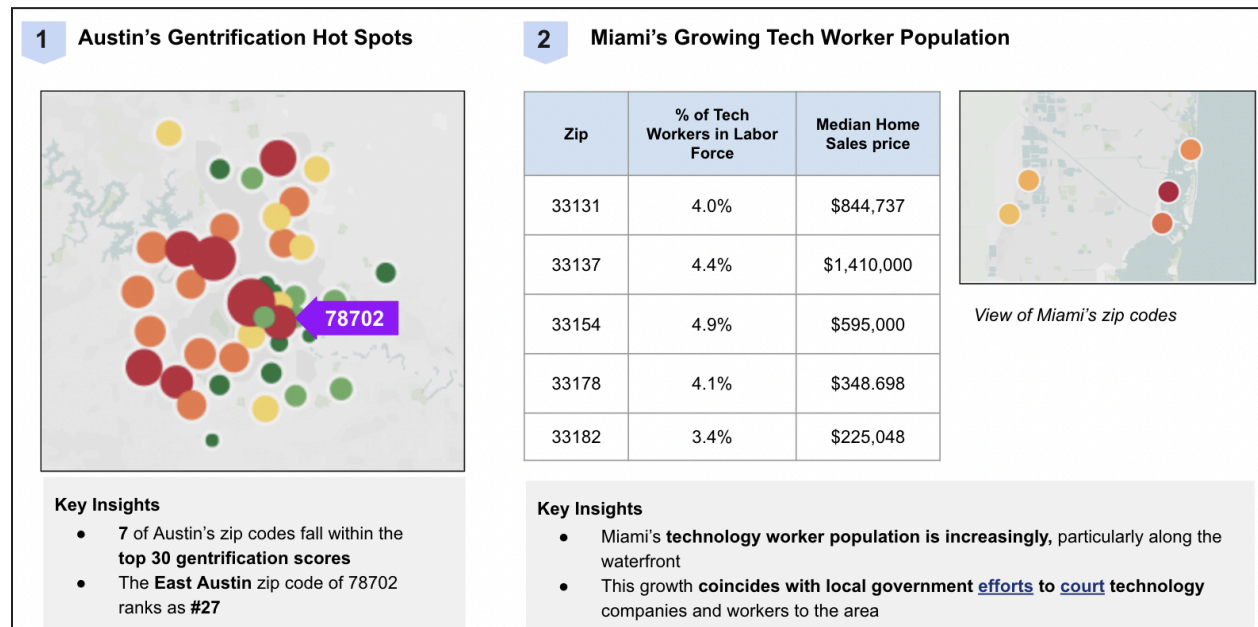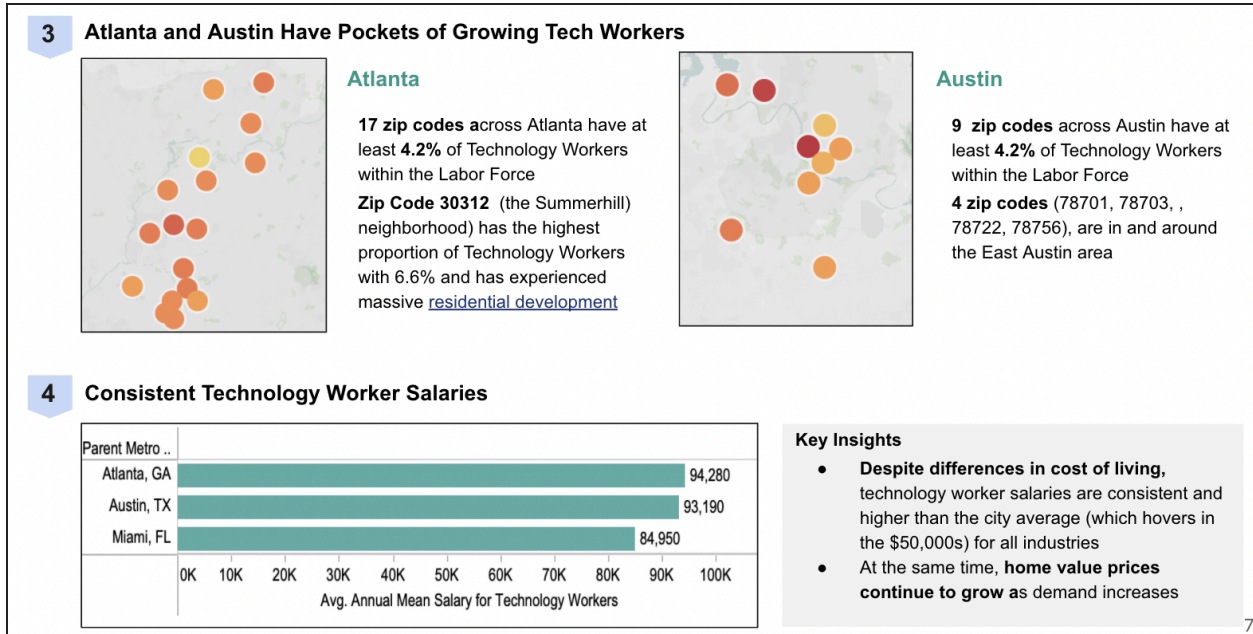| Zip	% of Tech Workers in Labor Force	Median Home Sales price
33131	4.0%	$844,737
33137	4.4%	$1,410,000
33154	4.9%	$595,000
33178	4.1%	$348.698
33182	3.4%	$225,048

View of Miami's zip codes

Key Insights
- Miami's **technology worker population is increasingly,** particularly along the waterfront
- This growth **coincides with local government efforts to court technology companies** and workers to the area

The ranking of the East Austin zip code 78702 reflects the surge in home values in addition to the growing presence of technology workers and the luxury commodities that begin to appear with a more affluent demographic. As of 2021 the mean sales price of a single family residential home in the 78702 zip code was $695, 664 while at the beginning of 2019 homes in the same region sold for an average of $472,090.

This shift in East Austin's cost of living, may be related to the emergence of new technology companies in the area. Tesla, which initially announced its intention to move to the outskirts of East Austin in 2019, began constructing its new gigafactory on the outskirts in 2020 opened their new facility in the nearby zip code of 78725. The new factory is also Tesla's new headquarters. The factory is reported to have created 20,000 direct and 100,000 indirect jobs across the technology and other industries

3 Atlanta and Austin Have Pockets of Growing Tech Workers

Atlanta

17 zip codes across Atlanta have at least **4.2%** of Technology Workers within the Labor Force

Zip Code 30312 (the Summerhill) neighborhood) has the highest proportion of Technology Workers with 6.6% and has experienced massive residential development

Austin

9 zip codes across Austin have at least **4.2%** of Technology Workers within the Labor Force

4 zip codes (78701, 78703, , 78722, 78756), are in and around the East Austin area

4 Consistent Technology Worker Salaries

Parent Metro ..	Avg. Annual Mean Salary for Technology Workers
Atlanta, GA	94,280
Austin, TX	93,190
Miami, FL	84,950

Key Insights

- **Despite differences in cost of living,** technology worker salaries are consistent and higher than the city average (which hovers in the $50,000s) for all industries
- At the same time, **home value prices continue to grow a**s demand increases

Conclusion & Recommendations

Our investigation yielded three key insights: 1) technology workers are embracing new hubs, 2) home prices are increasing in affordable areas, and 3) technology worker salaries are consistent and higher than non-technology workers.

Technology workers are embracing new hubs

Technology workers are gravitating towards cities outside of Silicon Valley and their movement may be attributed to both the emergence of technology companies in new areas, attractive local initiatives, and flexible remote work policies. The higher volume of technology workers may continue to attract growing numbers of tech workers as companies and people lay their roots,

Home prices are increasing in affordable areas

Across the board, prices are growing, especially in areas like East Austin, which are experiencing dramatic shifts in population and demographics Notably, areas with low median sales price have the highest gentrification score. Price hikes in areas with low home prices may continue to displace populations that are reported to be already vulnerable.

Technology worker salaries are consistent and higher than non-technology workers

Salaries are consistent across Miami, Austin, and Atlanta, making all three attractive options for technology workers. However, the average salary for tech workers is $30,00 - $40,000 higher than the average for all industries. While tech salaries are robust, lower salaries for non-tech workers may not be sufficient to support increasing housing and living costs

In order to combat the negative impact of tech-driven gentrification we recommend that local and state policy makers:

1) Assess the rate of displacement of existing communities within identified gentrification hot-spots to determine priority areas/groups to support

2) Invest in impacted communities (e.g., home buyer and business owner programs targeting marginalized communities), empowering and enabling people to remain in place

3) Incentivize technology companies (and other emerging industries) to engage with and support their communities by requiring them to invest resources in order to receive local tax breaks or other benefits