A SPATIAL ANALYSIS OF INVESTOR-OWNED SINGLE-FAMILY RENTALS IN PHOENIX

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MASTER OF SCIENCE
GEOGRAPHIC INFORMATION SYSTEMS TECHNOLOGY
FINAL PROJECT

THE UNIVERSITY OF ARIZONA

2022

ACKNOWLEDGMENTS

Thank you to Sheree Bouchee for all the help and encouragement along the way. I do not think that I could have finished this without you. I will always cherish the memories of your constant encouragement, deliveries of brain food, and keeping me company on those evenings where I toiled away on this project. I also want to thank all the excellent staff in the University of Arizona GIST program for their excellent tutelage. I have learned an immense amount from you. Lastly, I also want to thank the Maricopa County Assessors Office for providing the data which made this study possible.

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SFH	Single Family Home

ABSTRACT

The City of Phoenix is the 5th most populous city in the United States as well as one of the fastest growing. According to the Census Bureau, from 2010 to 2020 Phoenix grew by 11.2% from a population of 1.4 million to 1.6 million. While it has long been characterized as a relatively affordable place to live which offered a high standard of living, the combination of a serious decline the production of new housing units and the influx of new residents has greatly impacted housing opportunity and affordability. As of February 2022, Phoenix has seen the highest housing price increases in the country with a 33% year-over-year price increase compared to the national average of 19.8%. Phoenix's land use is dominated by suburban sprawl and single-family housing stock and was hit especially hard during the Great Recession. This created a real estate market attractive to large institutional investors aiming to purchase single family homes as rental units. These investors often out compete typical homebuyers with cash offers and aggressive outreach to potential sellers who have not yet entered the market. The aim of this study is to analyze the spatial pattern of investor-owned single-family homes and compare the socioeconomic, racial, and ethnic composition of the neighborhoods where they are found. Using data from the Maricopa County Assessors office, the City of Phoenix, and the US Census Bureau; a methodology was established to identify investor-owned single-family rentals which were then plotted against the characteristics of the neighborhoods in which they were located. Understanding the impact these investor-owned properties have on the City's housing stock can help better shape housing policy at the local and regional levels.

Keywords: Phoenix, Single Family Homes, Investor-owned, Rental Housing, Housing Policy

ETHICS

As the ability to create maps and manipulate geospatial data becomes increasingly more accessible with advancements in the available tools and software, the ethical concerns surrounding this practice have grown. The long-standing technical barriers to create maps and present geospatial data have all but disappeared. Despite this GIS processes continue to maintain a certain authority and influence for people as both the data used and the results which are presented are seen as trustworthy. People do not often consider that data can be manipulated to suite a specific narrative, or they simply do not presume that geospatial data can be misinterpreted. As a result, GIS can have a powerful impact in influencing people and the way they think. As a GIS practitioner we must be conscious of the trust placed in us and do our work in a way which reinforces it. We must be mindful to avoid any biases, whether they be conscious or unconscious, in selecting and manipulating the data to ensure that our work is ethical and does the best job at representing the world around us.

This project deals with the subject matter of investor-owned single-family homes. A topic which has become politicized for many due to the ongoing housing shortage and subsequent increase in housing prices throughout the country. To ensure minimal bias the analysis used two authoritative datasets in the American Community Survey from the US Census Bureau and a parcel dataset from the Maricopa County Recorder's office. In addition to this, all techniques and processes used to manipulate the data have been thoroughly explained to create the greatest level of transparency in how the outcomes were derived. The analyses used in this is project are based on established principals of statistical analysis which are commonly used to determine the significance in relationships between variables. The combination of authoritative data and transparency in the analyses used provide the reader with reassurance that this project was done ethically and honestly.

CHAPTER 1 INTRODUCTION

Phoenix has long been characterized as an affordable place to live combined with a high standard of living. Nationally it was known to strike a balance that few other cities could. This has recently changed as Phoenix has led the nation in home price increase for the past 33 months[1]. This has been largely attributed to a severe reduction in the number of annual new units built since the 2008 housing bubble combined with a continued influx of new resident to the area over that same time. Public concern has grown so much that it has prompted the City to create a plan on how to address this housing crisis[2].

The 2008 housing bubble and subsequent recession also saw an increase in institutional investors into the housing market, particularly in the realm of single-family home rentals[3]. These rental properties were turned to assets[4] and collateralized in such a way that saw large institutional investors such as Blackstone[5] entering this market. National studies show an average return of 8.5% on these investments[6] with some markets preforming far beyond the average.

Studies have shown that the growth of single-family rentals post-recession has occurred most intense in racially diverse yet economically segregated neighborhoods[7]. This analysis aims to determine a methodology to identify investor-owned single-family rentals in Phoenix and determine if this pattern holds true. It will also compare institutional class investor-owned rentals to single-family rentals owned by smaller operators to see if there is a difference in neighborhood composition and how these properties are situated in the study area. This analysis will also be able to determine the level of rental properties are having on Phoenix's single-family housing stock.

CHAPTER 2 METHODS AND DATA

Summary of Data

The data compiled and used for this analysis originated from several authoritative sources. The demographic data was sourced from the US Census through a geodatabase for a 5-year American Community Survey dataset. The parcel data came from the Maricopa County Assessors' office which provided a point in time download of their entire list of parcels along with the associated attribute tables. Lastly the shapefile for the study area boundaries was obtained directly from the City of Phoenix's Open Data portal.

Census Data

Official Name of data set	ACS_2019_5YR_TRACT_04.gdb
Year of Publication	2019 TIGER/LINE Shapefiles & 2015-2019 ACS
Author and/or owner	US Census
URL or FTP address of repository	https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-data.html
Description	Contains TIGER/Line Shapefiles with demographic data estimates for Census Tracts in Arizona from 2015 to 2019 in a GDB format
Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	NAD 83, GRS 1980, D North American 1983, WKID 4296
Projection (if any)	-
Spatial Resolution (if raster)	-
Type of geometry (if vector)	Polygon

Table 2-1. Metadata for Census Race and Ethnicity Data ACS (2019 5 Year)

Study Area

Official Name of data set	City_Limit_Light_Outline
Year of Publication	2022
Author and/or owner	City of Phoenix Planning Department
URL or FTP address of repository	https://mapping-phoenix.opendata.arcgis.com/datasets/
Description	Shapefile of the City of Phoenix boundaries
Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	NAD 83, GRS 1980, D North American 1983, WKID 4152
Projection (if any)	Transverse Mercator, WKID 4152
Spatial Resolution (if raster)	-
Type of geometry (if vector)	Polygon

Table 2-2. Metadata for City of Phoenix Boundaries

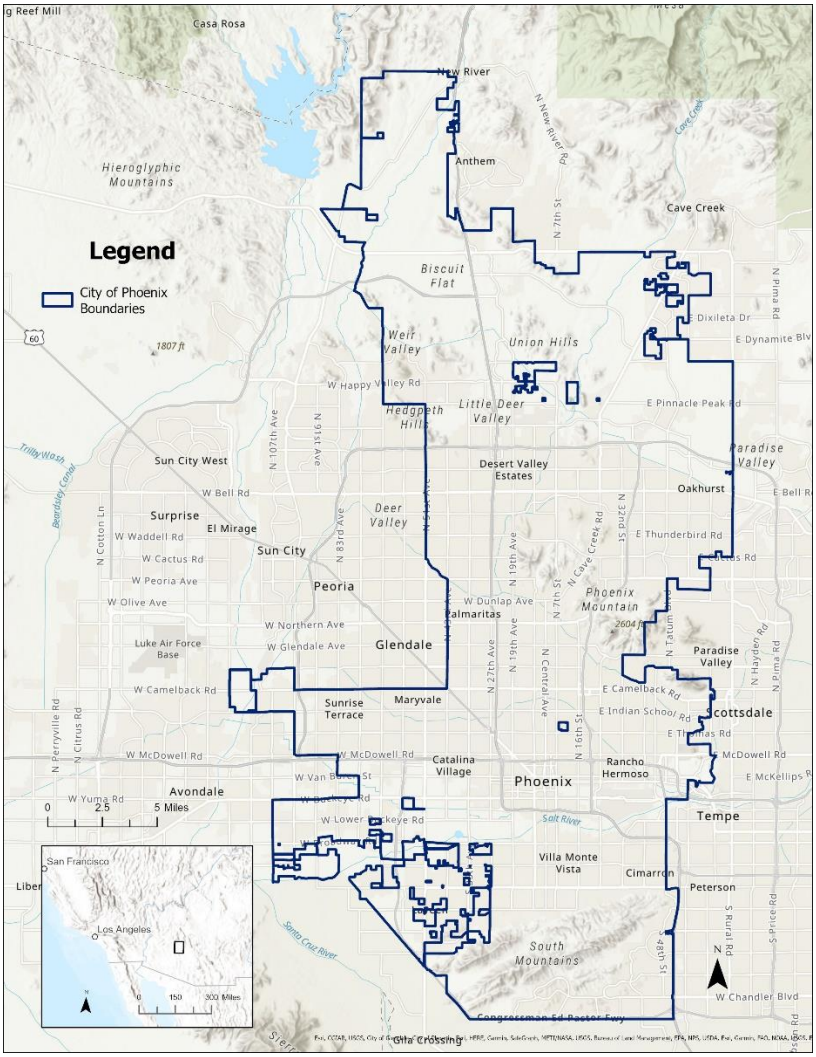

Figure 2-1. City of Phoenix Boundaries Shapefile.

Parcel Data

Official Name of data set	Property Use Codes
Year of Publication	2022
Author and/or owner	Maricopa County Assessors Office
URL or FTP address of repository	https://www.mcassessor.maricopa.gov/page/data_sales/ Not publicly available
Description	CSV file containing the property use codes used by Maricopa County
Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	N/A
Projection (if any)	N/A
Spatial Resolution (if raster)	N/A
Type of geometry (if vector)	N/A

Table 2-3 Metadata for Maricopa County Assessors Use Code Table

Official Name of data set	st42076_100
Year of Publication	April 22, 2022
Author and/or owner	Maricopa County Assessors Office
URL or FTP address of repository	https://www.mcassessor.maricopa.gov/page/data_sales/ Not publicly available
Description	Attribute table for st42076_100 shapefile.
Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	N/A
Projection (if any)	N/A
Spatial Resolution (if raster)	N/A
Type of geometry (if vector)	N/A

Table 2-4 Metadata for Maricopa County Assessors Attribute Table st42076_100

Official Name of data set	st42076_200
Year of Publication	April 22, 2022
Author and/or owner	Maricopa County Assessors Office
URL or FTP address of repository	https://www.mcassessor.maricopa.gov/page/data_sales/ Not publicly available
Description	Attribute table for st42076_200 shapefile.

Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	N/A
Projection (if any)	N/A
Spatial Resolution (if raster)	N/A
Type of geometry (if vector)	N/A

Table 2-5 Metadata for Maricopa County Assessors Attribute Table st42076_200

Official Name of data set	st42076_300
Year of Publication	April 22, 2022
Author and/or owner	Maricopa County Assessors Office
URL or FTP address of repository	https://www.mcassessor.maricopa.gov/page/data_sales/ Not publicly available
Description	Attribute table for st42076_300 shapefile.
Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	N/A
Projection (if any)	N/A
Spatial Resolution (if raster)	N/A
Type of geometry (if vector)	N/A

Table 2-6 Metadata for Maricopa County Assessors Attribute Table st42076_300

Attribute Field	Description
PARCEL_NUM	Parcel Number
O_NAME	Owner Name
O_ADDR1	Owner Address 1
O_ADDR2	Owner Address 2
O_CITY	Owner City
O_STATE	Owner State
O_ZIP	Owner Zip
O_CNTRY	Owner Country
SITE_ADDR	Site Address
S_SUITE	Site Suite
S_CITY	Site City
S_ZIP	Site Zip
PROP_TYPE	Property Type
DEED_NUM	Deed Number
DEED_DATE	Deed Date
DEED_TYPE	Deed Type
LAND_FCV	Land Full Cash Value
LAND_ASSDV	Land Assessed Value
IMPR_FCV	Improvements Full Cash Value
IMPR_ASSDV	Improvements Assessed Value
TOTAL_FCV	Total Full Cash Value
TOTAL_FCAV	Total Full Cash Value
LPV	LPV
PUC	Property Use Code
LOT	Lot
BLOCK	Block
TRACT	Tract
LAND_LCC	Land Local Code Class
LAND_LCSC	LAND_LCSC
IMPR_LCC	IMPR_LCC
IMPR_LCSC	IMPR_LCSC
RENTAL_IND	Rental Indicator
LIV_AREA	Livable Area
TOT_LOTSZ	Total Lot Size
CNSTN_YR	Construction Year
POOL_SZ	Pool Size
SALE_PRICE	Sale Price
SALE_MN_YR	Sale Year
MCR_NUM	Maricopa County Recorder Number
SUB_NAME	Subdivision Name
NUM_UNITS	Number of Units
TAX_AREA_CD	Tax Area Code

Table 2-7 Attribute Values for st42076 100-300 County Dataset

Official Name of data set	st42076_100
Year of Publication	2022
Author and/or owner	Maricopa County Assessors Office
URL or FTP address of repository	https://www.mcassessor.maricopa.gov/page/data_sales/ Not publicly available
Description	Shapefile of portion of Maricopa county parcels
Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	NAD 1983 HARN, GRS 1980, D North American 1983 HARN, WKID 4152
Projection (if any)	NAD 1983 HARN State Plane Arizona Central FIPS 0202 (Intl Feet), Transverse Mercator, WKID 2868
Spatial Resolution (if raster)	N/A
Type of geometry (if vector)	Polygon

Table 2-8 Metadata for Maricopa County Assessors Parcel Shapefile st42076_100

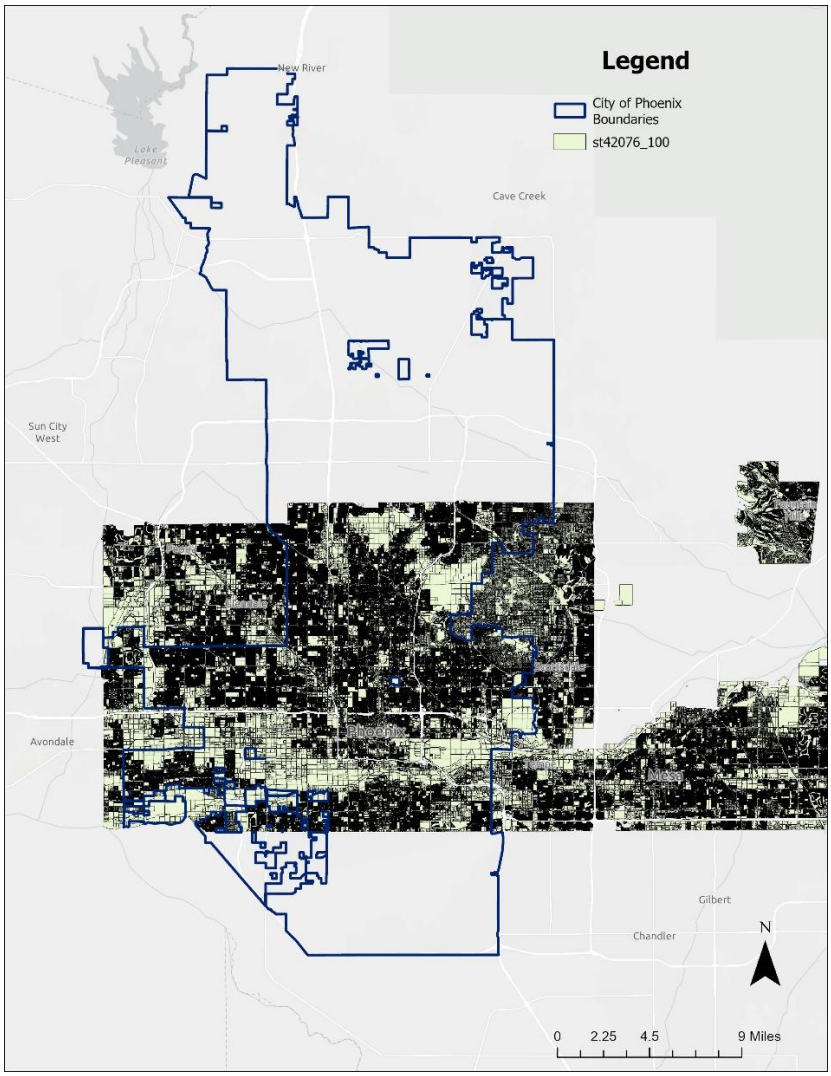

Figure 2-2. Extent for st42076_100 shapefile.

Official Name of data set	st42076_200
Year of Publication	2022
Author and/or owner	Maricopa County Assessors Office
URL or FTP address of repository	https://www.mcassessor.maricopa.gov/page/data_sales/ Not publicly available
Description	Shapefile of portion of Maricopa county parcels
Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	NAD 1983 HARN, GRS 1980, D North American 1983 HARN, WKID 4152
Projection (if any)	NAD 1983 HARN State Plane Arizona Central FIPS 0202 (Intl Feet), Transverse Mercator, WKID 2868
Spatial Resolution (if raster)	N/A
Type of geometry (if vector)	Polygon

Table 2-9 Metadata for Maricopa County Assessors Parcel Shapefile st42076_200

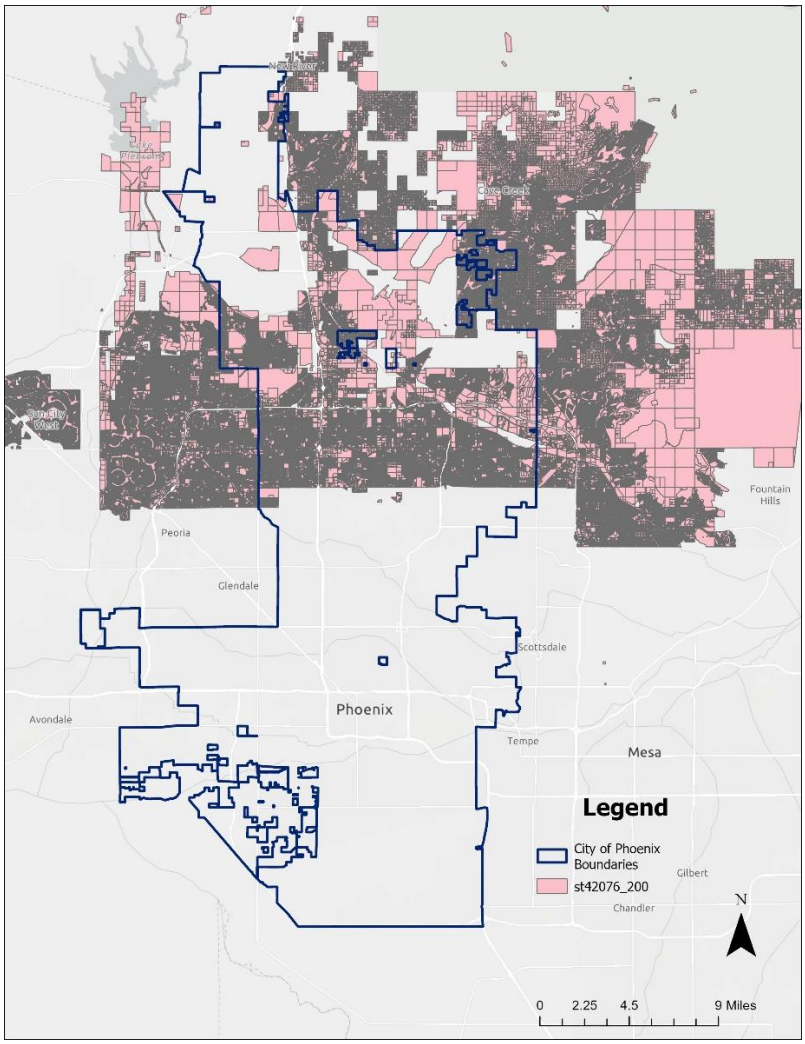

Figure 2-3. Extent for st42076_200 shapefile.

Official Name of data set	st42076_200
Year of Publication	2022
Author and/or owner	Maricopa County Assessors Office
URL or FTP address of repository	https://www.mcassessor.maricopa.gov/page/data_sales/ Not publicly available
Description	Shapefile of portion of Maricopa county parcels
Coordinate System; geodesic model, horizontal datem, vertical datum, and EPSG	NAD 1983 HARN, GRS 1980, D North American 1983 HARN, WKID 4152
Projection (if any)	NAD 1983 HARN State Plane Arizona Central FIPS 0202 (Intl Feet), Transverse Mercator, WKID 2868
Spatial Resolution (if raster)	N/A
Type of geometry (if vector)	Polygon

Table 2-10 Metadata for Maricopa County Assessors Parcel Shapefile st42076_300

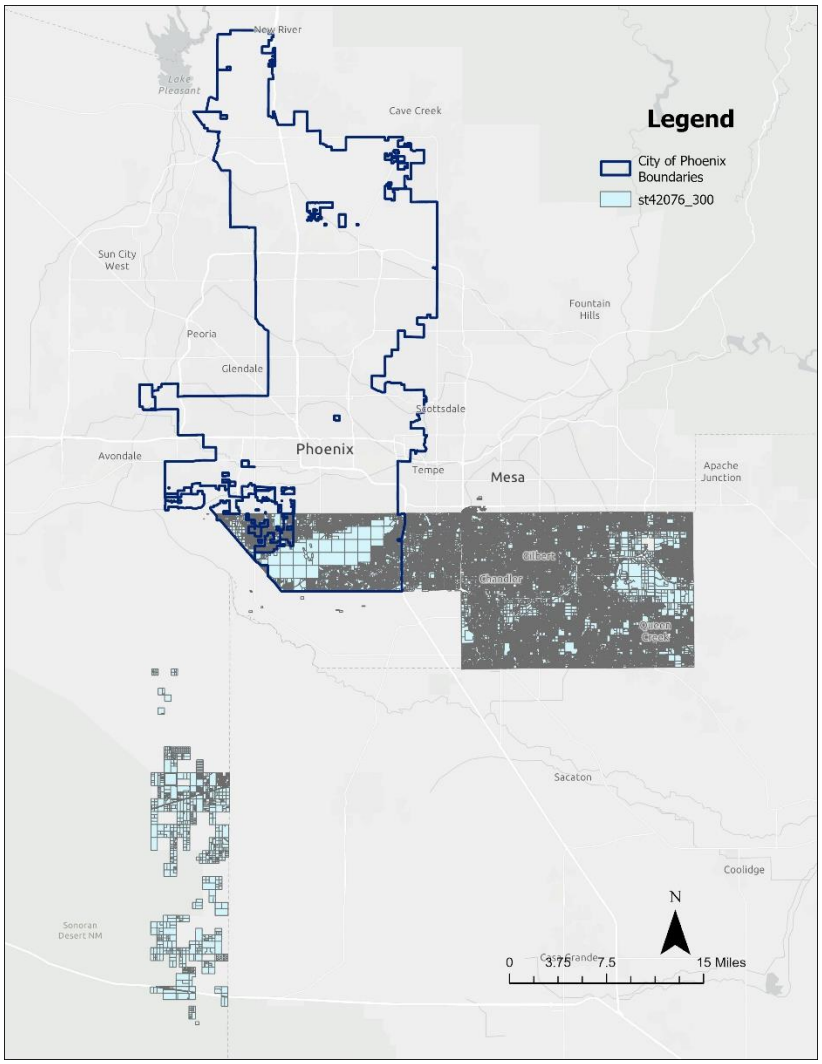

Figure 2-4. Extent for st42076_200 shapefile.

Methodology

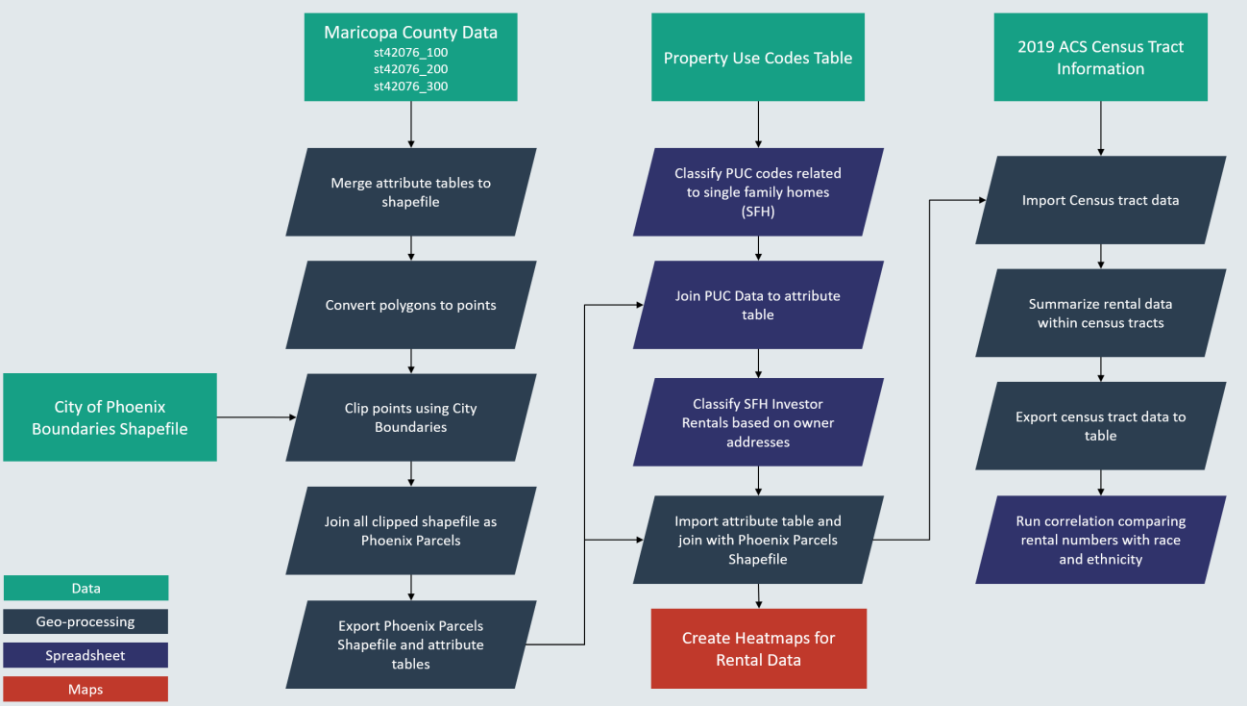

Figure 2-5. Methodology

As the initial parcel data sets from the Maricopa County Assessors Office were very large, initial geoprocessing was completed using Python. The analysis began with loading the parcel data obtained from the Maricopa County Assessors Office and joining the attribute tables to the shapefiles by the parcel numbers. The shapefiles were converted from polygons to points using the geopandas geometry function based on the center of the polygons. This was done to lower the size of the overall dataset and ensure more accuracy when using clipping functions and summarizing data within sub geographies within the study area. Then all the point files were joined and clipped using the City of Phoenix study area boundary to leave only parcel data relevant to the analysis. The resulting point shapefile was exported along with the attribute tables to be analyzed using other tools.

The next step of the analysis involved classifying the Property Use Code (PUC) data provided by the Assessors Office to identify which parcels were SFH. The dataset included 2,043 unique codes, of which 79 were identified and classified as SFHs. Those classifications were then joined to the point shapefile using a one to many relationship join.

Classifying Investors

At this stage a methodology was devised to identify and classify SFH rentals by the types of owners. As this analysis is concerned with SFH rentals owned by institutional investors, the initial assumption was that by grouping the investors by owner name would identify investors. Further exploratory data analysis revealed that owner address was a better indicator of investor ownership. The data (Figure 2-6) demonstrated that investor groups typical create several ownership entities tied to a single address. Based on this finding SFH rentals were classified as "investor owned" if the owner address was associated with five (5) or more rental properties. All remaining SFH rentals were classified as "non-investor owned". The breakdown resulting from this classification can be seen in Table 2-11.

Type	Count	% of SFH
SFH	358,028	100%
Non-Investor Rentals	32,090	8.9%
Investor Rentals	13,208	3.7%

Table 2-11 Classified SFH Data

OWNER ADDRESS	TOTAL SFH RENTALS
PO BOX 4090	1022
FREO ARIZONA LLC	3
FREO PROGRESS LLC	10
POGLAJEN MICHAEL/PROGRESS PHOENIX LLC	1
PROGRESS PHOENIX LLC	53
PROGRESS RESIDENTIAL 2015 3 BORROWER LLC	107
PROGRESS RESIDENTIAL 2015-1 BORROWER LLC	35
PROGRESS RESIDENTIAL 2015-2 BORROWER LLC	2
PROGRESS RESIDENTIAL BORROWER 1 LLC	30
PROGRESS RESIDENTIAL BORROWER 11 LLC	47
PROGRESS RESIDENTIAL BORROWER 13 LLC	40
PROGRESS RESIDENTIAL BORROWER 2 LLC	2
PROGRESS RESIDENTIAL BORROWER 3 LLC	13
PROGRESS RESIDENTIAL BORROWER 4 LLC	53
PROGRESS RESIDENTIAL BORROWER 5 LLC	214
PROGRESS RESIDENTIAL BORROWER 6 LLC	52
PROGRESS RESIDENTIAL BORROWER 7 LLC	1
PROGRESS RESIDENTIAL BORROWER 8 LLC	64
PROGRESS RESIDENTIAL BORROWER 9 LLC	14
PROGRESS RESIDENTIAL BRIDGE BORROWER LLC	15
PROGRESS RESIDENTIAL EXCHANGE BORROWER LLC	6
PROPERTY OWNER 10 LLC	54
PROPERTY OWNER 11 LLC	31
PROPERTY OWNER 9 LLC	4
PROPERTY OWNER I I LLC	1
PROPERTY OWNER I LLC	1
PROPERTY OWNER II LLC	1
YAMASA CO LTD	168
1717 MAIN ST STE 2000	517
2017-2 IH BORROWER LP	317
2018-2 IH BORROWER LP	18
2018-4 IH BORROWER LP	109
2019-1 IH BORROWER LP	29

Figure 2-6. Ownership Data Example. This data is grouped by owner address and lists all owner names associated with the data along with the count of rental properties.

Once all the data was classified it was imported into ArcGIS Pro and joined to the shapefile. This was followed by some initial data mapping to show concentrations of both investor owned and non-investor owned SFH rentals.

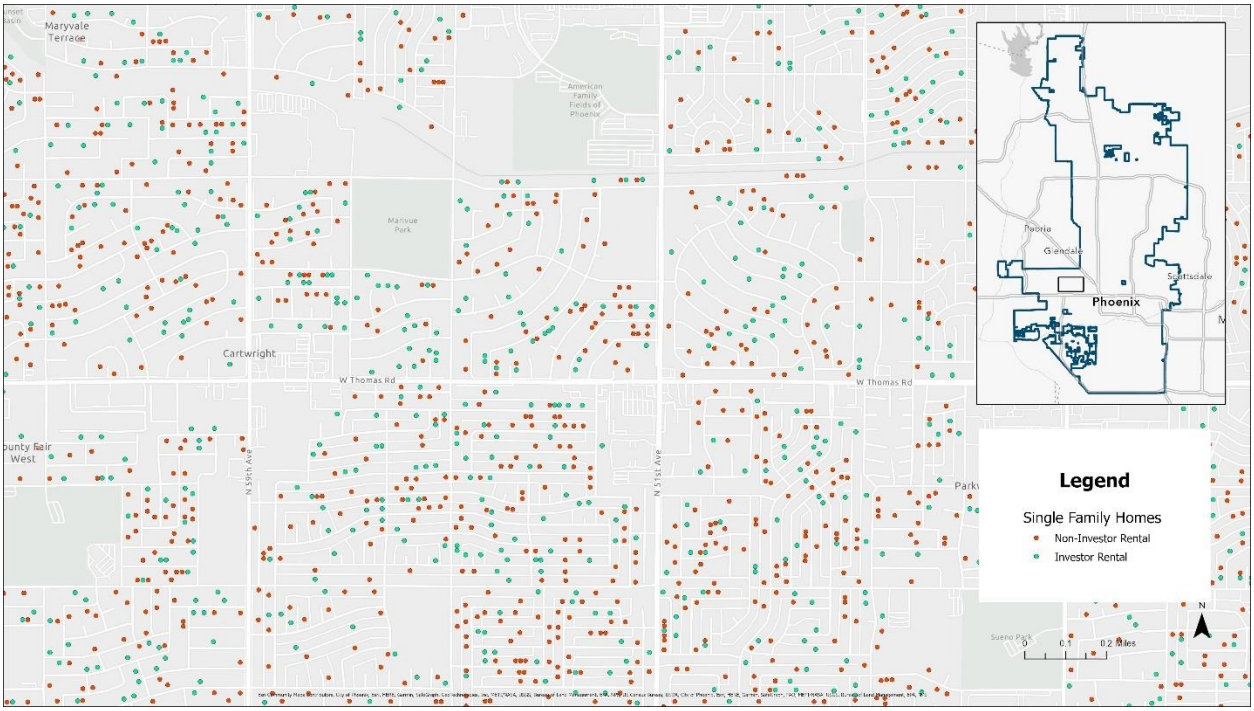

Figure 2-7. Sample neighborhood showing classified investor and non-investor SFH rentals.

Race and Ethnicity Analysis

The census dataset was then imported, and the racial and ethnic compositions were calculated. The census considers race and ethnicity separately. Individuals can identify as one race, multiple races, and at the same time identify under different ethnicities. For example, someone might identify as Black and Hispanic on the census while another person might identify as White and Hispanic. To determine the relation of the different types of SFH rentals to the racial and ethnic composition of neighborhoods, the percent of racial minorities and Hispanic population for each census tract were calculated using the following formulas:

$$\text{Percent Hispanic} = \frac{\text{Total Hispanic Population}}{\text{Total Population}} \text{ X } 100$$

$$\text{Percent Minority} = \frac{\begin{array}{c}\text{Total Black or African American +} \\ \text{Total American Indian +} \\ \text{Total Asian Alone +} \\ \text{Total Native Hawaiian +} \\ \text{Total Some other race +} \\ \text{Total Two or More Race}\end{array}}{\text{Total Population}} \text{ X } 100$$

The rental data was then summarized within each census tract. The percentage of investor owned SFH rentals as well as non-investor SFH rentals was calculated using the following calculations

$$\text{Percent Investor} = \frac{\text{Total Investor SFH}}{\text{Total SFH}} \text{ X } 100$$

$$\text{Percent Non-Investor} = \frac{\text{Total Non-Investor}}{\text{Total SFH}} \text{ X } 100$$

Linear Regression

The final part of the analysis involved a linear regression calculation between the four variables to determine which relationships were the strongest. The percentage of investor and Non-investor SFH rentals were independently measured against both the percentage of minority and Hispanic population for each census tract. This was done using a simple linear regression formula: $Y_i = \beta_0 + \beta_1 X_i$

CHAPTER 3 RESULT

SFH Rental Concentrations

When classified and mapped, the concentrations of SFH rentals shows a distinct pattern. Non-investor rentals are spread relatively evenly throughout the City of Phoenix with concentrations in Maryvale, Laveen, Ahwatukee, and North Phoenix.

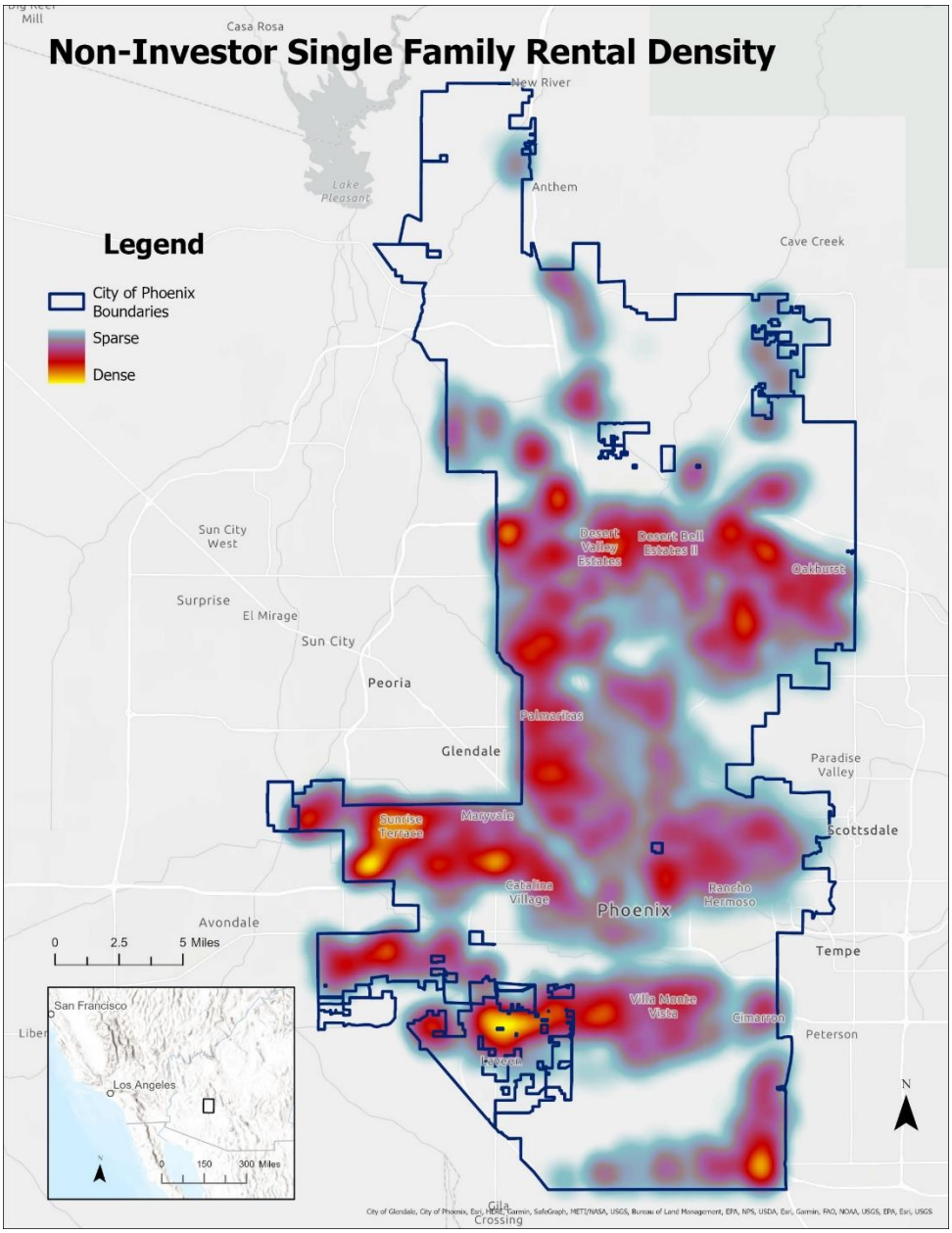

Figure 3-1. Non-Investor Single Family Rental Density

The investor rentals show a very different pattern. They are not nearly as widely represented throughout the City. Most concentrations of investor rentals are found in West Phoenix in Maryvale and Laveen.

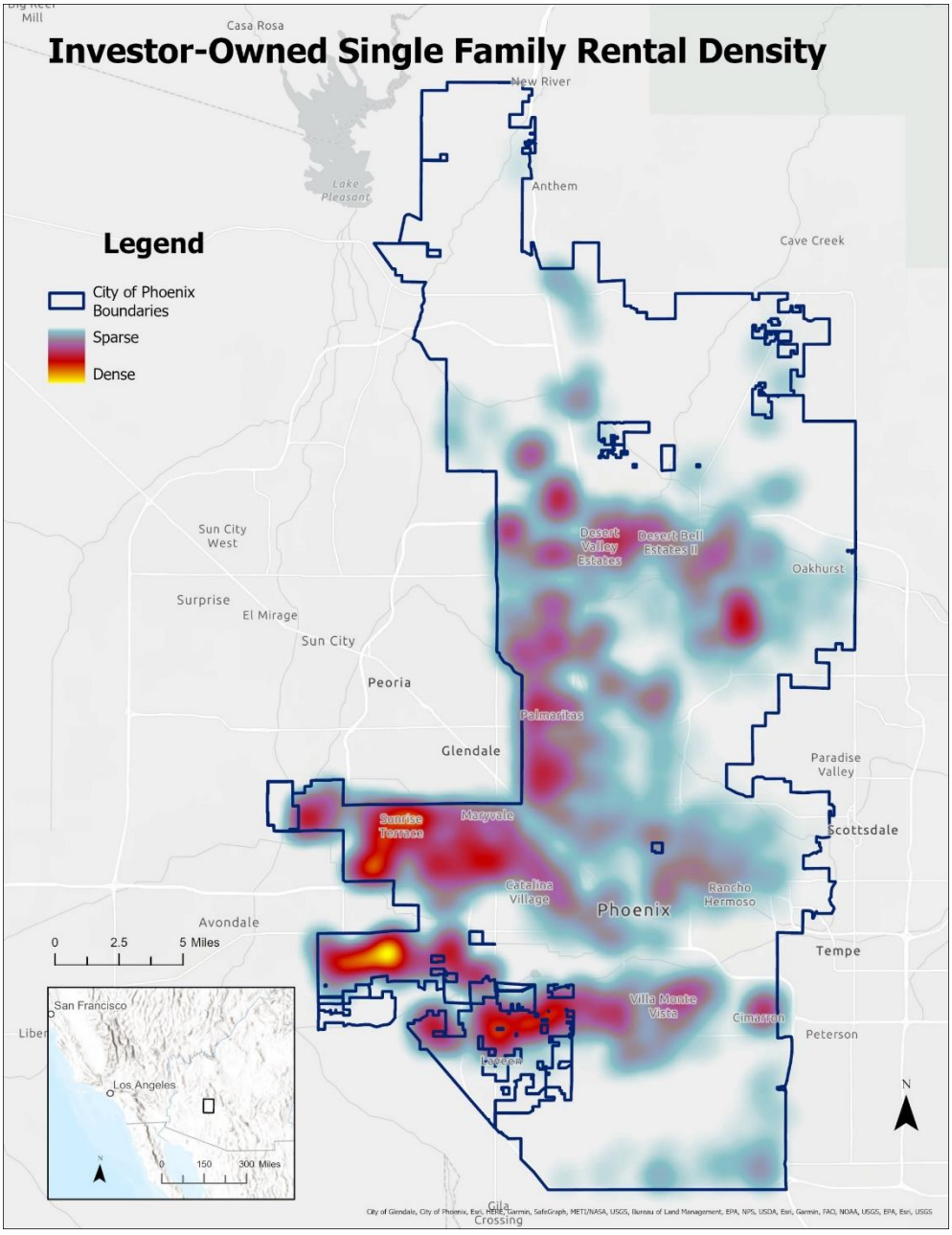

Figure 3-2. Investor Single Family Rental Density

Race and Ethnicity Relationship

Some of the most interesting findings were the relationship data from the linear regressions comparing the percentage of both investor and non-investor rentals to the minority and Hispanic population of the census tracts.

Non-Investor Rentals and Minority Population

The analysis showed a positive relationship between the non-investor rentals and minority populations (Figure 3-3) indicating that these types of rentals tend to be more present in higher minority census tracts. The Multiple R value for this comparison is below .3 which shows that while there is a positive relation, these two variables have a low correlation.

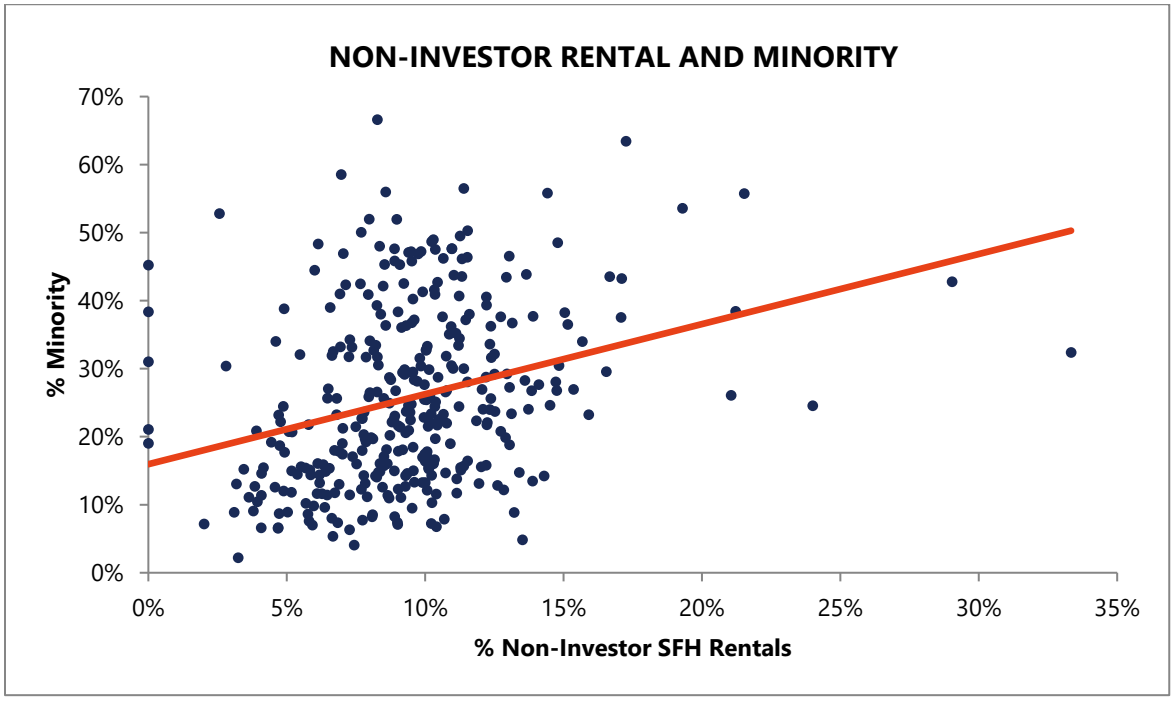

Figure 3-3. Non-Investor Rental and Minority Line Fit Plot

Regression Statistics	
Multiple R	0.299101377
R Square	0.089461634
Adjusted R Square	0.086845144
Standard Error	0.123525891
Observations	350

Table 3-1 Regression Statistics Non-Investor Rental and Minority

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.521715585	0.521715585	34.19147358	1.15104E-08
Residual	348	5.310008743	0.015258646		
Total	349	5.831724328			

Table 3-2 Non-Investor Rental and Minority ANOVA

Non-Investor Rentals and Hispanic Population

The analysis showed a positive relationship between the non-investor rentals and Hispanic populations (Figure 3-4) indicating that these types of rentals tend to be more present in census tracts with higher Hispanic populations. The Multiple R value for this comparison is below .3 which shows that while there is a positive relation, these two variables have a low correlation.

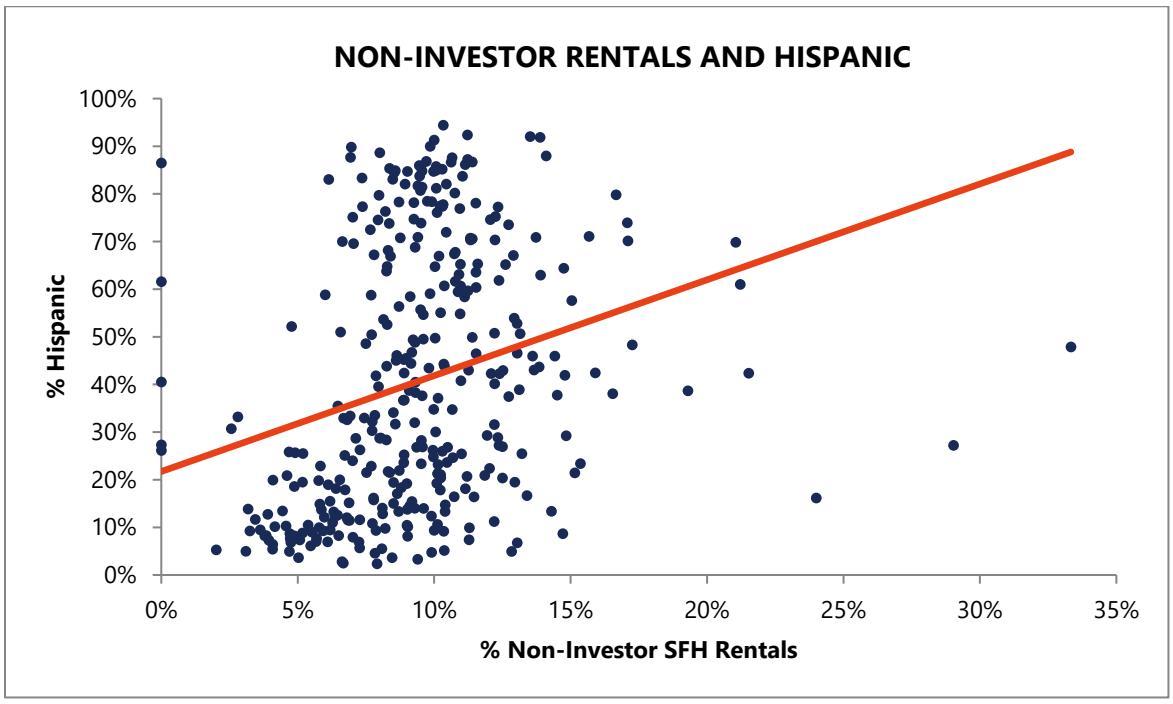

Figure 3-4. Non-Investor Rental and Hispanic Line Fit Plot

Regression Statistics	
Multiple R	0.278296
R Square	0.077449
Adjusted R Square	0.074798
Standard Error	0.261083
Observations	350

Table 3-3 Regression Statistics Non-Investor Rental and Hispanic

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.991402418	1.991402418	29.2147744	1.205E-07
Residual	348	23.72114986	0.068164224		
Total	349	25.71255227			

Table 3-4 Non-Investor Rental and Hispanic ANOVA

Investor Rentals and Minority Population

The analysis showed a positive relationship between the investor rentals and minority populations (Figure 3-5) indicating that these types of rentals tend to be more present in higher minority census tracts. The Multiple R value for this comparison is below .3 which shows that while there is a positive relation, these two variables have a low correlation.

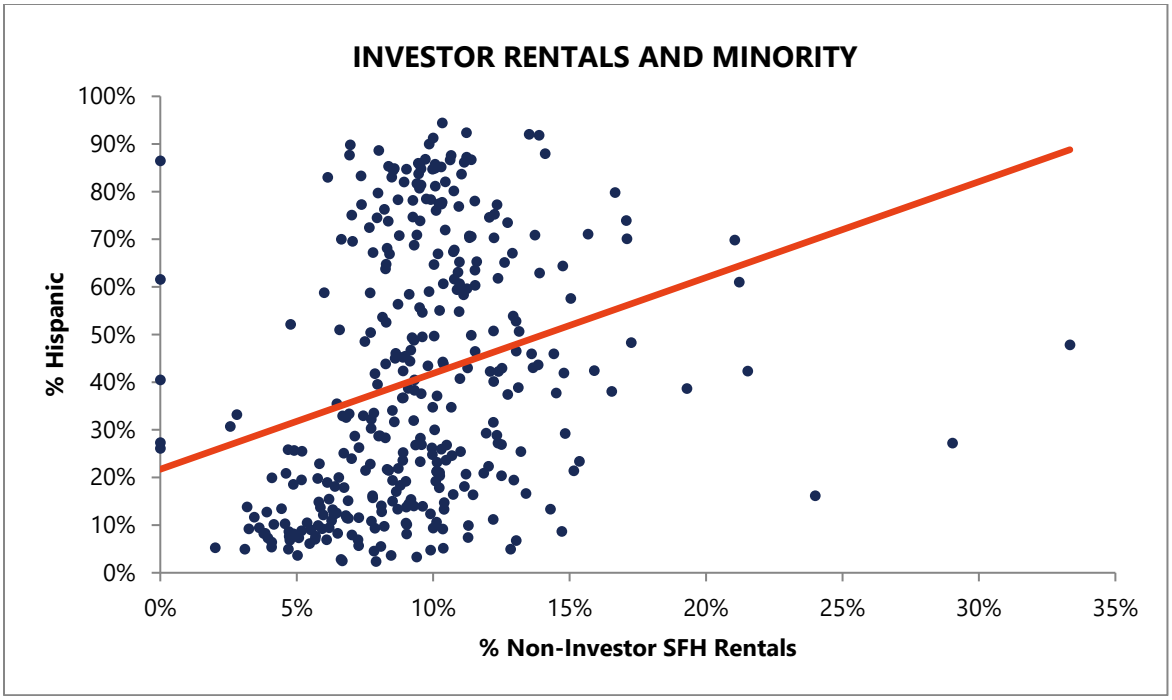

Figure 3-5. Investor Rental and Minority Line Fit Plot

Regression Statistics	
Multiple R	0.278296
R Square	0.077449
Adjusted R Square	0.074798
Standard Error	0.261083
Observations	350

Table 3-5 Regression Statistics Investor Rental and Minority

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.991402418	1.991402418	29.2147744	1.205E-07
Residual	348	23.72114986	0.068164224		
Total	349	25.71255227			

Table 3-6 Investor Rental and Minority ANOVA

Investor Rentals and Hispanic Population

The analysis showed a positive relationship between the investor rentals and Hispanic populations (Figure 3-6) indicating that these types of rentals tend to be more present in census tracts with a higher Hispanic population. The Multiple R value for this comparison is near .6 which shows a very significant correlation between investor rentals and Hispanic populations.

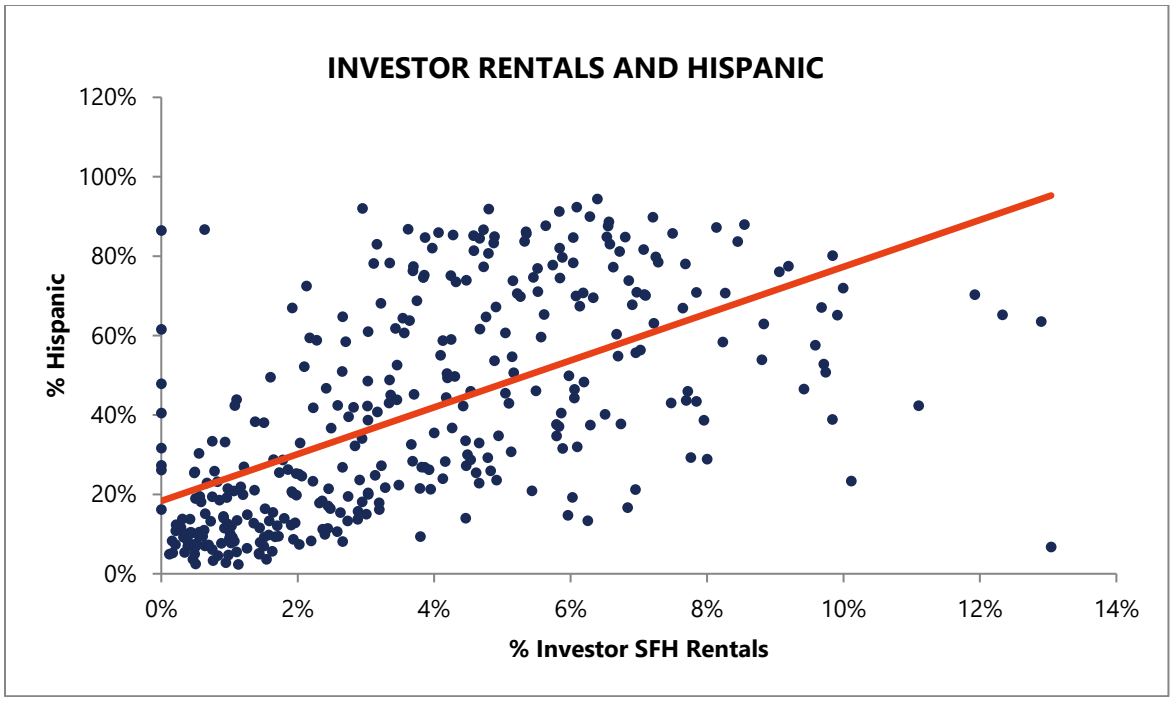

Figure 3-6. Investor Rental and Hispanic Line Fit Plot

Regression Statistics	
Multiple R	0.593956002
R Square	0.352783732
Adjusted R Square	0.350923916
Standard Error	0.218679305
Observations	350

Table 3-7 Regression Statistics Investor Rental and Hispanic

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	9.07097	9.07097	189.6874	9.49E-35
Residual	348	16.64158	0.047821		
Total	349	25.71255			

Table 3-8 Investor Rental and Hispanic ANOVA

CHAPTER 4 CONCLUSION

The analysis revealed a very clear and distinct spatial pattern to SFH rentals within the City of Phoenix. Non-investor rentals were relatively evenly disbursed throughout the City with several concentrations in the neighborhoods of Maryvale, Laveen, Ahwatukee, and part of North Phoenix. Although these non-investor rentals showed a positive relationship with both racial minority populations and Hispanic populations, the correlation between these variables was not particularly strong. Investor rentals painted a different story. These were far less evenly disbursed throughout the City, concentrating in West Phoenix, primarily in Maryvale. Investor rentals also showed a positive relationship with both racial minority populations and Hispanic populations but only showed a strong correlation with Hispanic populations.

The analysis brings up several questions as to the impact these investor owned rentals are having on Hispanic communities. Specifically, it brings into question whether these investors are decreasing the available housing stock for potential homeowners thereby limiting these households from the opportunity to build equity and subsequently subjecting them to the economic strain of increasing housing costs. The results of this study could be used to help local and regional housing policy in respects to affordability and homeownership to focus on increasing access to housing opportunity. Organizations or government officials can use this study to justify further investment in these Hispanic neighborhoods which have historically been underserved in a variety of ways.

One area of improvement this analysis could benefit from is by including additional socioeconomic factors in the regression analysis such as the income levels, household sizes, median age, etc. All of this data is available through the census, and it would be possible to

expand the analysis to see if there are any correlations with these factors as well. This would help paint a clearer picture of who lives in neighborhoods with high levels of investor-owned rentals.

It would also be interesting to see if there is any relationship between the rental status of the SFHs and the characteristics of the homes such as age, size, and value. There is also an opportunity to compare across jurisdictions using this dataset to see if the results hold up across the entire county. It would also be interesting to compare jurisdictions to one another to see if there are any differences that can be identified and attributed to local policies.

The data and methodology used in this analysis can be expanded in a variety of ways to help answer pressing questions posed by the housing crisis.

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