5-8-2020

An economic analysis of the short-term rental market: Local regulatory decisions

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An Economic Analysis of the Short-Term Rental Market:

Local Regulatory Decisions

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An Honors College Project Presented to

the Faculty of the Undergraduate

College of Business

James Madison University

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by Harrison D. Hooper & Joseph L. Kauffman

May 2020

Accepted by the faculty of the Department of Economics, James Madison University, in partial fulfillment of the requirements for the Honors College.

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Dedication

We dedicate this project to both of our families. Thank you for your endless love and support throughout our lives and for giving us the opportunities to pursue our personal, academic, and career goals.

You prepared us for great success in all aspects of life, and we could not have achieved our accomplishments over the past 22 years without such incredible support. We will continue to make you all proud!

Acknowledgements

We would like to begin by thanking Dr. Wood for his willingness to be our advisor and for inspiring us to pursue our econometric interests. You have been an incredible professor that has guided us through this thesis and our academic careers.

We also want to express our gratitude to Professors Heap and Graham for providing great feedback and advice throughout this project. We will forever appreciate their guidance both in and out of the classroom over the past several years.

In addition, we would like to thank James Madison University as well as the Department of Economics for providing the resources, education, and amazing professors necessary to create this project. JMU and the Economics Department have made the past four years extraordinary, and we will always value the opportunity to attend such a special school and program.

Finally, we want to thank the Honors College for the unique academic experiences throughout our time at JMU. Each has helped our personal growth and better prepared us for our futures. This thesis has allowed us to combine our knowledge and skills into the final piece representing our undergraduate experiences.

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Abstract

In recent years, short-term home rental companies such as Airbnb and Vacation Rentals by Owner (VRBO) have grown in popularity throughout the United States and the world. The lack of regulation of this rapid growth, which stemmed from the legal grey area these rentals fall under, caused some states to adopt specific regulatory policies. These regulatory policies attempt to better monitor this sector, to tax rental earnings, and to reduce perceived negative externalities to this new market. This thesis researches the benefits and costs that short-term rentals (STRs) provide to cities and the regulatory implications on the growing rental market. Using census data along with a STR regulatory index developed by the R Street Institute that measure city-level regulations, this paper presents evidence that city-level regulations of STRs were largely unpredictable. Although no widespread common factors explain regulatory decisions, local sales tax rates, residents' political policy preferences, city population age, and owner-occupied median home values were found to have some influence in explaining variations among cities in short-term rental regulation.

I - Introduction

The sharing economy has become increasingly popular over the last decade, with prominent examples in the short-term home rental markets and transportation service provider markets. Companies such as Airbnb, VRBO, Uber, Lyft, and Bird have contributed greatly to this rapid growth. As these markets continue to gain traction globally, PWC forecasts that the sharing economy will grow to $335 billion by 2025 (PWC, 2014). This rapid expansion has influenced cities across the United States to take diverse stances on how to best regulate STRs—with regulatory policies varying considerably across cities. The purpose of this paper is to explain whether or not cities that regulate the STR market share similarities that might help predict or categorize how cities outside of our sample of 35 cities will respond to STRs. These city-level regulatory legislations of the short-term rental market are unsystematically implemented among some of the largest cities in the U.S., with local tax rates, resident political preferences, median age, and owner-occupied median home values only capturing some of this variability.

The growth of the STR market has relied on the expansion of online communities of people that demand and supply goods and services in the sharing economy. Web-based platforms allow owners of idle assets to generate revenue from consumers looking to use these assets without directly owning them. Widespread smartphone and laptop usage has greatly eased the difficulties previously associated with connecting asset owners to potential consumers. These online platforms provide greater availability and access to otherwise underused assets or services, such as a vacant room in someone's home (Kenton, 2019).

One major sector within the sharing economy, the short-term rental market, has shown considerable growth in recent years. Primarily recognized through the popularity of Airbnb,

STRs describe rental periods lasting less than 30 days (DiNatale et al., 2018). Airbnb classifies itself as "a trusted community marketplace for people to list, discover, and book unique accommodations around the world - online or from a mobile phone" (Airbnb, 2019). More specifically, Airbnb specializes in connecting homeowners with short-term renters through its online platform to provide owners with additional income and renters with affordable places to stay. Within this market, there exists a wide range of rental options, from entire homes, condominiums, and apartments to single rooms, with over one million current listings worldwide (Airbnb, 2019). This unique and growing market continues to contribute to the sharing economy, making it an important, relevant, and evolving area for research.

Our motivation for researching this project stems from personal experiences. We have encountered several externalities in our own neighborhoods when homeowners market their extra rooms or whole homes for nightly rentals. Although many cities and neighborhood associations impose strict limitations on short-term rentals, these operations are often difficult to identify and time consuming for neighbors to report. As residents of Virginia Beach, we have seen many visiting Airbnb guests use Ubers or Lyfts as their mode of transportation. The increase in Uber traffic in our neighborhoods created potentially dangerous situations, as Uber drivers, unfamiliar with speed limits and the layout of the neighborhood, often drove quickly past playing children. Additionally, our families feared that the close proximity of short-term rentals would decrease the values of their homes. These experiences sparked our curiosity regarding the home-sharing market and also added a level of personal investment in this thesis.

This thesis begins with observing the costs and benefits of the STR market, followed by observing R Street's Roomscore report, and concludes with statistical analysis aimed at supplementing and explaining R Street's regulatory scores for cities.

II - Benefits and Costs of STRs

The short-term rental market includes rental agreements of residential rooms, apartments, condominiums, and entire homes, rentals with durations less than 30 days. Anyone with extra living space has the opportunity to list the space for rent on one of the numerous STR websites. These individuals can post their listings on websites such as Airbnb, VRBO, HomeAway, and even Craigslist. Demand for these listings stems from individuals who need or desire a place to stay for a short period of time, and these listing platforms connect the suppliers and consumers. This market introduces competition to the hotel industry, which has long operated under strict regulations with costly taxes and permits.

The sharing economy contributes materially to cities around the United States. As the number of homeowners who list their homes or individual rooms for rent on Airbnb and similar websites increases, competition in the overall short-term lodging market also increases. These new rentals often cost less than traditional hotel rooms and thus force many hotel companies to lower their own prices in order to maintain their rental occupancy rates. These lower prices expand the availability of affordable housing for vacationers and other short-term travelers in many cities, giving lower income individuals and families more selections and better access to vacationing options (Zervas et al., 2014). With lower short-term rental costs, more people become more willing and able to travel and vacation. According to Airbnb's own research and data collection, customers that utilize its website to book vacations instead of a more traditional booking service take, on average, 2.1 times longer vacations. Additionally, 31 percent of Airbnb guests report that they would have either not traveled or would have reduced their trip length if they could not use Airbnb to rent their rooms. While on vacation, they spend money and support

local economies with additional tourism revenue not available to cities prior to this sharing service (Airbnb, 2015).

In addition, renters can often find available rooms through home-sharing rentals when they cannot reserve rooms from hotels and other traditional short-term rentals. Those who travel to experience a different culture or to engage in social interactions outside of popular tourist destinations can do so more easily with the diverse rental locations Airbnb has to offer. Other evidence supports the claim that vacationers choose to rent through a home-sharing service because they prefer the larger rooms and full amenities of staying in a house rather than a hotel (Guttentag et al., 2017).

Hosts also benefit from listing their homes or additional rooms on these sharing sites. The hosts using Airbnb for an average of 66 days a year make, on average, an additional $7,530 per year from rental income on a single property. This additional income significantly helps middle class homeowners who have an additional room they can rent relatively easily (Sperling, 2014). With the additional income potential as a result of these short-term home-sharing economies, housing prices seem to rise as a result, giving homeowners more equity in their homes. This improves their balance sheets and gives them more economic freedom (Sheppard & Udell, 2016). Additionally, a decrease in long-term rental supply increases housing prices. An increase in short-term rental supply causes a decrease in long-term rental supply coupled with the potential for additional income. Given that the number of Airbnb listings has doubled (on average since inception), a 100 percent increase in Airbnb listings was associated with a 1.8 percent annual increase in rent costs and a 2.6 percent annual increase in housing prices (Barron et al., 2020).

Although many beneficial impacts come as a result of Airbnb's presence in a locality, there are negative consequences. While many individuals may benefit from the additional revenue streams provided from Airbnb rentals, close to 40 percent of Airbnb's revenue stems from another source: landlords known as "super hosts" that list and operate large numbers of Airbnb rentals (Pickell, 2016). "Super hosts" weaken the argument that only owner-occupants utilize the short-term rental market to help pay their mortgages by identifying individuals with multiple simultaneous Airbnb listings. Although the short-term rental market offers benefits to middle class homeowners that choose to rent out extra rooms and the large "super hosts," hotels have experienced drastic decreases in revenue growth rates since Airbnb's inception (Pickell, 2016).

Additionally, since many cities have not yet established definite Airbnb regulations, hosts can easily undercut higher hotel prices due to the high tax rates imposed on hotels. Hotels pass some of this tax burden onto consumers, which increases hotel room prices relative to home-sharing services that do not face these taxes. As a result of less expensive STRs, many cities have lost significant amounts of hotel tax revenue due to limited or nonexistent taxes on short-term rental transactions (Zervas et al., 2016).

The rapid growth of short-term rental listings has significantly increased the supply of accommodations, and consequently the overall lodging industry has become more competitive. As a result of these changes, hotels have been unable to maintain their long-enjoyed benefits of lodging price dominance. Prior to the introduction of rental platforms such as Airbnb, hotels had total control over the fixed supply of rooms available for nightly rentals, and they would set rental rates based on the level of demand and existing occupancy rates (Dogru, et al., 2018). Not only have STRs increased this supply, but these platforms also easily adjust their number of

listings in response to fluctuations in demand and strip hotels of much of their prior price-controlling power (Farronato & Fradkin, 2018).

Farronato and Fradkin (2018) measured the effects of Airbnb's market share on hotel industries across 50 U.S. cities in 2014. They estimated that Airbnb's presence in the accommodations industry caused an aggregate reduction in hotel profits across all 50 cities by up to 3.7 percent. In addition, this effect was concentrated in densely populated cities with large numbers of Airbnb listings during the busiest holidays. In these circumstances, hotels are constrained by the physical number of rooms they have, and their occupancy rates along with rental prices increase in response to this high demand situation. When homeowners or condominium owners with unused rooms observe these high prices, many of them begin listing room availabilities on the Airbnb platform. This increase in the supply of lodging due to Airbnb drives prices back down, and hotels miss out on much of the earnings that would have been realized if Airbnb listings had not become available (Farronato & Fradkin, 2018).

A similar study also published in 2018 determined the time series effects of Airbnb on the hotel industries in 10 U.S. cities from 2008 to 2014. This research estimated that each 1 percent increase in the number of Airbnb listings caused the average revenue per hotel room to decrease by 0.02 percent from 2008 to 2017. On the surface, this estimate seems to account for only a small effect, but considering that the number of Airbnb listings has doubled each year (on average since inception), the total effect is large. If this trend continues over the next year, hotel revenues are expected to fall by 2 percent in the next 12 (Dogru, et al., 2018).

Another negative impact stemming from the rise of Airbnb relates to the increases in long-term home ownership and rent, which have contributed to an affordability crisis, as people now spend a larger percentage of their income on their personal mortgages or long-term rental

services. The long-term rental market consists of rentals over 30 days which is typically seen in monthly and annual rentals. The increase in STRs also places potential homeowners in a difficult position due to rising house prices, and Airbnb has made this affordability crisis even more severe by lowering the supply of long-term rental properties or properties for sale. An increase in the supply of short-term rentals has decreased the supply of long-term rentals and mortgages— since homeowners are now willing to rent their properties in the STR market instead of renting their asset long-term or selling their property, making house prices increase. Consequently, homeowners and long-term renters now have to spend a greater portion of their salaries or incomes on houses (Ward, 2017). In San Francisco, for example, "residents can expect to spend 40.6 percent of their income on a monthly mortgage payment, or 47 percent on rent" (Lee, 2016). The U.S. Census Bureau identifies anything greater than 30 percent of an individual's income on housing as "housing-cost burden" (Schwartz & Wilson, 2006). This significant amount of income dedicated solely to rent and mortgage payments creates an area of concern for homeowners and long-term renters.

The effects of the short-term rental market raising long-term rental prices and home prices have also raised the concern of possible gentrification. Some analysts argue that Airbnb benefits wealthy white commercial homeowners who purchase housing to rent out in predominantly black and Hispanic neighborhoods, which makes these houses unaffordable for many people in the area (Bernardi, 2018). In New York City, for example, 23,200 new housing units were completed in 2016. This supply growth, however, was significantly offset by the 12,200 entire-home Airbnb listings in 2016. Over 52 percent of the increase in NYC housing supply in 2016 may have been canceled out these short-term rentals (Wachsmuth & Weisler, 2018). Wachsmuth and Weisler (2018) argue this has perpetuated the process of gentrification by

leading to even greater income inequality and taking away many housing opportunities for lower income families.

Many of the negative impacts of short-term home rental services involve market externalities. For instance, home-sharing guests can inadvertently inconvenience full-time residents by taking parking spots and stopping them during their daily commute to ask for directions (Edelman & Geradin, 2015). In Los Angeles, for example "these hotel-like room rentals are unpopular with neighbors in residential neighborhoods as they bring transients, traffic, create potential safety issues and could negatively impact surrounding property values" (The Eastsider, 2013). Often, home-sharing guests decide that, as only part-time visitors in a particular area, they have little accountability to care for their surrounding environment (Edelman & Geradin, 2015). This lack of concern can lead to environmental damages, unsafe environments for surrounding citizens, and potential damage to properties.

Externalities in the short-term home-sharing rental market make designing and implementing effective regulatory policies more difficult. Many cities in the United States have adopted legislation to restrict the usage and prevalence of Airbnb rentals. San Francisco, for example, adopted a policy that allows only permanent residents to use these markets, and these owners can only rent for ninety days out of the year. These hosts also must obtain certifications to operate within Airbnb's network. If a host breaks this law, they must pay a fine which increases with additional offenses. The most effective regulatory policies currently appear to target the hosts, rather than the renters (Espinosa, 2016).

Both special interest groups and public interest have played a role in local governments' decision-making processes regarding the STR market. Influence exists from both special interest

groups and public interest—which helps explain the divergence in regulation among cities across the United States.

Short-term rental platforms and the hotel industry primarily drive the two special interest groups competing to gain market-share in the lodging industry. In order to combat increased scrutiny and attacks from hotels, STR rental companies such as Airbnb have lobbied to fight against "new regulations or seeking compromises that allow the company to continue operating" (Kirkham & Bensinger, 2017). Airbnb has done this a few different ways. In the past, they have helped fund the Checks and Balances Project which is a "public watchdog blog" that attacks the hotel industry through lobbying and campaign expenditures (Kirkham, 2017). In addition to helping fund the Checks and Balances Project, Airbnb has taken a targeted lobbying approach of focusing on major cities that are considering potential regulations. For example, in 2017, Airbnb spent close to $1.9 million lobbying in Los Angeles in an attempt to keep that market intact— which proved unsuccessful. Conversely, Airbnb successfully outspent opponents 16 to one in San Francisco in 2015 and avoided legislation that would have significantly limited their operating capacity in the city. Trying to convince local governments to minimally regulate the STR market, Airbnb and similar companies have dedicated meaningful resources to special interest lobbying (Kirkham, 2017).

In an attempt to increase regulations on their competition, the hotel industry spends time, money, and resources lobbying against the STR market as a special interest group. During the 2016 election cycle, HotelPAC, the lobbying committee of the hotel industry, fundraised a record $1.5 million to support selected candidates (Breland, 2017). The American Hotel and Lodging Association, which oversees HotelPAC, stated that "the money boosted candidates who back the industry and were potentially in favor of having Airbnb 'play by the same rules'" (Breland,

2017). Specifically, they mentioned that their goal was to protect the lodging industry and communities from commercial "super hosts" that use Airbnb to run illegal businesses in residential areas. With Airbnb spending significant resources on lobbying, the hotel industry has decided to fight back. The two competing sides of these special interest groups have experienced both failures and successes—as policymakers are fairly split, which helps further explain the variations in regulation.

In addition to the special interest groups, public interest has also remained a major consideration for local governments when deciding policies regarding the STR market. Similar to the special interest groups, two sides also exist when thinking about the public interest. Increased tourism and tax revenues provide significant economic benefits to cities—and their citizens (FTC, 2015). A strong argument that STRs promote the public interest can be made due to this boost in local economies. Also, 48 percent of income hosts that use Airbnb claim that the supplemental revenue from listing their home as a STR helps pay for rent and food. In addition, 53 percent of hosts admit that this income has helped them keep their house (FTC, 2015). Due to the revenue opportunities for hosts, policymakers consider public interest and the advantages that come with the STR market.

Although the STR market can provide meaningful additional revenue through increased tourism and taxes in addition to income opportunities for hosts, local governments consider public interest in regulation because STRs "can also disrupt the market for affordable housing and create serious consumer safety hazards" (Katz, 2015, p. 1084). Local governments examine public interest in policy-decisions related to short-term rentals because of the significant impact the market can have on consumers, producers, and the city's environment through externalities. Safety is a top priority for all local governments, so public interest has played a large role in

attempting to ensure that proper regulations exist to provide a safe environment for all parties involved. Therefore, public interest promoting further regulation exists when policymakers try to correct externalities related to short-term rentals.

Local policymakers face the challenge of looking at both special interest groups and public interest. Since each city is different, there is not a uniform answer as to what cities should consider more when considering regulations. Public interest should always remain at the forefront of policymakers' decisions; however, this does not always happen because of special interest groups' influence in the decision-making process. The power of both special interest groups and public interest associated with the STR market helps explain the variation in regulations in cities across the country.

There are many benefits and costs associated with the short-term rental market. While opportunities exist by affording consumers unique living experiences, prices often less expensive relative to hotels, and providing property owners with a supplemental source of revenue, negative costs exist such as "super hosts" owning a significant stake of the STR market, a rise in home prices, poor consumer behavior and disregard for their surrounding environment, and gentrification.

III - R Street Institute: Roomscore Study Discussion

Although few in-depth studies regarding short-term rentals have occurred due to the recent significant growth in the market resulting in a lack of data, one primary study helped provide a baseline to expand upon. The R Street Institute, a nonprofit and nonpartisan organization that primarily studies public policy issues, published Ridescore, which observes problems associated with city and state regulation of the ride sharing market, in 2015. In March 2016, the organization completed Roomscore, a similar study focused on short-term rental market regulations (Moylan, 2016).

Roomscore examines how growth has led to many regulatory questions. Although room sharing has existed for many years, the introduction of the internet, specifically the mobile app market, has led to a much greater accessibility to information regarding room sharing, making the market significantly and rapidly grow. Homeowners can now post spare bedrooms and/or houses, described as "trapped capital," within a matter of seconds, allowing for the short-term rental market to grow substantially. With this change in how people can rent housing came the emergence of several companies—particularly Airbnb—hoping to profit from it. As this market has grown and these groups have encouraged more people to rent out their idle rooms or residential properties, it has become increasingly complex, which encourages lawmakers to take new steps to regulate it. The rapid speed of growth in the industry has caused regulatory responses to lag behind, and now legislators have to catch up.

R Street examined legal and regulatory frameworks within 59 large cities throughout the United States to quantify the degree of friendliness towards short-term rentals in each city in a Roomscore index. The lack of availability of data proved a major hurdle for the study. Thoroughly investigating publicly available information, the researchers found themselves

unable to complete their study with only the data they had. To fill gaps from missing data and

information, Moylan and his team of associates conducted interviews with relevant parties such

as local regulators and lodging hosts.

The final Roomscore index represent the degree of friendliness each city exhibits toward

the short-term rental market. The maximum score is 100, and higher scores illustrate greater

levels of friendliness. This overall score represents the aggregate of five sub scores, each of

which serves as a distinct measure of friendliness (Table 1). Prior to any sub score point addition

or deduction, each city began with a base score of 90. Tailored legal framework was the only

possible positive increase to the base score, while the other four regulation categories acted as

penalties to the overall friendliness for each city.

Table 1

Roomscore Index Calculation

Measure of City Friendliness Toward STRs - (Base Score = 90)		
Regulation Issue/Category	*Question*	*Point Structure*
Tailored legal framework indicates the relative strength and clarity of the legal foundation with respect to the short-term rental market	Does the city have a tailored legal framework for short- term-rental regulation?	**0 to +10** (0 suggesting a city has no tailored legal framework and +10 implying that a city has a modern legal foundation that specifically and explicitly discusses STRs)
Legal restrictions relates to the various restrictions imposed on property owners to limit their engagement in the STR market	What, if any, legal restrictions are in place to curb short-term rentals?	**0 to –40** suggesting that STRs are completely illegal and 0 implying that there are no legal restrictions on STRs)
Tax-collection obligations identifies what party involved in STRs is tasked with collecting relevant taxes (and the degree of the tax)	What tax-collection obligations are placed on short-term rental services?	**0 to -5** (-5 suggesting either disproportionate taxes relative to hotel taxes or ill-fitting tax collection for the business model and 0 implying the appropriate amount of tax collection)
Licensing requirements measures the extent and expense of barriers to entry for property owners to begin renting in the STR market	How burdensome and expensive is the city's licensing regime for short-term rentals?	**0 to -10** (-10 suggesting many repetitive, difficult, or expensive licensing hurdles and 0 implying minimal licensing requirements)
Hostile enforcement relates to additional challenges and restrictions imposed on STRs while operating that the other questions do not capture	How hostile is the city's enforcement regime for short-term rentals, including restrictions that do not fit neatly into prior categories?	**0 to -10** (-10 suggesting severe operational or additional restrictions and 0 implying few, if any, additional restrictions)

The tailored legal framework category was the first issue of interest used to build the index. This category measured the strength and clarity of existing legal foundations with respect to the short-term rental market. Cities could receive a maximum of 10 points in this category that were added to the base score of 90 (Table 2). Researchers began measuring this parameter by answering "how forward-looking the city is with regard to contemplating disruptive innovation in lodging" (Moylan, 2016, p. 6). New, updated legislation that specifically identifies and addresses room sharing represents strong tailored legal framework. Any city whose guidelines do not specifically discuss room sharing—including single rooms and whole homes—did not receive the full set of 10 positive points, and they experienced varying reductions in the sub score depending on the quality of the legal framework. Additionally, city adoption of strong frameworks signifies proactive legislative bodies that work to stay ahead of new and growing industries such as the STR market.

Table 2

Legal Framework (0 to +10)

City	Points	City	Points	City	Points
Albuquerque, N.M.	0	Fresno, Calif.	0	Oakland, Calif.	+3
Atlanta	0	Galveston, Texas	+10	Oklahoma City	0
Asheville, N.C.	+5	Houston	0	Omaha, Neb.	0
Anaheim, Calif.	+10	Indianapolis	0	Orlando, Fla.	0
Austin, Texas	+10	Jackson Hole, Wyo.	0	Philadelphia	+10
Baltimore	0	Jacksonville, Fla.	0	Phoenix	0
Boston	0	Kansas City, Mo.	0	Portland, Ore.	+10
Boulder, Colo.	+10	Las Vegas	+3	Raleigh, N.C.	0
Charleston, S.C.	+5	Long Beach, Calif.	0	Sacramento, Calif.	+10
Charlotte, N.C.	0	Los Angeles	0	San Antonio	0
Chicago	+3	Louisville, Ky.	+10	San Diego	+5
Cleveland	0	Maui County, Hawaii	+10	San Francisco	+10
Colorado Springs, Colo.	0	Memphis, Tenn.	0	San Jose, Calif.	+11
Columbus, Ohio	0	Mesa, Ariz.	0	Santa Barbara, Calif.	0
Dallas	0	Miami	0	Savannah, Ga.	+10
Denver	0	Milwaukee	0	Seattle	+5
Detroit	0	Minneapolis	0	Tucson, Ariz.	0
El Paso, Texas	0	Nashville, Tenn.	+10	Virginia Beach, Va.	0
Fort Lauderdale, Fla.	+10	New Orleans	0	Washington	0
Fort Worth	0	New York	0	**AVERAGE**	**+2.9**

Overall, the legal framework data represented a delayed regulation adoption process that left many of the studied cities with poor scores in this category due to little to no stated policies regarding room sharing. R Street's collected data found that only 21 cities had any framework recognizing the market and supplying a basis for short-term rentals to operate.

Of the 21 cities that received any points in the category, 14 received the full 10-point credit. The wide range of scores across the 59 cities and the low average score of +2.9 could potentially demonstrate that further efforts need to take place regarding the clarity of legal frameworks for STR regulation across the majority of the country.

The second question pertains to legal restrictions. Moylan describes the purpose of this question as "seek[ing] to assess the restrictions cities place on the ability of property owners to engage in short-term rentals" (Moylan, 2016, p. 4). A significant amount of variability in responses to this question exists, for cities have vastly different restrictions on various elements, including geography, duration, zoning, and the proximity of the owner to the premises. Instead of the 10 points awarded in legal frameworks, the legal restrictions analysis could deduct up to 40 points from the base score (according to the gravity of the regulations), with cities that have no restriction receiving no deduction at all (Table 3).

Table 3

Legal Restrictions (0 to -40)

City	Points	City	Points	City	Points
Albuquerque, N.M.	0	Fresno, Calif.	-35	Oakland, Calif.	0
Atlanta	-40	Galveston, Texas	0	Oklahoma City	-40
Asheville, N.C.	-25	Houston	-20	Omaha, Neb.	0
Anaheim, Calif.	0	Indianapolis	0	Orlando, Fla.	0
Austin, Texas	-25	Jackson Hole, Wyo.	-30	Philadelphia	-10
Baltimore	-25	Jacksonville, Fla.	-35	Phoenix	0
Boston	-15	Kansas City, Mo.	-35	Portland, Ore.	-20
Boulder, Colo.	-30	Las Vegas	0	Raleigh, N.C.	-30
Charleston, S.C.	-25	Long Beach, Calif.	-15	Sacramento, Calif.	-25
Charlotte, N.C.	0	Los Angeles	-35	San Antonio	0
Chicago	-10	Louisville, Ky.	0	San Diego	0
Cleveland	0	Maui County, Hawaii	-15	San Francisco	-10
Colorado Springs, Colo.	0	Memphis, Tenn.	-25	San Jose, Calif.	-10
Columbus, Ohio	0	Mesa, Ariz.	0	Santa Barbara, Calif.	-35
Dallas	0	Miami	-20	Savannah, Ga.	0
Denver	-40	Milwaukee	0	Seattle	0
Detroit	0	Minneapolis	0	Tucson, Ariz.	0
El Paso, Texas	0	Nashville, Tenn.	-10	Virginia Beach, Va.	0
Fort Lauderdale, Fla.	0	New Orleans	-35	Washington	-10
Fort Worth	-30	New York	-20	**AVERAGE**	**-13.3**

With 32 of the 59 cities including some form of restriction regarding the short-term rental market, the results regarding legal restrictions covered a wide range.

Atlanta, Denver, and Oklahoma City completely ban any participation in the short-term rental market. Other cities with scores of -35 make it a severe challenge and limit participation in this market. Various cities with lower scores have more modest or no regulations. With an average score of -13.3, this category indicates wide variation in the regulation of short-term rentals.

Taxation of the short-term rental market has become a major topic of discussion due to taxes imposed on hotels. The third question identified which party in STR transactions was tasked with collecting all applicable state and local taxes (if any exist). This category was a penalty on the overall friendliness Roomscore with a maximum deduction of five points from the base score. The two most prominent measures of this category were disproportionate taxes on

STRs relative to hotels and ill-fitting collection procedures based on the relevant business model. Ill-fitting tax collection captures a unique attribute of tax policies (Table 4). For example, free STR listing platforms such as Craigslist lack information on whether or not a rental transaction set up on the site actually occurred. In addition, if the transaction occurs, Craigslist never acts as a financial intermediary, and it would prove inefficient and illogical to task these platformscollecting all relevant taxes.collecting all relevant taxes.

Table 4

Tax Collection (0 to -5)

City	Points	City	Points	City	Points
Albuquerque, N.M.	0	Fresno, Calif.	0	Oakland, Calif.	-5
Atlanta	0	Galveston, Texas	-2	Oklahoma City	0
Asheville, N.C.	0	Houston	0	Omaha, Neb.	0
Anaheim, Calif.	0	Indianapolis	0	Orlando, Fla.	-2
Austin, Texas	0	Jackson Hole, Wyo.	0	Philadelphia	0
Baltimore	0	Jacksonville, Fla.	0	Phoenix	0
Boston	0	Kansas City, Mo.	0	Portland, Ore.	-5
Boulder, Colo.	0	Las Vegas	0	Raleigh, N.C.	0
Charleston, S.C.	0	Long Beach, Calif.	0	Sacramento, Calif.	0
Charlotte, N.C.	0	Los Angeles	0	San Antonio	0
Chicago	0	Louisville, Ky.	0	San Diego	0
Cleveland	0	Maui County, Hawaii	0	San Francisco	-5
Colorado Springs, Colo.	0	Memphis, Tenn.	0	San Jose, Calif.	0
Columbus, Ohio	0	Mesa, Ariz.	0	Santa Barbara, Calif.	0
Dallas	0	Miami	0	Savannah, Ga.	0
Denver	0	Milwaukee	0	Seattle	0
Detroit	0	Minneapolis	0	Tucson, Ariz.	0
El Paso, Texas	0	Nashville, Tenn.	0	Virginia Beach, Va.	0
Fort Lauderdale, Fla.	0	New Orleans	0	Washington	0
Fort Worth	0	New York	0	**AVERAGE**	**-0.3**

These sub scores reflect the judgement that nearly all cities set appropriate tax rates and collect from reasonable parties, or that nearly all cities do not collect any taxes on STRs. Only five of the 59 cities (Galveston, Oakland, Orlando, Portland, and San Francisco) were penalized for poor tax collection. Therefore, this parameter has little negative effect on the overall friendliness scores for 91.5 percent of cities. Moylan and his colleagues predict that as more cities impose STR-specific taxes in the future, policymakers will need improve collection

efficiency. Efficient practices will depend on the types of platforms operating in each city and existing hotel taxes.

The fourth question relates to licensing requirements and their impact on short-term rentals. This question measures potential hurdles associated with required registration and licensing for an individual to begin hosting in the STR market. Cities with long wait-times to receive licenses or approvals, large fees, or overall restrictive licensing requirements receive deductions up to 10 points in this category (Table 5).

Table 5

Licensing Requirements (0 to -10)

City	Points	City	Points	City	Points
Albuquerque, N.M.	-2	Fresno, Calif.	0	Oakland, Calif.	-8
Atlanta	0	Galveston, Texas	0	Oklahoma City	0
Asheville, N.C.	0	Houston	0	Omaha, Neb.	0
Anaheim, Calif.	-5	Indianapolis	0	Orlando, Fla.	-4
Austin, Texas	-7	Jackson Hole, Wyo.	0	Philadelphia	-5
Baltimore	0	Jacksonville, Fla.	0	Phoenix	0
Boston	-7	Kansas City, Mo.	0	Portland, Ore.	-4
Boulder, Colo.	-1	Las Vegas	-10	Raleigh, N.C.	0
Charleston, S.C.	0	Long Beach, Calif.	-9	Sacramento, Calif.	-1
Charlotte, N.C.	0	Los Angeles	0	San Antonio	0
Chicago	-5	Louisville, Ky.	0	San Diego	-3
Cleveland	0	Maui County, Hawaii	-5	San Francisco	-7
Colorado Springs, Colo.	-5	Memphis, Tenn.	0	San Jose, Calif.	0
Columbus, Ohio	0	Mesa, Ariz.	0	Santa Barbara, Calif.	0
Dallas	0	Miami	-2	Savannah, Ga.	-2
Denver	0	Milwaukee	0	Seattle	-5
Detroit	0	Minneapolis	0	Tucson, Ariz.	-5
El Paso, Texas	0	Nashville, Tenn.	-3	Virginia Beach, Va.	-4
Fort Lauderdale, Fla.	-10	New Orleans	0	Washington	-1
Fort Worth	-2	New York	0	**AVERAGE**	**-2.0**

With an average point deduction of just -2.0, the data revealed that licensing did not play a large factor in the overall index scores. Although, 25 cities experienced some form of deduction, more than half of cities do not impose significant licensing hurdles.

Fort Lauderdale and Las Vegas experienced the maximum deduction amount (-10 points) due to their various restrictions to achieving a license in the short-term rental market. Fort Lauderdale, for example, requires property owners to "complete seven forms and pay more than

$2,900 in associated fees" over the course of five years (Moylan, 2016, p. 9). Other cities such as Washington require minimal costs and forms, so they earned deductions as low as –1.

The fifth and final question captures hostile enforcement of STRs that make continued operations in this market more challenging. Specifically, this category consists of "unnecessarily burdensome inspection regimes, disproportionately high insurance requirements, restrictive occupancy limits, mandates to provide vehicle parking spaces, and prescriptive regulation of a host's location and/or accessibility" (Moylan, 2016, p. 5). Cities received deductions according to the challenges and severity of these hostile rules with a maximum deduction of 10 points from the base score. These restrictions create problems for the short-term rental market that the previous four questions could not capture (Table 6).

Table 6

Hostile Enforcement (0 to - 10)					
City	*Points*	*City*	*Points*	*City*	*Points*
Albuquerque, N.M.	-1	Fresno, Calif.	-1	Oakland, Calif.	0
Atlanta	0	Galveston, Texas	-1	Oklahoma City	0
Asheville, N.C.	-7	Houston	-5	Omaha, Neb.	0
Anaheim, Calif.	-10	Indianapolis	0	Orlando, Fla.	0
Austin, Texas	-5	Jackson Hole, Wyo.	0	Philadelphia	-5
Baltimore	-5	Jacksonville, Fla.	0	Phoenix	0
Boston	-6	Kansas City, Mo.	0	Portland, Ore.	-3
Boulder, Colo.	0	Las Vegas	-10	Raleigh, N.C.	0
Charleston, S.C.	0	Long Beach, Calif.	-3	Sacramento, Calif.	-5
Charlotte, N.C.	-3	Los Angeles	0	San Antonio	0
Chicago	-8	Louisville, Ky.	-7	San Diego	0
Cleveland	0	Maui County, Hawaii	-10	San Francisco	-10
Colorado Springs, Colo.	-1	Memphis, Tenn.	0	San Jose, Calif.	-5
Columbus, Ohio	0	Mesa, Ariz.	0	Santa Barbara, Calif.	0
Dallas	0	Miami	0	Savannah, Ga.	-1
Denver	0	Milwaukee	0	Seattle	-3
Detroit	0	Minneapolis	-5	Tucson, Ariz.	0
El Paso, Texas	0	Nashville, Tenn.	-5	Virginia Beach, Va.	0
Fort Lauderdale, Fla.	-10	New Orleans	0	Washington	-5
Fort Worth	0	New York	-8	**AVERAGE**	**-2.5**

Overall, 28 total cities received deductions because of their hostile outside rules, and the 59 cities had an average score of -2.5. While nearly half of the cities received varying levels of deductions, the fairly low overall average demonstrated relatively mild hostile enforcement.

Anaheim, Fort Lauderdale, Las Vegas, Maui County, and San Francisco all received the maximum deduction of -10. Fort Lauderdale, for example, "limits occupancy, requires both initial and ongoing annual property inspections, enforces minimum parking requirements and mandates that an owner or manager reside within 25 miles of a rented property" (Moylan, 2016, p. 9).

After measuring each category and assigning the appropriate sub score to all five parameters for each city, these sub scores were added/subtracted from the base score of 90 to calculate each city's Roomscore. The Roomscore denotes a city's overall friendliness toward the short-term rental market based on the R Street index parameters. A higher (lower) score represents less (more) STR regulation. Letter grades were also assigned to overall Roomscores in order to help with grouping and increase result clarity (Appendix Figure 1).

The average score of 74.7, a C, involved the deduction of 15.3 total points. The standard deviation of 14.3 demonstrates that there exists a large variation in the scores of the cities. Therefore, 39 cities fall within a range of 60.4 and 89.0 (range of D- to B+). The vast differences in how each city approaches the regulation of the short-term rental market, as this figure displays, stem in part from the recency of the market's growth.

The cities with the highest score of 97—Galveston and Savannah—have enacted no significant regulations against short-term rentals. Galveston, for instance, lost three points and gained ten only because it requires property managers to stay within a one-hour drive of the currently rented home and had a tax collection deduction.

Eleven cities—Cleveland, Columbus, Dallas, Detroit, El Paso, Indianapolis, Mesa, Milwaukee, Omaha, Phoenix, and San Antonio, had a score of 90, the base score. These cities

had no regulations that aided or hindered the short-term rental market and thus neither received

nor lost any points.

Washington DC, as well as Charleston, Chicago, Las Vegas, and Maui, had a score close

to the average for all of the cities studied. With no tailored legal framework, a limit on the

number of bedrooms per rental, and a few other minor restrictions, Washington, with a score of

74, has no laws in place to help protect people who wish to rent their property short-term and has

minor restrictions that inconvenience property managers without prohibiting them from renting

their rooms.

The ten cities with scores lower than 59 (where < 60 equates to an F)—Atlanta, Denver,

Fort Worth, Fresno, Jacksonville, Kansas City, Los Angeles, New Orleans, Oklahoma City, and

Santa Barbara—either completely ban short-term rentals or make them virtually impossible for

property managers (Table 7).

Table 7

Highest 15 and Lowest 15 Overall City Scores

15 Highest Scoring Cities	Scores	Letter Grade	15 Lowest Scoring Cities	Scores	Letter Grade
Galveston, Texas	97	A+	Atlanta	50	F
Savannah, Ga.	97	A+	Denver	50	F
Louisville, Ky.	93	A	Oklahoma City	50	F
San Diego	92	A	Fresno, Calif.	54	F
Cleveland	90	A	Jacksonville, Fla.	55	F
Columbus, Ohio	90	A	Kansas City, Mo.	55	F
Dallas	90	A	Los Angeles	55	F
Detroit	90	A	New Orleans	55	F
El Paso, Texas	90	A	Santa Barbara, Calif.	55	F
Indianapolis	90	A	Fort Worth	58	F
Mesa, Ariz.	90	A	Baltimore	60	D
Milwaukee	90	A	Jackson Hole, Wyo.	60	D
Omaha, Neb.	90	A	Raleigh, N.C.	60	D
Phoenix	90	A	Boston	62	D
San Antonio	90	A	New York	62	D
			OVERALL 59 CITY AVG.	**74.7**	**C**

The variations in restrictions on short-term rentals among different cities do not follow

any easily explained trends according to the study completed by Moylan. Political leanings

among cities made no discernible difference in their scores. Additionally, tourism had little effect

on the cities' and states' openness to short-term rentals. Jackson Hole had a score of 60 in

comparison to Savannah's score of 97. This lack of systematic influence in how cities regulate

the short-term rental market provided a strong motivation for building regression equations to

better understand and explain this variation.

IV – Model & Data

To fill gaps in existing research examining factors that explain differences in city-level short-term rental market regulatory decisions, we expanded R Street's research to determine patterns between R Street's calculated scores and measurable economic indicators. There is a current lack of understanding why some cities implement strict STR regulations and others allow unregulated operations (Moylan, 2016).

Our empirical study consisted of six cross-sectional linear regression models with R Street's overall friendliness scores and the five sub scores as dependent variables. Each estimated equation was designed to explain one of these scores. Additionally, all regressions included five explanatory variables: median household income, local sales tax rate, policy preferences, median age, and median value of owner-occupied homes. Assembled, our general form model follows:

$$Score_i = \beta_0 + \beta_1 (T) + \beta_2 (PP) + \beta_3 (A) + \beta_3 (I) - \beta_4 (V) + e_i$$

$Score_i$: R Street Regulatory Score

- $Score_1$: Roomscore (Overall Friendliness Score)
- $Score_2$: Legal Framework
- $Score_3$: Hostile Enforcement
- $Score_4$: Tax Collection
- $Score_5$: Licensing Requirements
- $Score_6$: Legal Restrictions

Explanatory Variables:

- T: Local Sales Tax Rate
- PP: Policy Preferences
- A: Median Age
- I: Median Household Income
- V: Owner-Occupied Median Home Value

Our model used data from 35 of the same cities in R Street's Roomscore study (Appendix

Figure 2). In view of the short-term rental market's recent popularity growth and subsequent

passing of city regulations, we collected the most recent data on all explanatory variables. U.S.

Decennial Census reports contain the most extensive economic data, but the STR market and

regulatory policies have significantly changed since the last report from 2010. Although less

extensive, 2018 Census estimates include recent changes in city-level economic indicators that

may have influenced city regulations. These 2018 estimates limited our sample size to 35 cities

instead of the 59 from R Street's study because our indicators of interest were not yet estimated

for every city. Additionally, the Census Bureau was transitioning its data to a new platform

during our data collection, which limited access to the data set as it was updated.

Local sales tax rates (T) target the same group of people that reserve STRs during out-of-

town trips because they often also choose to spend more money in restaurants and shop in local

stores than residents of the respective city (The Tax Foundation, 2019). Cities with higher sales

tax rates rely on these travelers for tax revenue, and STRs expand the supply of lodging

accommodations and indirectly increase sales tax revenue (Airbnb, 2015). Therefore, we expect

these cities to receive a higher overall friendliness score because such regulations would limit

STR activity and consequently revenue from traveler spending.

Policy preferences (PP) may show meaningful importance in a city's decision of whether

or not to regulate the short-term rental market (Tausanovitch & Warshaw, 2014). The overall

policy preferences of a city represents the opinions of both voters and the policymakers that

these voters selected as their representatives. The policy preferences variable has a ranking on a

scale of -1 to +1. A score of -1 indicates the most liberal views, while a score of +1 describes the

most conservative preference—with a score of 0 representing no policy preference.

Conservatives traditionally prefer less government intervention and less regulations; therefore, we predict that a higher policy preference score will indicate a higher overall friendliness score.

Median age (A) can show the dynamic of a city's STR supply (U.S. Census Bureau, 2018). The average age of an Airbnb host is over 50 years old, and we expect a positive relationship between median age and less STR regulations (Muthara, 2018). Since the average age of a host is older than 50, then cities with a higher median age will likely include more Airbnb listings; therefore, public interest and special interest groups within the locality will more likely encourage less regulation because of their reliance on the STR market as a source of supplemental income. Therefore, we predict higher friendliness scores in cities with higher median ages.

Median household income (I) helps frame an understanding of residents' potential spending behaviors (U.S. Census Bureau, 2018). The level of median income determines the effect that additional revenue from renting out extra living space has on households. Therefore, we anticipate cities with higher median incomes to have fewer households utilizing STR platforms to increase their incomes. In cities where fewer households list on sites like Airbnb, we predict higher overall friendliness scores. Voters and legislators in these cities are less likely to view the smaller number of STRs as a problem or a large source of tax revenue.

Median value of owner-occupied houses (V) provides information regarding the value of homes in a city (U.S. Census Bureau, 2018). We expect that a higher value for houses may inspire full-time residents in a city to push policymakers to implement strict STR market regulations in order to maintain privacy and safety in their neighborhoods. We predict these cities will encourage policies that attempt to prevent negative externalities such as damage to homes and noise complaints, leading to lower STR friendliness scores.

V - Results and Discussion

Our model results align with the variability Moylan (2016) observed across city-level

short-term rental market regulation decisions. The six regressions show limited statistically

significant estimated coefficients, reflecting relatively low explanatory power of the model.

However, median household income, local sales tax rates, and policy preferences explain the

most variation in our estimated equations.

Table 8

Descriptive Statistics

Variable	Units	Mean	Std Dev	Minumum	Maximum
Overall Friendliness Score (Score$_1$)	25 to +100 Points	75.29	14.54	50.00	93.00
Legal Framework (Score$_2$)	0 to +10 Points	2.74	4.22	0.00	10.00
Hostile Enforcement (Score$_3$)	0 to -10 Points	-2.71	3.25	-10.00	0.00
Tax Collection (Score$_4$)	0 to -5 Points	-0.29	1.18	-5.00	0.00
Licensing Requirements (Score$_5$)	0 to -10 Points	-1.89	2.79	-10.00	0.00
Legal Restrictions (Score$_6$)	0 to -40 Points	-12.57	14.00	-40.00	0.00
Local Sales Tax Rate (T)	Percent (%)	2.03	1.47	0.00	5.41
Policy Preferences (PP)	-1 to +1 Scale	-0.30	0.33	-1.00	0.41
Median Age (A)	Years	34.75	1.85	31.50	38.30
Median Household Income (I)	Dollars	59,746	17,917	31,283	113,036
Owner-Occupied Med. Home Value (V)	Dollars	330,460	261,737	51,600	1,195,700

No. Observations: 35

Table 8 presents descriptive statistics of our variables. Examining this simple summary

provides preliminary measures of variable behaviors. Adding and subtracting one standard

deviation from the mean overall Roomscore index reveals that 68 percent of cities in our sample

received overall friendliness scores between 60.74 and 89.82 out of 100 possible. Given that

higher Roomscores indicate cities are friendlier toward STRs and impose less regulation, a range

of 43 points and a mean of 75.29 indicates fairly large variation in the amount of regulation cities

choose to impose on short-term rentals. Denver and Oklahoma City both earned the lowest score

of 50. Louisville received the highest score of 93.

Based on the overall friendliness index calculation with a minimum earnable score equal to 25 and a maximum of 100, the lowest scores, rather than the highest, appear as the more extreme outliers. This illustrates that the most restrictive cities take more significant stances on STRs relative to the cities with the least regulations. It is also necessary to understand that this result may occur due to the index beginning with a base score of 90 points that puts upward pressure on the mean. Along with this, it is more difficult to implement regulations than to allow STRs to operate unregulated. This may capture the effect of local representatives choosing to regulate because they feel the need to take a strong stance in order to justify the governmental process.

Also displayed in Table 8, the sub score descriptive statistics present significant variability across cities within the sample. Median household income has a range of $81,753, showing meaningful differences in income between some of the cities in our sample. This range offers insight into the different income levels across the model. Similarly, the median value of owner-occupied houses, adding and subtracting one standard deviation from the mean, exhibits that 68 percent of cities had home values between $592,197 and $68,723. The variability within one standard deviation of our data provides insight into the values of different houses potentially available in the STR market of a city.

Sales tax indicates less variability between cities with a maximum of 5.41 percent, a minimum of 0 percent, and a mean of 2.03 percent. However, the contrast between a 5.41 percent sales tax and a 0 percent sales taxes may affect policymakers' decision-making process regarding the STR rental market because of the different sales tax revenue potential across cities. The median age for the cities in our sample also shows less variability in comparison to the other sub score variables. The standard deviation reveals that 68 percent of the cities have median ages

between 36.6 and 32.9, which illustrates a small—although not negligible—variability in median ages across these cities. While unsurprising because people tend to move out of cities as they age, the median age of everyone living in the cities in our sample, three years younger than the United States median age, could explain why the median policy preference of -0.297 leans more liberal (U.S. Census, 2018). Younger individuals typically align with more liberal policies, with nearly 46 percent of 34 year-olds classifying themselves as Democrats or left-leaning; however, as people age, this percentage drops (Gallup, 2014).

The correlations between legal framework and tax collection, licensing requirements, and hostile enforcement are -0.430, -0.434, and -0.555, all statistically significant. When cities strengthen their legal frameworks, these correlations signal that cities typically clarify their legal codes to enforce increased regulation rather than to promote the short-term rental market (Table 9).

Table 9

Simple Correlation Coefficients

Variable	$Score_1$	$Score_2$	$Score_3$	$Score_4$	$Score_5$	$Score_6$	T	PP	A	I	V
$Score_1$	1.000										
$Score_2$	0.085 [0.629]	1.000									
$Score_3$	0.172 [0.324]	-0.555 [<0.001]	1.000								
$Score_4$	0.125 [0.474]	-0.430 [0.010]	0.291 [0.090]	1.000							
$Score_5$	0.090 [0.474]	-0.434 [0.009]	0.589 [<0.001]	0.323 [0.058]	1.000						
$Score_6$	0.945 [<0.001]	0.038 [0.827]	-0.029 [0.870]	0.043 [0.805]	-0.139 [0.427]	1.000					
T	-0.126 [0.472]	-0.200 [0.249]	0.078 [0.655]	0.239 [0.167]	0.044 [0.801]	-0.117 [0.502]	1.000				
PP	0.126 [0.470]	-0.294 [0.087]	0.440 [0.008]	0.382 [0.023]	0.408 [0.015]	0.004 [0.982]	0.060 [0.730]	1.000			
A	-0.010 [0.954]	0.431 [0.010]	-0.488 [0.003]	-0.432 [0.010]	-0.234 [0.176]	0.056 [0.748]	0.075 [0.667]	-0.187 [0.282]	1.000		
I	-0.099 [0.574]	0.545 [<0.001]	-0.416 [0.013]	-0.460 [0.005]	-0.342 [0.045]	-0.063 [0.719]	0.100 [0.568]	-0.413 [0.014]	0.415 [0.013]	1.000	
V	-0.161 [0.356]	0.440 [0.008]	-0.435 [0.009]	-0.470 [0.004]	-0.344 [0.043]	-0.090 [0.606]	0.109 [0.532]	-0.550 [<0.001]	0.445 [0.007]	0.928 [<0.001]	1.000

No. Observations: 35
Standard errors are reported in brackets.

Turning from correlation to multiple regression analysis, we began by investigating the overall friendliness score. In reporting statistical significance, we adopted the following convention: "marginally statistically significant" for p-values between 0.05 and 0.10, "statistically significant" for p-values between 0.01 and 0.05, and "highly statistically significant" for p-values less than 0.01.

Regression 1: (Table 10) & (Score[1])

Table 10 presents the estimated results from the regression with the overall friendliness index score (Score[1]) as the dependent variable. Higher (lower) overall scores represent less (more) regulations based on aggregating the five sub scores. This regression lacks statistical significance overall and in coefficient estimations, but it highlights the unpredictability of overall STR regulatory decisions across cities. Segmenting this friendliness index into the five sub scores and inputting them into our model as dependent variables resulted in stronger estimates and overall fit.

Table 10

Regression Results: Overall Roomscore

Dependent Variable: Score$_1$				
R^2		0.06		
Adj. R^2		-0.10		
$Pr > F$		0.860		
Variable	Description	β Coefficients	Std. Error	$Pr > |t|$
Intercept		48.88	56.24	0.392
T	Local Sales Tax	-1.12	1.81	0.542
PP	Political Pref.	0.87	10.28	0.933
A	Median Age	0.61	1.58	0.702
I	Median Income	0.26	0.09	0.500
V	O-O Median Home Value	0.02	0.03	0.390

No. Observations: 35

*, **, *** indicates significance at the 90%, 95%, and 99% level, respectively

Regression 2: (Table 11) & (Score[2])

Statistically significant variables (holding other things equal):

- A 1 percent increase in sales tax rates for a city was associated with a 0.66 point decrease in the legal framework score
- A 1-year increase in the median age was associated with a 0.71 point increase in the legal framework score
- A $1,000 increase in median income was associated with a 0.26 increase in the legal framework score
- A $10,000 increase in the owner-occupied median home value was associated with a 0.10 decrease in the legal framework score

These regression results suggest that sales tax, median age, median income, and median value of owner-occupied houses affect the legal framework score calculated by R Street. These estimates indicate that cities with lower sales taxes, older populations, higher incomes, and lower owner-occupied housing prices tend to implement clearer laws regarding short-term rentals. The primary goal of higher sales taxes revolves around raising government revenue without having to increase involuntary taxes on city residents. Cities that experience high tourism activity generally have higher sales taxes because they increase tax revenue with few negative effects on the people living and working in these cities (Povich, 2015). Cities with high volumes of vacationers require hotels or other short-term living spaces for these visitors, and companies such as Airbnb offer alternatives to hotels. The estimated negative relationship between sales taxes and clearer short-term rental legal framework confirms our hypothesis. Additionally, this provides additional evidence that cities with high tourism rates choose not to pass laws that explicitly target STR market activity because these would reduce tourism and consequently tax revenue.

Higher owner-occupied home values, on the other hand, have a clearer association with strong legal frameworks. Legislators concern themselves with both maintaining home affordability without stifling growth and mitigating possible negative externalities associated with the short-term rental market (Sheppard & Udell, 2018). These points of focus make setting

political agendas and designing policies more difficult, but our results in this section suggest that policymakers take firm stances on short-term rentals in cities with higher owner-occupied home prices. This indicates that these cities do not want to risk new rental platforms like Airbnb causing significant changes in home values if they did not update vague or outdated laws.

Overall, our results explain what influences cities to pass updated laws pertaining to the short-term rental market, although we could not identify why some of our variables have significant influences on this measure.

Table 11

Regression Results: Legal Framework

	Dependent Variable: $Score_2$			
R^2	0.49			
Adj. R^2	0.40			
$Pr > F$	0.001			
Variable	*Description*	*β Coefficients*	*Std. Error*	*Pr > |t|*
Intercept		-32.78	12.02	0.011
T	Local Sales Tax	-0.39	*0.39	0.097
PP	Political Pref.	-2.81	2.20	0.211
A	Median Age	0.71	**0.34	0.045
I	Median Income	0.26	***0.08	0.005
V	O-O Median Home Value	-0.01	*< 0.01	0.054

No. Observations: 35

*, **, *** indicates significance at the 90%, 95%, and 99% level, respectively

Regression 3: (Table 12) & ($Score_3$)

Statistically significant variables (holding other things equal):

- An increase of 0.1 on the policy preference scale was associated with a 0.35 increase in the hostile enforcement penalty
- An increase of 1 year in the median age was associated with a 0.69 decrease in the hostile enforcement penalty

These regression results suggest that policy preferences and median age affect R Street's hostile enforcement score. City policy preferences and median age both had statistically significant relationships with rises in R Street's hostile enforcement penalty. Political preferences explain the score variations across cities well compared to other variables in this regression. We

anticipated that more conservative cities would impose less strict policies, and this model

strongly supports our prediction. However, median age had the opposite association than we

expected. Although small, this model shows that as median ages rise, the score penalty for

hostile enforcement increases.

Table 12

Regression Results: Hostile Enforcement				
Dependent Variable: $Score_3$				
R^2		0.39		
Adj. R^2		0.29		
$Pr > F$		0.010		
Variable	*Description*	*β Coefficients*	*Std. Error*	*Pr > |t|*
Intercept		24.57	10.12	0.022
T	Local Sales Tax	0.21	0.33	0.525
PP	Political Pref.	3.50	*1.85	0.069
A	Median Age	-0.69	**0.28	0.021
I	Median Income	-.06	0.07	0.432
V	O-O Median Home Value	<0.01	0.01	0.625

No. Observations: 35

*, **, *** indicates significance at the 90%, 95%, and 99% level, respectively

Regression 4: (Table 13) & (Score4)

Statistically significant variables (holding other things equal):

- A 1 percent increase in the sales tax rate was associated with a 0.22 point increase in the tax collection penalty

- A-year increase in the median age was associated with a 0.19 decrease in the tax collection penalty

These regression results suggest that sales tax and median age affect the tax collection

score that R Street calculated. Hotels face specific lodging taxes, and many cities have imposed

similar tax structures on short-term rental transactions. Hotel companies lobbying that Airbnb

rentals should also pay the often-significant lodging taxes have largely driven the introduction of

these policies (Moylan, 2016).

We found that cities with higher local sales taxes and younger populations tend to pass

legislation that applies either the full lodging tax or a similar tax to short-term rental transactions.

We expected high sales taxes to explain which cities invoke specific rental tax laws because both policies focus on tourists in order to raise government revenue. If a city charges high sales taxes, they also tend to charge an explicit short-term rental tax. A higher sales tax may incentivize cities to invoke regulatory decisions that will increase the tax collection penalty scores because of the potential for additional financial gains.

Cities with younger populations have also passed more laws imposing taxes on these transactions. The cause of this relationship does not have as clear of an explanation, and we initially attributed the connection to younger individuals supporting more progressive policies; however, this theory would only make sense if the policy preferences variable also had a significant relationship (Gallup, 2014). Unfortunately, no statistically significant relationship exists between policy preference and the taxation of short-term rentals, and we lack additional evidence supporting an explanation.

Table 13

Regression Results: Tax Collection

Dependent Variable: $Score_4$

		R^2	0.40	
		Adj. R^2	0.30	
		$Pr > F$	0.008	

Variable	Description	β Coefficients	Std. Error	$Pr > |t|$
Intercept		7.23	54.78	0.057
T	Local Sales Tax	0.22	*1.76	0.068
PP	Political Pref.	0.71	10.01	0.297
A	Median Age	-0.19	*1.54	0.073
I	Median Income	< 0.01	< 0.01	0.472
V	O-O Median Home Value	< 0.01	< 0.01	0.975

No. Observations: 35
*, **, *** indicates significance at the 90%, 95%, and 99% level, respectively

Regression 5: (Table 14) & (Score5)

Statistically significant variables (holding other things equal):

- A 0.1 increase on the policy preference scale was associated with a 0.32 increase in licensing requirement's penalty

Table 14 presents the overall regression regarding licensing requirement score penalties, and it explained little variation across cities. However, one variable, city policy preferences, was statistically significant. Although this regression is weak, political preferences explain a similar amount of variation in this model to the hostile enforcement model. However, the estimated relationship in this model is less valuable because the overall regression was not statistically significant.

Table 14

Regression Results: Licensing Requirements

Dependent Variable: $Score_5$

R^2			0.22	
$Adj.\ R^2$			0.09	
$Pr > F$			0.174	

Variable	Description	β Coefficients	Std. Error	$Pr > |t|$
Intercept		8.41	9.83	0.400
T	Local Sales Tax	0.08	0.32	0.812
PP	Political Pref.	3.22	*1.79	0.083
A	Median Age	-0.19	0.28	0.493
I	Median Income	-.07	-0.07	0.373
V	O-O Median Home Value	<0.01	0.01	0.563

No. Observations: 35

*, **, *** indicates significance at the 90%, 95%, and 99% level, respectively

Regression 6: (Table 15) & ($Score_6$)

Legal restrictions had no discernable relationship with any of our explanatory variables which indicates that the intensity of laws preventing hosts from participating in the STR market follow no definite trend across these cities. We found it odd that we were able to explain differences in the strength of legal frameworks; however, there is no clear explanation for legal restrictions. Although these scores indicate different portions of STR regulations, we would have anticipated cities with clear and updated frameworks to have implemented restrictions that were explained by the same variables. We attribute this lack of a relationship to the fact that cities do not have to impose strict restrictions when clarifying their frameworks. This may indicate that

cities overall do not clearly choose to either deregulate or further regulate the STR market when updating their legal frameworks.

Table 15

Regression Results: Legal Restrictions

Dependent Variable: $Score_6$

R^2		0.04	
Adj. R^2		-0.13	
$Pr > F$		0.942	

Variable	*Description*	*β Coefficients*	*Std. Error*	*Pr > |t|*
Intercept		-48.54	54.78	0.383
T	Local Sales Tax	-0.96	1.76	0.589
PP	Political Pref.	-3.75	10.01	0.711
A	Median Age	0.98	1.54	0.532
I	Median Income	0.02	0.04	0.693
V	O-O Median Home Value	< 0.01	< 0.01	0.519

No. Observations: 35

*, **, *** indicates significance at the 90%, 95%, and 99% level, respectively

Regression 7: (Table 16) & ($Score_1$)

$$\text{New Model: } Score_1 = \beta_0 + \beta_1\,(Rshare) + e_i$$

Dependent variable:

- $Score_1$: R Street Overall Friendliness Score

Explanatory variable:

- Rshare: Overall Rideshare Score

As previously mentioned, conducting the Roomscore analysis, R Street observed the emerging ridesharing market in its Ridescore study. This study observed three categories of vehicle transportation: taxis, limos, and transportation network companies (TNCs). TNCs represent companies such as Uber and Lyft that provide transportation for individuals by drivers that use their own vehicles. Ridescore combined these three subcategories in a very similar way to the Roomscore friendliness index in order to create a ride sharing friendliness score index for each city. This index describes each city's friendliness toward these three modes of transportation.

Due to the recent significant growth in both the ridesharing and short-term rental market, we wanted to observe whether any regulatory correlations existed across these two markets. Fortunately, both R Street's Roomscore and Ridescore had the same 35 cities used in our original regressions, so we could directly compare the results of the two studies. Table 16 represents regression results of the previously reported overall Roomscore index as the dependent variable and the overall Ridescore friendliness score as the explanatory variable.

Interestingly, the regression provided results that were nowhere close to statistically significant. The model exhibited no statistically significant association between the two friendliness scores. This surprised us because it indicates that cities do not make similar regulation decisions regarding ride sharing and room sharing. The lack of correlation between regulation styles within common cities likely shows that cities do not view the two markets as requiring the same regulatory conditions. Due to this view, economists cannot use current regulations regarding either of the markets to predict a city's potential future regulatory decisions in the other market.

Table 16

Overall Roomscore & Overall Rideshare				
Dependent Variable: $Score_7$				
R^2		0.03		
Adj. R^2		0.00		
$Pr > F$		0.341		
Variable	Description	β Coefficients	Std. Error	$Pr > |t|$
Intercept		52.15	24.06	0.038
Rshare	Overall Rideshare Score	0.28	0.29	0.341

No. Observations: 35

VI – Limitations & Future Research

Although R Street tried for consist judgement when creating the Roomscore index, the irregularity in the data they collected as well as their collection methods introduce subjectivity into their model. For example, both the responses to the questions that the researchers asked city regulators and city laws varied considerably in their language, and the final index scores may have included inaccuracies and potential biases. We understand that this type of index requires more subjective scoring measures due to the variability in city-level regulation; however, this may have caused our results to inaccurately explain variations in STR market regulation.

Additionally, collecting market-specific data on STRs might improve our results and provide clearer explanations for the variations and effects of STR regulation. Although this type of data is not currently available, Airbnb's potential upcoming initial public offering (IPO) will likely release this data of interest. As a private company, Airbnb does not have to make most company data publicly available—which will become a requirement after its IPO. Limited data regarding how Airbnb's revenue changes across states along with the impacts STRs have on city revenues and costs poses obstacles for cities when deciding what degree of regulation to implement. Specifically, cities cannot accurately anticipate the financial impacts certain regulatory laws will have on their overall economies or specific businesses. If Airbnb goes public, the variability in city STR regulation may decrease as cities better understand the financials behind one of the largest companies in the sharing economy.

VII - Conclusion

This thesis researched and observed the costs, benefits, and positive and negative externalities of the short-term rental market as well as regulatory implications/trends among many cities. Many current discussions surround this topic, making it relevant especially given the recent significant growth of the short-term rental market. Our analysis of the costs and benefits of STRs led to the conclusion that both advantages and disadvantages are prevalent; therefore, effective and appropriate regulations should exist to maximize the advantages and minimize the disadvantages of the STR market.

In addition to an analysis of the market, we built upon R Street's Roomscore study through our own statistical analyses and found difficulties in explaining variability in city-level short-term rental market regulations. Although our results indicate that there are few commonalities between cities and the way they regulate STRs overall, breaking down the Roomscore index into its sub scores revealed interesting relationships. We were able to explain variations in legal frameworks reasonably well with local sales tax rates, median ages, median age, and owner-occupied home values. Additionally, hostile enforcement across cities are best explained by residents' political affiliations and median age. These results suggest that variations in the overall Roomscore index and even the sub scores do not follow the same pattern across across the 35 cities in our sample.

The relevance and large-scale predicted growth of the short-term rental market leads to the importance of future research regarding this topic—especially as time goes on and more data becomes accessible. We anticipate Airbnb's upcoming IPO to provide supplementary data necessary for additional informative studies.

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Appendix

Figure 1

Overall Roomscore Index Results

City	Framework	Restrictions	Taxation	Licensing	Enforcement	Total	Grade
Albuquerque, N.M.	0	0	0	-2	-1	87	B+
Atlanta	0	-40	0	0	0	50	F
Asheville, N.C.	+5	-25	0	0	-7	63	D
Anaheim, Calif.	+10	0	0	-5	-10	85	B
Austin, Texas	+10	-25	0	-7	-5	63	D
Baltimore	0	-25	0	0	-5	60	D
Boston	0	-15	0	-7	-6	62	D
Boulder, Colo.	+10	-30	0	-1	0	69	D+
Charleston, S.C.	+5	-25	0	0	0	70	C
Charlotte, N.C.	0	0	0	0	-3	87	B+
Chicago	+3	-10	0	-5	-8	70	C
Cleveland	0	0	0	0	0	90	A
Colorado Springs, Colo.	0	0	0	-5	-1	84	B
Columbus, Ohio	0	0	0	0	0	90	A
Dallas	0	0	0	0	0	90	A
Denver	0	-40	0	0	0	50	F
Detroit	0	0	0	0	0	90	A
El Paso, Texas	0	0	0	0	0	90	A
Fort Lauderdale, Fla.	+10	0	0	-10	-10	80	B
Fort Worth	0	-30	0	-2	0	58	F
Fresno, Calif.	0	-35	0	0	-1	54	F
Galveston, Texas	+10	0	-2	0	-1	97	A+
Houston	0	-20	0	0	-5	65	D
Indianapolis	0	0	0	0	0	90	A
Jackson Hole, Wyo.	0	-30	0	0	0	60	D
Jacksonville, Fla.	0	-35	0	0	0	55	F
Kansas City, Mo.	0	-35	0	0	0	55	F
Las Vegas	+3	0	0	-10	-10	73	C
Long Beach, Calif.	0	-15	0	-9	-3	63	D
Los Angeles	0	-35	0	0	0	55	F
Louisville, Ky.	+10	0	0	0	-7	93	A
Maui County, Hawaii	+10	-15	0	-5	-10	70	C
Memphis, Tenn.	0	-25	0	0	0	65	D
Mesa, Ariz.	0	0	0	0	0	90	A
Miami	0	-20	0	-2	0	68	D+
Milwaukee	0	0	0	0	0	90	A
Minneapolis	0	0	0	0	-5	85	B
Nashville, Tenn.	+10	-10	0	-3	-5	82	B
New Orleans	0	-35	0	0	0	55	F
New York	0	-20	0	0	-8	62	D
Oakland, Calif.	+3	0	-5	-8	0	80	B
Oklahoma City	0	-40	0	0	0	50	F
Omaha, Neb.	0	0	0	0	0	90	A
Orlando, Fla.	0	0	-2	-4	0	84	B
Philadelphia	+10	-10	0	-5	-5	80	B
Phoenix	0	0	0	0	0	90	A
Portland, Ore.	+10	-20	-5	-4	-3	68	D+
Raleigh, N.C.	0	-30	0	0	0	60	D
Sacramento, Calif.	+10	-25	0	-1	-5	69	D+
San Antonio	0	0	0	0	0	90	A
San Diego	+5	0	0	-3	0	92	A
San Francisco	+10	-10	-5	-7	-10	68	D+
San Jose, Calif.	+10	-10	0	0	-5	85	B
Santa Barbara, Calif.	0	-35	0	0	0	55	F
Savannah, Ga.	+10	0	0	-2	-1	97	A+
Seattle	+5	0	0	-5	-3	87	B+
Tucson, Ariz.	0	0	0	-5	0	85	B
Virginia Beach, Va.	0	0	0	-4	0	86	B
Washington	0	-10	0	-1	-5	74	C
AVERAGE	**+2.9**	**-13.3**	**-0.3**	**-2.0**	**-2.5**	**74.7**	**C**

Figure 2

Overall Roomscore Results for Regression Sample

City	Framework	Restrictions	Taxation	Licensing	Enforcement	Total	Grade
Albuquerque, N.M.	0	0	0	-2	-1	87	B+
Austin, Texas	+10	-25	0	-7	-5	63	D
Baltimore	0	-25	0	0	-5	60	D
Boston	0	-15	0	-7	-6	62	D
Charlotte, N.C.	0	0	0	0	-3	87	B+
Chicago	+3	-10	0	-5	-8	70	C
Columbus, Ohio	0	0	0	0	0	90	A
Dallas	0	0	0	0	0	90	A
Denver	0	-40	0	0	0	50	F
Detroit	0	0	0	0	0	90	A
El Paso, Texas	0	0	0	0	0	90	A
Fort Worth	0	-30	0	-2	0	58	F
Fresno, Calif.	0	-35	0	0	-1	54	F
Houston	0	-20	0	0	-5	65	D
Indianapolis	0	0	0	0	0	90	A
Jacksonville, Fla.	0	-35	0	0	0	55	F
Las Vegas	+3	0	0	-10	-10	73	C
Los Angeles	0	-35	0	0	0	55	F
Louisville, Ky.	+10	0	0	0	-7	93	A
Memphis, Tenn.	0	-25	0	0	0	65	D
Mesa, Ariz.	0	0	0	0	0	90	A
Milwaukee	0	0	0	0	0	90	A
Nashville, Tenn.	+10	-10	0	-3	-5	82	B
New York	0	-20	0	0	-8	62	D
Oklahoma City	0	-40	0	0	0	50	F
Philadelphia	+10	-10	0	-5	-5	80	B
Phoenix	0	0	0	0	0	90	A
Portland, Ore.	+10	-20	-5	-4	-3	68	D+
Sacramento, Calif.	+10	-25	0	-1	-5	69	D+
San Antonio	0	0	0	0	0	90	A
San Diego	+5	0	0	-3	0	92	A
San Francisco	+10	-10	-5	-7	-10	68	D+
San Jose, Calif.	+10	-10	0	0	-5	85	B
Seattle	+5	0	0	-5	-3	87	B+
Tucson, Ariz.	0	0	0	-5	0	85	B
TOTAL AVG.	**2.74**	**-12.57**	**-0.29**	**-1.89**	**-2.71**	**75.29**	**C**