博士論文

Toward a Sustainable Ride on the "Perennial Gale of Creative Destruction": Adaptive Governance of Short-Term Rentals

（民泊の適応的ガバナンスの研究：「持続可能性」と「創造的破壊」の観点による考察）

古　川　範　和

Doctoral Thesis

Toward a Sustainable Ride on the "Perennial Gale of Creative Destruction": Adaptive Governance of Short-Term Rentals

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ABSTRACT

Sustainable city and community is the eleventh goal of the seventeen Sustainable Development Goals (SDGs) published by United Nations in 2015, and the importance of this particular goal is growing as more people move into urban areas around the globe. While academic literature had discussed the ways the well-being of communities can be preserved, the effective ways to cope with new stressors must be devised as technological innovations keep altering the process in which the socioeconomic and environmental landscape changes.

The growth of middle-income class all over the world, which is a much desired achievement in terms of other SDGs, resulted in the influx of travelers in cities with tourist attraction, disrupting the local economic and social structures. The most controversial aspect of tourism development today is short-term rentals (STRs), the practice of renting out housing units for a short-period, less than a month according to the regulation in most cities, for a certain amount of fee paid through online platforms epitomized by the Silicon Valley company Airbnb. As the popularity of STRs grew exponentially over the past decade, critics have argued that the promulgation of STRs causes gentrification – displacement of tenants for capital investment targeting wealthier users – and nuisance to permanent residents. The United States, especially the State of California, is experiencing a serious housing shortage; the issue of STRs has very serious implications for them as well as for popular tourist destinations in other regions. Municipalities around the world have started to regulate STRs in recent years to ameliorate these issues.

As the academic literature on the subject of effective regulation of STRs, which is highly relevant to the SDG 11 mentioned above, is still young and fraught with knowledge gaps, this doctoral research was conducted to provide several key insights for both scholars and practitioners interested in sustainable communities and/or tourism. After the introduction of

the issue in Chapter 1, the evolutionary process of STRs from the inception of Airbnb to the most recent regulatory events around the world is discussed in Chapter 2. Document analysis of academic and newspaper articles, reports and blogs with the theoretical frameworks of Adaptive Governance and Socialization of Conflict was conducted to demystify how STR began to be regulated, which the existing literature had not clarified. The result shows that Airbnb and their rivaling hotel industry lobbied governmental officials and mobilized sympathetic stakeholders for policies in their own favor, involving various entities including public relation firms and academia. The current regulation is the middle ground of what Airbnb pursued, i.e., no regulation of STRs, and the demand from the hotels: a complete ban of STRs.

Existing literature of STR regulation is dominated by purely theoretical works and case studies. In Chapter 3, the characteristics of STR regulation in 17 American cities are examined to build a conceptual framework in which the findings from existing and future empirical studies can be connected for better understanding the subject matter. Six approaches to STR regulation were identified with the values of regulatory variables of the cities as well as the STR Friendliness of each city was evaluated. Using an eyeball test, the study shows that STR regulation has been rigor in cities with higher dependence on the hotel industry, while the speed of rent growth does not make the city's regulation rigorous significantly.

Due to the novelty of STR regulation, the assessment of the effectiveness of STR regulation has just begun and few case studies exist. Chapter 4 investigates the effectiveness of the current STR regulation in San Francisco, California, the city experiencing the worst housing crisis today. Using Interrupted Time Series analysis, a method frequently used to assess the impact of public interventions, besides panel analysis to address the potential heterogeneity between neighborhoods, the ratio of Airbnb listings to housing units of the entire city and of 27 zip codes within, before and after the beginning of the coercive enforcement of

the regulation at January 2018, are compared. The results show that the negative effect of the regulation on Airbnb listings was homogeneous across the neighborhoods but short lived: the listings bounced back to the pre-intervention period level within a year. This can be explained by a loophole discussed in expert interviews conducted with the Office of Short-Term Rentals and Tenant Union of the city.

Chapter 5 concludes the thesis with recommendations for policy and future studies. It is important for the policymakers to recognize the possibility of STRs concentration in certain areas, such as the Mission and Haight-Ashbury Districts in San Francisco, which have cultural factors that attract tourists. Limiting the number of buildings with which STR operation is allowed would be an effective tool to address this problem. Moreover, it is advisable to limit or even prohibit STRs in buildings of affordable housing for them to function as such instead of as “affordable hotels”. For researchers, investigation of the loopholes in the current STR regulation is an important topic they can contribute to for better regulate STRs for maintaining sustainable community in tourist destinations.

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This study was carried out only for the support and cooperation the author received from a number of people. Without their help, not only the submission of this thesis but a contemplation on the issue itself must have been impossible. Here, I would like to declare my gratitude to them.

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Also imperative for the study was the instruction and help I received from the faculty and staff members of the Graduate Program in Sustainability Science - Global Leadership Initiative in the Graduate School of Frontier Sciences, the University of Tokyo. I would like first to thank Associate Professor Motoharu Onuki, my supervisor for 5 years since my Master's research in the program. Despite his incredibly tight schedule, he has spared me hours for discussion and advice on the thesis and matters of sustainability in general. Through various occasions,

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DEDICATION

I dedicate this thesis to my friend, the late doctoral student at GPSS-GLI Alexander Sjögren (1981-2019).

Alexander enrolled in GPSS-GLI as a doctoral student when I did as a Master's. Positive, vibrant, energetic… these are the words people use when remembering him. He was truly outstanding: passionate about biology, social justice, music and cartoon, Alexander always had things to converse about.

I talked on a video chat with him just a little over a week before he passed away from cancer. He appeared normal, and later I heard that he was not expected to be capable of that. Resilience and evanescence coexisted in his life.

At various occasions, including his funeral, I have already expressed my condolences. Here, I would like to appreciate that I have met such a wonderful spirit during my study here.

May his blessings be with his family.

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1.1 Short-Term Rentals and Airbnb

Short-Term Rentals (STRs) are renting out residential space for less than a month as defined in the regulation of most cities. STRs have become very popular since the birth in 2008 of Airbnb, an online platform listing over 7 million rental units in about 100,000 cities in more than 190 countries[1], which outnumbers the top 6 international hotel chains and is estimated to have around 50% share in the STR market (Martineau, 2019a). Although the service called STRs today has existed since the 19th century as boardinghouses (Gamber, 2007; Graham, 2013) or its history can be traced to the 17th century (Dayao, 2015), Airbnb is a business model innovator (Markides, 2006) that popularized STRs in the 21st century with web technology and disrupted the tourism industry (Guttentag, 2015; Christensen and Raynor, 2003). While there are other STR platforms operated by Bookings.com and Expedia group, Airbnb is treated synonymously with STRs in both academic and public debates for its dominance (Guttentag, 2019).

The STR market is expected to be worth over $200 billion around the year 2020 (Wasiolek and Le, 2018). STRs are preferred over hotels by tourists looking for authentic, rather than commercialized, local experience or *new urban tourism* (Füller and Michel, 2014) and popular especially among the millennials (Wasiolek and Le, 2018). As Kolar and Zabkar (2010) argued, those tourists can immerse themselves in the unique environment of the destination by staying in residences using STRs, circumventing what MacCannell (1973) famously called the *staged authenticity* of facilities commercially designed for tourists. Residents, on the other hand, can generate income by accommodating visitors as STR hosts (Farronato and Fradkin, 2018).

[1] Data will be constantly updated at https://news.airbnb.com/en-uk/fast-facts/ that are updated irregularly.

Furthermore, Midgett et al. (2018) pointed out that STRs not only consume less energy and resources and produce a smaller amount of waste compared to hotels, but also catalyze social interactions between the guests and hosts. Airbnb themselves reported that STR guests contribute to the local economy more than hotel guests do by staying in their destination longer and spending more money (Guttentag, 2015; Airbnb, 2012; Lawler, 2012). As a result, STRs tend to be welcomed in locations developed in a tourism-oriented manner (Rhodes, 2015).

Not all STR guests behave well in their destination, however: some guests cause nuisance to the neighbors with noise, littering and other kinds of indecent behavior (Gurran and Phibbs, 2017). In an inquiry of STR related nuisances in Sydney, Australia, Thomas (2015) reported that large groups of guests prefer to stay in an entire home together and throw parties which may lead to drunken behaviors. Influx of STR guests can also cause traffic jam and safety concerns, and neighborhoods appreciated for being quiet and crime-free are severely affected, like in the case of Silver Lake, Los Angeles (Espinosa, 2016). The situation has brewed conflict between STR users and nonusers over their rights to space (Rogers, 2018). An even more serious concern is what is termed tourism gentrification (Gotham, 2005). La Barceloneta, Spain, located on a coastline, is a famous case of tourism gentrification over the latter half of the 20th century: its residences along the beach were replaced by high-end hotels (Lamarca 2017); while tourism gentrification involving such redevelopment is conspicuous, Coelho et al. (2016) argued that STRs cause tourism gentrification without noticeable physical change. This STR gentrification can alter the environment of a neighborhood to the extent the residents lose the sense of being home (Cócola-Grant, 2018) and replace the service sector operating for residents with the entertainment sector targeting tourists, diminishing the local quality of life considerably (Schild, 2019). On top of that, residents can be displaced from their home, either being evicted by the property owner who would convert the housing unit into STR for a higher profit margin (Wachsmuth and Weisler, 2018) or being unable to afford the rent increasing due

to the competition with STRs (Barron et al., 2018). Studies have also found that a small population of commercial operators, rather than "mom-and-pop" hosts, are generating a large portion of the total STR revenues worldwide (Slee, 2014; Popper, 2015; O'Neill and Ouyang, 2016). Mendes (2016a, 2016b) studied a severe case of STR gentrification in Lisbon, Portugal and concluded that the public participation in urban planning is the key to protect locals' right to housing (Hartman, 1998).

1.2 Short-Term Rentals in the Perennial Gale of Creative Destruction

The fact that innovations can be destructive had been discussed by Joseph Schumpeter (1950). He observed that, as technology keeps developing, old means of production will be obliterated by new means of production, which will in turn become old themselves and be obliterated, ad infinitum; hence his famous metaphorical expression of the process as the "perennial gale of creative destruction". Upon the introduction of this idea, Schumpeter (1950) argued that capitalism as an economic paradigm would not survive after the twentieth century due to, besides external pressures against it such as those elucidated by Carl Marx, its internal self-negating forces: first, when the capitalist society matures, entrepreneurs and managers of businesses tend to become "of the executive type" as they acquire "something of the psychology of the salaried employee working in a bureaucratic organization"; second, rationalization, which had entered the public sphere to generate capitalism in the first place, seeps into the private life leading to individualism and the "disintegration of the bourgeois family"; third, capitalist economic development sends an ever wider segment of the population to higher education who will discover themselves being underemployed and "enter it in a thoroughly discontented frame of mind", thus such development brews the public opinion

critical toward itself[2]. However, Schumpeter was aware that "there are no purely economic reasons why capitalism should not have another successful run which is all [he] wished to establish"[3]. Referring to Wilhelm Wundt's idea of Heterogony of Aims (or "the fact that, as higher standards of life are attained, [people's] wants automatically expand and new wants emerge or are created, satiety becomes a flying goal, particularly if we include *leisure* among consumers' goods"[4] in Schumpeter's own words; emphasis by the author), he described the evolutionary, and therefore unpredictable, nature of capitalism, which is illustrated eloquently in the following quote:

> Consciously or unconsciously [economists] analyzed the behavior of the man whose views and motives are shaped by [a family] home and who means to work and to save primarily *for wife and children*. As soon as these fade out from the moral vision of the businessman, we have a different kind of homo oeconomicus before us who cares for different things and acts in different ways. For him and from the standpoint of his individualistic utilitarianism, the behavior of that old type would in fact be completely irrational. He loses the only sort of romance and heroism that is left in the unromantic and unheroic civilization of capitalism – the heroism of ["seafaring is necessary, living is not necessary"]. And he loses the capitalist ethics that enjoins working for the future irrespective of whether or not one is going to harvest the crop oneself[5].

[2] (Schumpeter, 1950, 156-163)

[3] Ibid., 163.

[4] Ibid., 131.

[5] Ibid., 160.

In 2007, Brian Chesky and his roommate Joe Gebbia, two industrial designers who started Airbnb, did not start up their business "for wife and children" as the archetypal capitalist would; the single men simply tried to "make a few bucks" in order to pay their rent by putting three air mattresses in their loft, turning their home into a bed and breakfast (Carson, 2016). Joined by their former roommate and a highly skilled programmer Nathan Blecharczyk, they eventually built the multibillion STR platform causing creative destruction in the lodging industry – in *leisure*, which Schumpeter singled out from consumer goods as an important driver for creative destruction – making "the hotel industry running scared" (Carson, 2016).

Contemporary discussions of the negative externalities of innovative economic activities have continued since Witt's (1996) paper, and researchers like Mokyr (2014) and Komlos (2016) contend that the society has passed the era where benefits of innovation outweigh the harms, since all of the technological "low-hanging fruits" had already been taken. The issue of STRs may be seen as a case of such general pessimistic observations. A relevant academic field for such inquiry is sustainable tourism. According to Clarke's (1997) summary of the development of sustainable tourism as an idea, originally, sustainable tourism was almost synonymous with small-scale tourism as opposed to institutionalized mass tourism (Pearce 1992). Upon this dichotomy between sustainable tourism and mass tourism, a model of spectrum in which actual practices of tourism fall in between them was proposed (Davidson, 1992). However, this rather simplistic polarization of sustainable and mass tourisms with a narrow focus on the scale alone did not fit the reality where tourism was growing rapidly and intertwined with many other sectors (Hunter, 1995; Cooper et al., 1993; Heath & Wall, 1992; Butler, 1992; Cohen, 1987). An alternative understanding of sustainable tourism was proposed and aimed at improving the conducts of mass tourism, specifically under the goal of

environmental protection (Middleton & Hawkins, 1993, 1994; World Travel and Tourism Enviromnent Research Centre, 1994; McKercher, 1993; Economic Intelligence Unit, 1992). Later, the idea of sustainable tourism was expanded to include benefits of local communities in the destination, as stipulated in the Berlin Declaration on Biological Diversity and Sustainable Tourism issued in 1997 (Mihalic, 2016).

A major challenge for sustainable tourism management lies in the difficulty of reaching agreements between stakeholders. While Murphy (1985) summarized the distinct attitudes toward tourism development between the administration, the business sector, and the residents, Madrigal (1994) correspondingly identified “realists”, “lovers” and “haters” of tourism development. Taylor (1995) observes that whether a community can define the common goods and cooperate in the context of tourism development depends on the extent of local cohesion. Where the allocation of the benefits of tourism development is expected to be asymmetrical, the perceptions of such development will differ among the locals according to how much benefits would accrue to each of them (Prentice, 1993), and as Inskeep (1991) noted, even communities that have maintained homogeneity theretofore can be fractured into competing stakeholders by tourism development. In this regard, the principles of sustainable tourism management proposed by Bramwell et al. (1998) stipulating the need to allow local communities, possibly comprised by incongruent clusters of stakeholders, to participate in the process of decision making are crucial for sustaining communities.

Richards and Hall (2003a) pointed out that communities are “a basic reason for tourists to travel” as tourists seek experiences unique to their destination and that tourism needs to be managed in ways that sustain the community of destination. Over-tourism to a destination is contradictive, self-destructive and unsustainable since they will deprive the destination of its appeal to tourists by diminishing unique features of the community, as exemplified in the case

of Venice reported by Seraphin et al. (2018). The underlying truth is that sustainable tourism presupposes sustainable community: sustaining community should interest not only the locals but also the tourism industry. Understanding the implications of STRs to sustainable community, therefore, is important not only for members of the communities but also for participants in the tourism industry including STR platforms such as Airbnb.

1.3 Short-Term Rentals and Sustainable Community

At the United Nations Conference on Environment and Development (UNCED) a.k.a. Earth Summit 2012, an agreement was reached on the need of a common set of goals, which appears in *The Future We Want* (United Nations, 2012). As a result, the UN General Assembly's Open Working Group on Sustainable Development Goals was established, and the group submitted a set of proposals to the UN General Assembly in July 2014 (United Nations, 2014a). In December, the General Assembly announced that it would accept the proposals and reify Sustainable Development Goals (SDGs) (United Nations, 2014b). Intergovernmental negotiations on developing SDGs were held eight times from January to July 2015 (United Nations, 2015a), and at the 2015 UN Sustainable Development Summit in New York, SDGs were adopted and published as *Transforming Our World: the 2030 Agenda for Sustainable Development* (United Nations, 2015b). Given the interdependence of issues regarding people, planet, prosperity, peace, partnership, SDGs were designed to cover seventeen interlinked goals to be accomplished by 2030.

One of the 17 SDGs, SDG 11, is *Sustainable Cities and Communities*, which stipulates that:

> "Making cities sustainable means creating career and business opportunities, safe and affordable housing, and building resilient societies and economies. It involves investment in public transport, creating green public spaces, and improving urban planning and management in participatory and inclusive ways" (United Nations Developing Program, n.d.).

Based on the literature of STRs mentioned earlier, three assumptions can be made for the implications of STRs to sustainable community building. First, STRs have *positive* impacts on career and business opportunities because they provide income to hosts and bring potential customers to businesses in city fringe where traditional travelers staying at hotels would not reach. Local communities in Columbus, Ohio, for example, are trying to use STRs strategically to vitalize local businesses (James, 2018). Second, STRs have *negative* impacts on safe and affordable housing since STRs usher tourists, including noisy and violent individuals, into residential areas, and take housing units away from the residential market, exacerbating gentrification and homelessness in cities with housing shortage (Wachsmuth and Weisler, 2018). And third, the impact of STRs on resilient societies and economies is *uncertain*: STRs contribute to resilience as a more eco-friendly alternative to hotels and foster communication between tourists and locals (Midgett et al., 2018) on one hand; they can raise unemployment in the hotel industry (Farronato & Fradkin, 2018) on the other. It is also remarkable that SDG 11 emphasizes the need for "improving urban planning and management in participatory and inclusive ways". This view echoes the theory of *sustainable community development* formed by Roseland (2000) where inclusive governance with the mobilization of citizens plays a pivotal role for minimizing the consumption of natural capital, multiplying social capital, and using urban space efficiently.

1.4 Research Objective and Questions

These assumptions suggest that, on the default promotion of STRs for their positive impacts on commercial opportunities and on the reduction of ecological footprint in tourism, regulation of STRs should be placed through participatory and inclusive planning according to the significance of their negative impacts, namely the severity of housing shortage and the importance of hotels in the local economy, for sustainable community development. The present study investigates whether the design of the existing STR regulation placed by local governments is advisable from this perspective as well as its effectiveness in making STRs coexist with sustainable community development. The investigation is conducted in the form of answering three key questions:

The first question regards whether the regulation of STRs emerge from debates involving a broad range of stakeholders including not only executives of STR platforms and incumbents of accommodation industry but also citizens whose housing affordability may be affected. In other words, was the STR regulation shaped by concerns of both private and public interests?

Secondly, the study investigates the logic behind the actual regulations placed. From the perspective of SDG 11 mentioned above, STRs should be regulated according to the severity of their negative externalities on the local housing and labor market. Specifically, cities with heavy demand in housing market and dependence on the hotel industry would need to limit the number of STRs more strictly than other cities in order to protect housing affordability and employment. Does the rigor of the existing STR regulation reflect this logic?

And thirdly, it is important to assess the effectiveness of the existing regulation to understand whether the current policy design is appropriate to adequately address the local

concerns over STRs. For example, if a city experiencing a severe housing shortage has a regulation to reduce the number of STRs, we would expect to observe a decreased level of STR usage after the regulation in comparison with the pre-regulation period. Is this the case in cities with STR regulation aim to achieve such objective?

Chapters 2, 3 and 4 answer these question respectively, and the study is concluded in Chapter 5.

2 SHORT-TERM RENTAL REGIME

2.1 Aim of Chapter 2

This chapter answers the first research question concerns the inclusivity of debates over STRs that led to the STR regulation, the answer to which is sought by an examination of the emergence and institutionalization of a new socioeconomic regime (Walker et al., 2004) swarming with STRs, the *STR regime*, from the birth of Airbnb, for the company has been the central entity in the process, to the most recent legal actions taken by the authorities. A scoping study (Arksey & O'Malley, 2005) of 115 documents including academic journal articles, organizational reports, industrial media articles, newspaper or magazine articles, books and blogs (See Figure 1) was conducted for "producing rich description of a single phenomenon, event, organization or program" to "understand the historical roots" (Bowen, 2009) of STRs. Three conceptual frameworks from different academic disciplines act as catalysts for this conceptual synthesis of the STR regime. The next section introduces these theories.

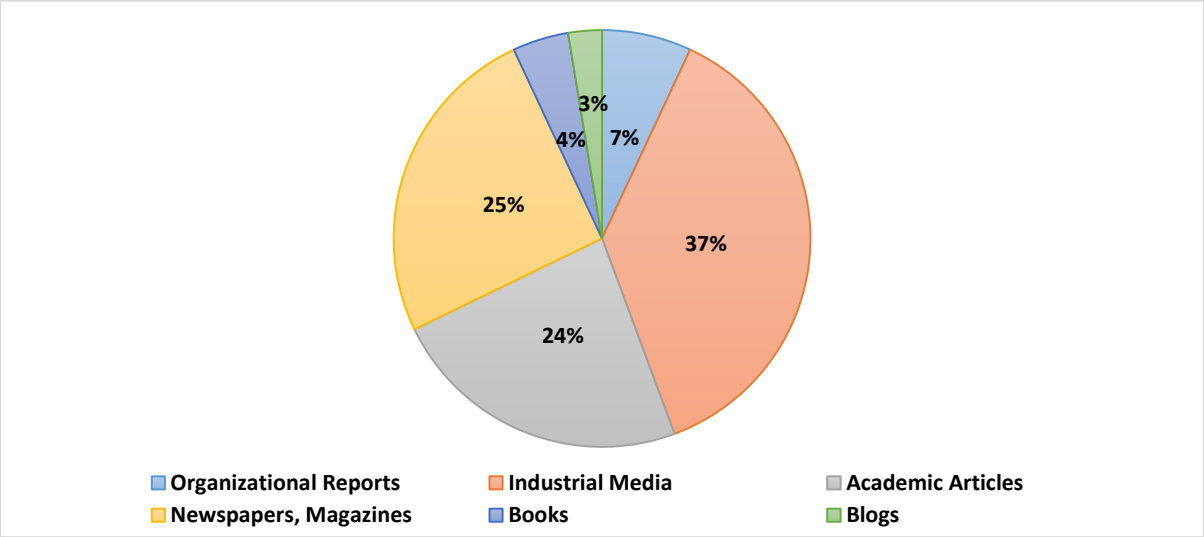

Figure 1. Percentage of Types of Documents Analyzed (2008-2019)

2.2 Conceptual Frameworks

2.2.1 Adaptive Governance

The concept of adaptive governance was introduced first by Dietz et al. (2003), refined by Folke et al. (2005), and redefined by Chaffin et al. (2014) as a system of governance by emergent interactions between actors, networks, organizations in pursuit of a desired state within social-ecological systems. "[A]s an adaptation or transformation in social organization to better achieve an agreed-upon ecological vision", adaptive governance will emerge due to "the potential disconnects between what science tells us is necessary for a healthy ecological system, what society wants from that ecosystem, and perhaps more importantly, what is politically feasible" (Chaffin et al., 2014). Empirical studies have shown that adaptive governance emerges as a result of conflict over scarce resources and perceptions of crisis (Chaffin and Gunderson, 2016; DeCaro et al., 2017). In the context of the present study, the scarce resource causing conflict is space in urban societies.

Adaptive governance operates iteratively with renewed understanding of the matter at hand, as scientific knowledge continues to evolve over time, and collaboration between scientists and managers enables its successful implementation. However, "many of the collaborative processes are emergent and cannot be directly legislated or mandated" (Cosens et al., 2017), and stakeholders' skewed mental models of issues affect the process of adaptive governance (DeCaro et al., 2017).

The emergence of adaptive governance entails institutionalization: "Beyond the initial emergence of [adaptive governance], the informal nature of individual leadership, collective trust-building, and network formation may gain formal legitimacy through policy change and/or the creation of new organizations" (Chaffin and Gunderson, 2016). Adaptive governance cycle revolves in the following order (Chaffin et al, 2014):

The r phase (exploitation): Development of a new structure, capital and complexity of a social-ecological system; e.g., inception of Airbnb.

The K phase (conservation): Stabilization of the new structure, capital and complexity; e.g., growth of Airbnb and STRs around the world.

The Ω phase (release): Crisis arising from social or ecological upheavals due to the new structure, e.g., opposition to STRs.

The α phase (organization): Reorganization of the structure starting a new r phase for the next cycle; e.g., legitimization of STRs

2.2.2 Socialization of Conflict

In the field of policy process research, i.e., "the study of the interactions over time between public policy and its surrounding actors, events, and contexts, as well as the policy or policies' outcomes" (Sabatier and Weible, 2014) initiated by Harold Lasswell (1956), Elmer Erick Schattschneider (1960) introduced the socialization of conflict to explain how conflicts ignite changes in public policy, inspiring later empirical works on policy processes, most notably on agenda setting (Kingdon, 1984; Baumgartner and Jones, 1991; Studlar, 2015). The theory captures the development of political conflicts in which the losing side strives to change the game by enlarging the audience of the debate so that their chance of winning the battle will

increase. Schattschneider (1960) observed that "special-interest groups often tend to rationalize their special interests as public interests"; both Airbnb and the hotel industry, the latter threatened by the success of the former, socialized the conflict by involving the public into their struggle.

Management scholars, political scientists, economists and sociologists have studied the socialization of conflicts by firms and industries. Walker and Rea (2014) reviewed related works across disciplines, highlighting business engagement in electoral politics, corporate lobbying, collective action of trade associations, mobilization of civil society, and tactical use of CSR (corporate social responsibility) as the tools used for manipulation of the political environment. These political tools have played significant roles in the development of the STR regime.

2.2.3 Policy Disruption

While policy process theories explain policy upheavals, studies of disruptive innovation have focused on business upheavals with new technology (Christensen et al., 2018). Recognizing that "[t]he two theory domains have largely ignored each other" and that "radical transformation of an industry by a business innovation demands clear thinking about whether a substantial policy response is appropriate and, if so, in what form", Biber et al. (2017) combined knowledge of the two domains to explain policy disruption as a result of business innovation. They listed four possible scenarios of such policy disruptions:

1. End-runs

End-runs "occur when the business innovation, notwithstanding similarities to the incumbent industry, argues that the features of its technology or business model innovation make it

sufficiently distinct so as to not be subject to costly regulation, tax, or other instruments of the policy regime governing the incumbent industry".

2. Exemptions

"Exemptions occur when it is clear that the business innovation fits an explicit exception in the existing policy regime and is not subject to the regulation, tax or other constraint" despite "it is creating or exacerbating a condition the policy regime was intended to control or mitigate".

3. Gaps

"Gaps occur when the business innovation threatening incumbent businesses creates a new policy problem for which no policy regime exists or for which applying an existing regime would require a novel and tenuous application of the regime's statutory and regulatory authorities".

4. Solution

"Solutions arise when the business innovation, which is arguably or clearly covered by existing regulations, solves a problem that led to regulation of the incumbent industry in the first place or presents superior public welfare outcomes looking forward compared to the incumbent industry operating under the regulatory status quo".

Biber et al. (2017) then identified four actions the government can take:

1. Block

"Interpret legal rules to block the new form of business and preserve existing regulatory and business structures".

2. Free Pass

"Allow the business innovation to proceed without changing the regulatory structure, potentially consigning the previous business model and its associated regulatory structure to extinction".

3. OldReg

"Allow the new firm to enter the market, but apply existing legal rules. This approach will impose additional regulatory costs on the new business models but aims for a somewhat level playing field between incumbents and innovators".

4. NewReg

"Develop new regulatory structures and legal categories entirely. Like OldReg, NewReg can strive for neutrality between incumbents and innovators, but need not always be neutral".

It will be seen in the following that the policy disruption caused by STRs was a Gap and the NewReg approach has become the regulatory standard across cities.

2.3 A Synthesis of the Short-Term Rental Regime

2.3.1 Overview

In the following, each phase of the STR regime's development will be examined. Drawing on the theory of adaptive governance theory, the development of the STR regime can be captured in the stream of the r, K, Ω and α phases [Figure 2]. Legal actions of governments will be classified using the theory of policy disruption into Block, Free Pass, OldReg and NewReg. A discussion of the socialization of conflict and political actions taken by Airbnb or the hotel industry will appear in the examination of the α phase since it is in this phase that the significant results of those actions appear.

Figure 2. Adaptive Governance of Short-Term Rentals

2.3.2 The r phase: Q3 2007 – Q4 2010

Originally, the idea for Airbnb was generated as a way for its founders to pay their rent. They launched Airbedandbreakfast.com on August 11, 2008 (Schonfeld, 2008). Eventually, the venture capitalist Paul Graham noticed the team and let them join the prestigious startup accelerator Y Combinator where the team would complete their product (Graham, 2009; Rao, 2009). In March, 2009, the name of Airbedandbreakfast.com was shortened to Airbnb, and the company received $600,000 seed capital from Sequoia Capital in April. Airbnb started to grow rapidly, and by 2011, the company was offering their service in around 90 countries and reached the total bookings of 1 million nights (Lee, 2011).

Anti-STR sentiments were already brewing in this phase. In the spring of 2010, a bill to amend the Multiple Dwelling Law (MDL) of New York State was introduced to ban certain types of STRs in New York City (Lazarow, 2015). The city was Airbnb's largest market with an estimated annual revenue of $450 million; the company hired the New York based prominent lobbying firm Bolton-St. Johns and rallied its community of hundreds of hosts in the city to write to Governor David Paterson. However, the bill passed to go into effect in July 2011 and many STR operations in the city became illegal under the state law (Lazarow, 2015; Gallagher, 2017): New York State adopted a Block strategy to cope with STRs. Labeling STRs that rent out the entire unit *illegal hotels*, New York remains the capital of the antithesis to STRs thenceforth (Gallagher, 2017; Stone, 2017).

2.3.3 The K phase: Q1 2011 – Q2 2014

At the end of May 2011, Airbnb opened its first international office in Germany (Bradshaw, 2011; Taylor, 2011), and the company raised $112 million from venture capitalists in Silicon

Valley (Carson, 2016). In October, Airbnb opened its second international office in London (Quinn, 2011) and subsequently opened more offices in Paris, Milan, Barcelona, Copenhagen, Moscow, and São Paulo (Wauters, 2012). The company reached its 5 millionth booking in January 2012 and 10 millionth booking in June that year (Sethna and Blythe, 2016). In November, Airbnb opened international offices in Sydney and Singapore (Ong, 2012; Russell, 2012) and kept expanding globally; in April 2014, the American investment company TPG Capital valued the company at $10 billion (Lunden, 2014) and by August, Airbnb raised additional $475 million (Snyder, 2014). In July that year, the company revised its logo and web design, as well as launched its mobile app (Baldwin, 2014), started collaboration with Handybook to provide home cleaning service to its hosts (Lawler, 2014a) and with Concur to facilitate the report of Airbnb stays as business expense (Lawler, 2014b).

During this phase, New York City and State intensified their attack on STRs. In February 2013, a New York State judge supported the city's decision to keep Smart Apartments and its parent company Toshi from operating and advertising residential units as STRs (Ugolik, 2013a). In September, New York City Environmental Control Board decided to allow STRs when a permanent occupant is present in the unit, as Airbnb claimed that such STRs do not violate the city's housing code (Villmer, 2013). A week after this decision, however, the New York Attorney General Eric Schneiderman subpoenaed Airbnb for information of its hosts operating in the city to enforce the MDL amended in the r phase (Ugolik, 2013b). Airbnb fought back saying the request for information would violate the hosts' privacy rights and the think tank Future of Privacy Forum supported their claim (Ugolik, 2013c). Six months later, the request for information was dismissed by a New York state judge as "too broad" (Rodrigues, 2014b), to which Schneiderman reacted with a revision of the request to target information regarding local zoning and tax violations (Sistrunk, 2014); Airbnb agreed (Brush, 2014).

In the spring of 2014, Airbnb and Schneiderman were reaching an agreement on legalizing STRs under the condition that the company collects and pays taxes on behalf of its hosts. However, Schneiderman abruptly stopped negotiating and kept villainizing Airbnb. Those involved in the negotiation admitted that this was due to Airbnb's commercial success: as already mentioned, the company was valued at $10 billion, surpassing major hotel chains like Hyatt Hotels and Wyndham Worldwide; ten days after the news, the American Hotel and Lodging Association (AHLA) stated it would call public attention to the negative externalities of STRs (Stone, 2017). As will be discussed below, Schneiderman has a strong political connection with the hotel industry that now sees Airbnb and STRs as serious threats, and he suddenly stepped out from the negotiation table.

2.3.4 The Ω phase: Q1 – Q3 2014

In general, the K phase of an adaptive governance cycle stabilizes the structure that has emerged in the r phase. The new structure, however, accumulates stress in the system that will trigger a crisis in the Ω phase; competition with hotels, the negative externalities of STRs such as the nuisance by guests and tourism gentrification discussed earlier are notable stressors in the case of the STR regime. Another salient issue of STRs is taxation: local governments may lose its tax revenue considerably when they fail to collect taxes from STRs as they do from hotels. A major controversy started in January 2014 as Palm Beach County, Florida sued Airbnb and other STR platforms for not collecting taxes on their bookings (Villmer, 2014). This claim was eventually dismissed when a state court ruled that STR platforms do not qualify as responsible parties under the state statute (Tay, 2019); the county tried to regulate STRs in an OldReg approach, but failed.

In April 2014, the city of San Francisco sued two property owners for converting several rental properties into STRs (McIntyre, 2014b). In June, the Manhattan Housing Court overturned the eviction of a tenant by Airbnb hosts in New York City, making fulltime STR operation in the city difficult (Rodrigues, 2014c). Across the Atlantic, the Government of Catalonia, Spain fined Airbnb €30,000 in July for operating STRs without registration to the government's tourism management system (Rodrigues, 2014d). In September, back in San Francisco, thousands of renters took a class action and accused Airbnb in a court for driving up rents (Winegarner, 2014). The severest opposition arose, again in New York: on September 12, a coalition of elected officials, housing activists and hotel owners called ShareBetter started a negative campaign against Airbnb with a budget of $3 million (Short, 2014). Furthermore, a month later, the Attorney General Schneiderman released a report contending that about 75% of past Airbnb bookings in the city violated zoning and tax laws, based on an analysis of the data Airbnb had disclosed in the K phase (Schneiderman, 2014; Rodrigues, 2014e).

2.3.5 The α phase: Q3 2014 – Q2 2019

As mentioned above, Palm Beach County, Florida filed a lawsuit against STR platforms for tax evasion in the beginning of 2014. Airbnb swiftly adapted to the authorities' concern about taxation, and in March, the company reached an agreement with Portland and San Francisco to collect and pay lodging taxes on behalf of its hosts (Rodrigues, 2014a). Two weeks later, David Chiu, the president of San Francisco's Board of Supervisors, unveiled an ordinance to lift the ban on STRs in the city (McIntyre, 2014a). The bill, which was called the Airbnb law, passed and received Mayor Ed Lee's signature in October; it entered force in February 2015 leading to the establishment of the Office of Short-Term Rentals to administer and enforce the law (Stone, 2017): San Francisco adopted a NewReg approach to deal with the policy disruption

by STRs. In the same period, Airbnb expanded its liability insurance from covering only property damage to including guests' accidental injury in the property during their stay (Perez, 2014). In June, the company was valued at $25.5 billion and received additional funding of $1.5 billion (O'Brien, 2015); a year later, the valuation went up to $30 billion and the company raised further $850 million (Mannes, 2016). In September 2016, Airbnb launched its Friendly Buildings Program to foster negotiation and collaboration between homeowners and their tenants on hosting STRs (Kokalitcheva, 2016). In November, the company launched a new feature called Experience to offer tour suggestions to guests, making itself more than a STR platform (Lynley, 2016). In 2017, Airbnb acquired a handful of companies in related fields, most notably Luxury Retreats, a STR platform focused on high-end homes and premium vacation rentals, which allegedly costed $200 – $300 million (Zaleski and De Vynck, 2017). A surprise came from its CEO Brian Chesky in February 2018 when he announced the company's plan to launch an airline (Rizzo, 2018). Finally, Airbnb made its largest deal hitherto in March 2019 as it acquired the last minute hotel booking platform HotelTonight for over $400 million (Somerville, 2019).

STRs have contradicted with existing rules on land use and been illegal in many cities around the world (Guttentag, 2017). The 2014 legalization of STRs in San Francisco, however, proved to be a turning point toward the legitimization of the STR regime, and it was a fruit of Airbnb's political efforts. Public records show that Airbnb's lobbyists had met David Chiu thirty times for a year leading up to the introduction of the Airbnb law in April 2014; in May, Reid Hoffman, a board member of Airbnb, and another board member Ron Conway's wife Gayle, contributed $200,000 and $49,000 respectively to a political action group supporting Chiu; in September, Hoffman and Ron Conway contributed $300,000 and $49,900 additionally; they further contributed $100,000 and $25,000 in October, while HomeAway is not recorded to have offered anything (Herrera, 2014). According to a Center for Public

Integrity report, Airbnb executives and top funders donated about $200,000 to candidates for California's state-level office of the year; for example, the founders Brian Chesky and Nathan Blecharczyk donated $13,700 to the re-election of California Attorney General Kamala Harris, while the company donated $15,000 to both the Republican Attorneys General Association and the Democratic Attorneys General Association (O'Brien, 2015).

On the other hand, the hotel industry also donated at least $134,000 to the same attorneys general groups and contributed approximately $5 million to similar national organizations that support gubernatorial and state legislative candidates in the year, according to the same report. Furthermore, one of the top donors to the re-election campaign of the New York State Attorney General Schneiderman, who had been attacking Airbnb, was Jonathan Tisch, the chairman of Loews Hotels: he gave more than $31,000 to Schneiderman's campaign; the New York Assemblyman Keith Wright had introduced a bill in 2013 to require Airbnb hosts to pay taxes and a $5,500 permission fee, and he received $4,100 from Tisch in 2014; New York state and city lawmakers received at least $60,000 in total from the Hotel Association of New York City in the first half of 2015 (O'Brien, 2015).

Both Airbnb and the hotel industry employed "engagement in electoral politics" and "corporate lobbying" of Walker and Rea's (2014) aforementioned toolbox for socialization of conflict. Another tool "collective action of trade associations" is also existent as AHLA has been fighting STRs collectively. "Mobilization of civil society" has been observed as well when AHLA created an anti-STR grassroots organization Neighbors for Overnight Oversight (O'Brien, 2015), now called AirbnbWATCH (Nielsen, 2017), besides ShareBetter. Airbnb counterattacked hiring Targeted Persuasion, a firm specialized in public relations, to create grassroots campaigns to mobilize STR hosts (McDonald, 2018). The most dramatic faceoff between anti-STR and pro-STR grassroots was observed in San Francisco in 2015: Sharebetter

SF, the local branch of ShareBetter, with a budget less than $1 million, initiated a ballot called Proposition F demanding a more strict STR regulation in the city (Cutler, 2015). On the other hand, with an $8 million budget, Airbnb's global head of public policy Chris Lehane deployed a team of campaign organizers and mobilized the local user base as a group called San Francisco for Everyone; they were joined by the Home Sharers Democratic Club, an organization of STR hosts in the city led by a semi-retired lawyer Peter Kwan, and Proposition F was dismissed with 67,000 votes against the 15,000 signatures for the proposition (Gallagher, 2017; Stone, 2017). Finally, for CSR, Airbnb had started its commitment when Superstorm Sandy hit New York in 2012: 1,400 Airbnb hosts provided accommodation and food to victims displaced from their homes (Napier, 2014). This type of aid evolved into the Shared City initiative, first introduced in Portland, Oregon (Spencer, 2014), which now operates as OpenHomes. Furthermore, the company offered free housing to refugees and others in limbo due to President Donald Trump's executive order in 2017 (Wang, 2017).

Following the 2014 legalization in San Francisco, Airbnb reached agreements with Chicago, San Jose, Washington D.C., Phoenix, Philadelphia as well as Amsterdam, Paris and other cities around the world to take a NewReg approach to STRs (Stones, 2017; Lawler, 2015; Lomas, 2015). Some cities remained hostile toward STRs: Berlin took a Block approach to make all STRs renting out an entire home illegal with fines up to €100,000 ("Berlin's Government", 2016). The national government of Japan adopted NewReg that limits the operation of STRs to the extent "that lowers the chances for competition" with the hotel industry that "had very serious concerns" about STRs (Nakamura, 2016); when the law was enforced in June 2018, Airbnb had to remove 80% of its listings since their hosts chose not to go through a cumbersome process to obtain the permission for STR operation (Nikkei Staff Writers, 2018). Even in San Francisco, there was a pushback from Sharebetter SF; taking control of the board of supervisors in 2016, the coalition made a draconian rule that fines STR platforms $1,000 per

night for every illegal operation; Airbnb sued the city (Conger, 2016) but eventually complied, and like in the case of Japan, its listings in the city dropped by half as the new regulation started in January 2018 (Said, 2018).

Whatever reasons the authority may raise for restricting STRs, a very powerful driver of such policy is the pressure from the hotel industry. In the spring 2017, the New York Times reported that it received two leaked documents circulated in AHLA laying out "multipronged, national campaign approach at the local, state and federal level" to diminish STRs (Benner, 2017). With an annual budget of $5.6 million, the association has formed alliances with affordable housing groups and neighborhood associations, as well as politicians including three Senators who sent a letter "raising concerns about the short-term rental industry" to the Federal Trade Commission. The association has also teamed up with affordable housing groups, neighborhood associations, and even their sworn enemy, i.e., hotel labor unions (Benner, 2017). AHLA has also met with legislators and attorney generals across states to discuss STR regulation, and has funded academic studies critical of Airbnb and STRs such as O'Neill and Ouyang's (2016) report (Benner, 2017; Mest 2016). Likewise, Hotel Trades Council, which has also been fighting Airbnb by mobilizing hotel employees, funded studies of STR gentrification (Wachsmuth et al., 2018).

The dynamic α phase has just ended, however, as STR regulation around the world has been converging to NewReg. In March 2018, Berlin replaced its STR ban with a license system, or Block with NewReg (O'Sullivan, 2018a). In June, Barcelona, one of the cities that had been cracking down on STRs, decided to allow Airbnb to operate STRs under the condition that the company provides the data of its listings in the city to the authority (O'Sullivan, 2018b). In July, New York City Council demanded a similar rule and introduced a bill (Lawler, 2018); in May 2019, Airbnb agreed to share partially anonymized data of its listings in the city, and a

judge ordered the company to share detailed data of listings suspected to have operated illegally (Martineau, 2019b).

Airbnb has been pushing local governments for Free Pass whereas the hotel industry has demanded Block. Both camps have donated to politicians, lobbied to officials, and mobilized citizens. The interpretation of policy disruption by STRs as an End-run or a Solution was denied as many operations were labeled and criticized as "illegal hotels". Since the business model of STRs is distinct from that of hotels, the policy disruption by STRs fits the Gap, rather than the Exemption. OldReg approachs have been tried, like in the case of Palm Beach County, but not successfully. Rather, cities have been adopting NewReg, which falls between the two extreme regulatory approaches, i.e., Free Pass and Block (Furukawa and Onuki, 2019).

2.4 Conclusion of Chapter 2

The investigation above found that the regulation indeed emerged in a participatory and inclusive manner as Airbnb and the hotel industry, while lobbying governments with claims supported by media or academic studies, mobilized citizens on their own side to petition for common interests. The rivalry in the private sector necessitated inclusion of the public.

It is worth noting that the STR regime spawned *information clearinghouses* (Biber et al., 2017) and three of them, all founded in 2015, have altered the dynamics of the regime significantly. A very successful Airbnb host Scott Shatford, who operates several STRs and has authored *The Airbnb Expert's Playbook*, launched a company called AirDNA that scrapes and sells data from Airbnb, HomeAway and other STR platforms covering over 40,000 cities to STR hosts and real estate investors seeking business intelligence (The Rebel Broker, 2018; The Budget Diet Team, n.d.). Meanwhile, another STR host Ulrik Binzer living in Tiburon,

California was asked by the local officials to help them design STR regulation. He founded a company called Host Compliance out of this experience; while AirDNA would contribute to the increase and success of commercially operated STRs renting the entire unit whom housing activists criticize the most, Host Compliance is a company that sells software with scraped data from STR platforms to hundreds of local governments trying to rein in illegal STRs (Martineau, 2019a; Host Compliance, n.d.). Yet, Airbnb's "Public Enemy No. 1" is Murray Cox, the founder of Inside Airbnb. As a housing activist, Cox was teaching a youth group about gentrification, segregation and housing pressures in New York. Once he noticed the issue of STRs renting the entire unit in the city in the summer 2015, he started to build the website Inside Airbnb where scraped data from Airbnb are visualized and listed in downloadable formats. Thirty cities around the world including San Francisco, Barcelona and Paris have requested Cox's data for regulation in exchange for small fees (e.g., San Francisco pays Cox $200 per month), and he sends data to New York City's Office of Special Enforcement every month (Carville, 2019). Born almost at the same time, these entities equipped with web scraping technology enabled the regulation of STRs.

Local attitude toward innovation has a significant impact on the dynamics of the STR regime. Palombo (2015) compares two cities that have been taking quite opposite positions toward STRs: New York and San Francisco. A similar difference between New York and San Francisco toward disruptive business models is found for ridesharing such as Uber and Lyft: in New York, drivers working with ridesharing platforms are required to obtain TLC license and drive a specific type of car and are very likely to have professional experience of working in the public transportation sector whereas their counterparts in San Francisco can drive without such license and chose their car from a far wider variety (Haque, 2016). People who have worked in the IT industry in both cities agree that New York is "crafty and practical", San Francisco "dreamy and idealistic"; in other words:

> "Valley tech entrepreneurs fundamentally believe it is their job to invent the future and see the world as one that will conform to the future they are building. New York tech entrepreneurs are exposed to other industries on a regular basis and therefore see their offering as sitting alongside others in building a future" (Stillman, 2016).

Ruhl (2012) contends that the “deterrents to implementing adaptive management come from three fronts: legislatures, the public, and the courts, all of which have calibrated around the front-end style of decision making”. A “front-end” decision making presumes how the effects of the decision affect the society a myriad of variables of which keep changing will be, whereas the dynamics of complex systems, such as the long term impacts of STRs, is practically impossible to predict and therefore calls for a “back-end” decision making which is iterative and incremental (Shapiro and Glicksman, 2002). Ultimately, it seems to be the case that understanding local ethos on politics and educational intervention to foster the literacy of complex systems (Vemuri, 1978) will fulfill the need for essential means to promote adaptive management of any issue (DeCaro et al., 2017).

3 THE STRUCTURE OF SHORT-TERM RENTAL REGULATION

3.1 Aim of Chapter 3

The second research question asks whether the design of actual STR regulation place by cities correspond with the severity of issues that can be aggravated by unfettered growth of STRs[6].

Negative externalities of STRs to sustainable community building, especially the conspicuous lack of affordable housing in cities around the world, necessitate STR regulation (Mendes, 2016; Oskam and Boswijk, 2016; Interian, 2016). Local governments around the world placed regulatory measures such as requirement of an STR license for annual fees, limitation of days STRs can operate, specification of properties that are allowed to host STRs, taxation, etc. (Jefferson-Jones, 2014 & 2015). These measures are employed to let the sharing of excess housing capacities flourish while curtailing the negative externalities that threaten the livelihood of local residents (Aloni, 2018). Nieuwland and Melik (2018) examined STR regulation in 11 American and European cities and concluded that while most cities share the same purposes for the regulation, namely the protection of affordable housing and quality of life, the implications of STR promulgation varies depending on the characteristics of the city. They also raised the need to find a way of assessing the effectiveness of those regulations and the difficulty of the enforcement due to the elusive nature of P2P (peer-to-peer, meaning "between individuals") transactions in comparison with traditional B2C (business-to-consumer, exemplified by traditional service delivery) cases. Although some studies have deciphered how STRs have been disrupting land use management of various cities and drew insightful policy recommendations (DiNatale et al., 2018; Wegmann & Jiao, 2017), empirical analysis of the regulations actually placed remains a task for the future.

[6] This chapter draws on a recently study conducted by the author (Furukawa and Onuki, 2019).

So far the literature is dominated by purely theoretical works and case studies. There is no framework constructed from an inductive study for connecting empirical findings. This chapter seeks to develop a framework to catalog STR regulation with qualitative and quantitative measurement.

3.2 Methods

Furukawa and Onuki (2019) investigated how the placement of regulation is associated with the data related to STRs and other socioeconomic factors by examining cases of 17 American cities. These cities were selected by the availability of data on the usage of Airbnb, which are provided for public debates by Inside Airbnb (http://insideairbnb.com), an open source data tool. Inside Airbnb provides data of 22 locations in the US. Five among those locations, namely Clark County, Hawaii, Rhode Island, Santa Clara County and Santa Cruz County, have multiple sub-regions that have separate STR regulations, which would hinder a consistent study of the effects of the regulations, and therefore were excluded from the list. The remaining 17 cities used for the investigation are: 1. Asheville, North Carolina; 2. Austin, Texas; 3. Boston, Massachusetts; 4. Chicago, Illinois; 5. Columbus, Ohio; 6. Denver, Colorado; 7. Los Angeles, California; 8. Nashville, Tennessee; 9. New Orleans, Louisiana; 10. New York City; 11. Oakland, California; 12. Portland, Oregon; 13. Salem, Oregon; 14. San Diego, California; 15. San Francisco, California; 16. Seattle, Washington; and 17. Washington D.C.

Most of the cities have an official website where prospective STR hosts can find information about the local regulations and how to obtain a license if necessary. From these websites and other online sources, the following information was collected for each municipality:

A) Types of STRs

Each municipality defines STRs in its own language and some of them categorize them in a unique manner. But across all of the 17 cities, STRs fall under one of the following 3 categories.

i. Primary Hosted STRs: Rentals of this type are operated in the primary residence of the host while the host stays at home with the guests. In other words, only part of a home is offered to the guests.

ii. Primary Unhosted STRs: Rentals of this type are operated in the primary residence of the host. The host is absent and the entire home is rented to the guests.

iii. Nonprimary STRs: Rentals of this type are operated in properties other than the primary residence of the host. Renting out of second homes and other properties for commercial purposes fall under this category.

B) Requirement for a License

Whether it is necessary for the host to obtain a license in order to operate STRs. Most of the municipalities require the hosts to have a license.

C) License Fees

How much the license acquisition costs. Theoretically, an expensive fee can act as a deterrent.

D) Zoning

Whether STRs are prohibited in certain areas. Many municipalities restrict STRs in some districts.

E) Limitation of Guests

How many guests can stay at an STR property at a time. Typically, the number of guests allowed to stay is twice the number of the bedrooms.

F) Limitation of Days

How many days of STR operation is allowed at a property in a year. Most municipalities allow the operation for 365 days.

G) Fines for Violation

How costly the penalty for illegal STR operations is. Many municipalities have set a certain amount of fine per day with violation while others would charge a large sum at once.

H) Occupancy Tax

Whether or not and how much tax is levied on STRs. Most cities tax STRs as they do the traditional lodging industry.

Requirements for parking space, property insurance and safety measures such as fire extinguishers and alarms are very common across cities and therefore not considered here.

In the cities studied, STR regulation started quite recently. Many of them started regulating STRs since 2017 while in Boston, Columbus, Los Angeles and Seattle the regulation is to start in 2019. Therefore, a few more years have to pass for the impacts of these regulations on gentrification and quality of life to become subject to empirical assessment. That said, the effectiveness of the regulation can be forecasted by contrasting the measures employed by each city and issues they are facing and examining whether the former is designed proportionally to the latter. If the intensity of gentrification in a city is greater than in other cities, that city would need a stricter regulation of STRs, under the assumption that STRs cause gentrification. On the contrary, cities facing only mild gentrification would miss out the benefits of STRs if their regulations were too restrictive. In the following sections, the relationships between STR regulation and several socioeconomic indicators in the 17 cities are examined to discuss the effectiveness of their regulatory measures. To do so, both qualitative and quantitative measures of the rigor of STR regulation were formed and compared with socioeconomic indicators from various sources, as explained in the next section. As will be seen in the last section, a clear typology of STR regulatory structure as well as a framework to examine the impact of STR regulation have been established as a result of this analysis.

3.3 Data

For assessment of the effectiveness of STR regulation, unique cases across cities must be formalized in terms of a group of variables to be comparable with each other. This task was executed by constructing qualitative and quantitative measures of the strictness of STR regulation. STR regulations of the 17 cities can be classified into 6 approaches (the qualitative term) and rated by their friendliness to STRs (the quantitative term). These values are then compared with several socioeconomic indicators in order to draw hypotheses on how STR

regulation and socioeconomic factors are related to each other which will motivate future empirical studies.

3.3.1 Six Approaches to STR Regulation

Each municipality has a unique scheme to regulate STRs. For example, New Orleans distinguishes Primary Hosted STRs, Primary Unhosted STRs and Nonprimary STRs (Accessory, Temporary and Commercial STRs in their vocabulary) and place restrictions for each category whereas Seattle regulates all types of STRs equally. There are, however, some patterns across the 17 cities and their regulatory approaches can be grouped into 6 approaches:

I. Laissez-Faire Approach

This approach does not place any specific regulation for STRs. San Diego and Washington D.C. do not have STR regulation despite their legislative efforts for reasons discussed later.

II. General Approach

This approach does not differentiate the categories of STRs and regulate them indiscriminatingly. Chicago, Columbus and Seattle take this approach and allow all types of STRs for 365 days.

III. Residence Oriented Approach

This approach restricts Nonprimary STRs strictly: indeed, Boston, Denver, Los Angeles and Portland do not allow this type of STRs at all while Nashville allows them only in designated districts.

IV. Host Oriented Approach

This approach places stricter measures for STRs where the host would be absent, i.e., Primary Unhosted STRs. New Orleans and Salem cap the days their operation is allowed at around 90 days per year.

V. Hybrid Approach

Austin and San Francisco have separate measures to restrict both Primary Unhosted STRs and Nonprimary STRs. Austin allows these types of STRs in only a half of its zoning districts whereas San Francisco allows the former for only 90 days a year and prohibits the latter completely. Ashville and New York also take this approach.

VI. Prohibitive Approach

This approach of regulation is the strictest of all types and makes the operation of STRs very difficult or almost impossible. In the 17 cities, only Oakland takes this approach.

3.3.2 STR Friendliness of the Regulation

There are multiple factors that characterize STR regulations. Nonetheless, a few of them are not suitable for comparison across cities. First, although tax amount would be a good indicator to assess how friendly the regulation is to STRs in theory, it is not the case. The existing hotel tax is applied to STRs in most of the cities. Since hotel tax rate had been determined independently from STR regulation, the tax rate cannot be used for comparison (all of the 17 cities, except for San Diego and Washington D.C. which take the Laissez-Faire Approach, tax STRs, eliminating qualitative difference about the taxation). The fines for violation of STR regulation are practically impossible to normalize for comparison due to the following complications. First of all, some cities set fines per day, i.e., a certain amount for every day STR is operated illegally, whereas cities like Chicago and Columbus stipulate fines of a much

larger amount regardless of the duration of violation. Secondly, in Los Angeles, platforms like Airbnb and HomeAway will be fined instead of hosts, and Seattle fines various amounts from $150 to $500 per day. To complicate the issue further, the amount of fine can vary significantly according to the degree of violation like in the case of New York. Therefore, the fines were not incorporated into the model. Similarly, the number of guests allowed to stay is limited explicitly in some cities while others demand the operators to observe the building code, making the number depend on the structure of the property.

With these situations considered, comparable types of data are days allowed to operate STRs per year, fraction of zonings districts where STRs are allowed (e.g., 0.5 if STRs are allowed in 5 out of 10 districts), and licensing fees per year (the fees are charged annually in most of the cities). Their values vary with the types of STRs, i.e., Primary Hosted, Primary Unhosted, or Nonprimary STRs, in cities taking approaches other than Laissez-Faire, General, and prohibitive Approaches. Thus, first, the friendliness of regulation toward each type of STRs is calculated individually. The sum of their values, then, is STR Friendliness of the city.

The friendliness of regulation for a particular type of STRs, denoted F, is a *principal component series* (Somarriba and Pena, 2009; Ram, 1982), a method widely used to measure quality of life, calculated as follows:

$$F = \delta z - \varphi \tag{3.1}$$

where:

δ is the days the type of STRs is allowed;

z is the fraction of zoning districts where the type of STRs is allowed;

and φ is the fees in USD charged for the type of STRs annually.

For example, the friendliness of the regulation of Primary Hosted STRs in Austin is $365 \times 1 - 285 = 80$ (Primary Hosted STRs are allowed for all year in all districts and the licensing fee costs $285). While F is set to be an increasing function of δ and z, it is set to decrease as φ increases, following basic economic assumptions. While it is possible to weigh the variables δz and φ with certain factors based on a particular theoretical deliberation, no weight was applied in this investigation.

Adding the scores of friendliness for all of the three types of STRs, with some modification, the STR Friendliness of a particular city is calculated as follows:

$$STR\ Friendliness = \frac{F_h + F_u + F_n + C}{\theta} \tag{3.2}$$

where:

F_h is the friendliness of the regulation of Primary Hosted STRs;

F_u is the friendliness of the regulation of Primary Unhosted STRs;

F_n is the friendliness of the regulation of Nonprimary STRs;

C and θ are factors to bound STR Friendliness between arbitrary values.

Here, the score of STR Friendliness was set to vary between 0 and 5, and after calculating the STR Friendliness for all of the cities, C turned to be 1095 and θ to be 500. The values of these factors would change if the same model is applied with an alternative choice of the boundary of STR Friendliness and/or with a different sample of regulation. The maximum values are

found for San Diego and Washington D.C., for the lack of regulation in these cities with Laissez-Faire Approach. Oakland has a zero value since it bans STRs.

3.3.3 Socioeconomic Indicators

In order to study how STR Friendliness is associated with housing affordability, the annual growth rates of home rent for the cities were calculated using the data from American Community Survey available at the US Census Bureau website. For the inherent error of the survey results based on sampling, 5-year-average data prepared by the Bureau instead of annual raw data were used: e.g., the average of the 2008-2012 period was used for the year 2012. The annual growth rent of home rent is derived as:

$$(\frac{1}{6}) \times \ln(\frac{Home\ rent\ in\ 2017}{Home\ rent\ in\ 2012}).$$

(3.3)

Hong and Lee's (2018) empirical study found evidence that the higher the hotel tax rate of the city, the more restrictive the STR regulation tends to be. As discussed in the introduction, STRs can act as competitors and be disruptive to the traditional lodging businesses (Farronato and Fradkin, 2018; Zervas et al., 2017; Varma et al., 2016). In this study, the ratio of the lodging industry in the total payroll of a city in 2016 derived from U.S. Census Bureau's 2016 County Business Patterns data is used to represent the weight of the industry to local economy. For example, the payroll of the lodging industry in Asheville in 2016 was $76,643,000 and this is 1.51% of the total payroll of the city in the year: $5,085,185,000. In relation to the lodging industry, the tourism attraction of the 17 cities, as a factor that could potentially influence STR Friendliness, had been examined using NAICS Code 713, an indicator of local amusement,

gamble, and recreation industries within US Census database. However, no correlation between STR Friendliness and the indicator was observed.

3.4 Results

As noted at the end of the introduction, the variables elucidated in the previous section were compared with each other, especially STR Friendliness with other variables, to explore the relationships between the rigor of STR regulation and socioeconomic factors. Since the number of observations in this investigation is only 17, "eyeball estimation" of scatter plots was used instead of regression analysis.

First, the relationship between the qualitative and quantitative aspects of STR regulation is shown in Figure 3; the vertical axis represents STR Friendliness, the horizontal the 6 approaches. It may be counter intuitive that Austin and San Francisco, taking the Hybrid Approach, are more Airbnb friendly than those taking Host Oriented Approach, i.e., New Orleans and Salem, and Los Angeles which takes Residence Oriented Approach. This result is due to the fact that the former do not have zoning restriction while New Orleans and Salem do, and Los Angeles caps the days both Primary Hosted and Primary Unhosted STRs are allowed at 120 days a year. Despite such intricacy, Figure 3 shows the general positive relationship between the qualitative and quantitative measures of strictness. Thus in the following discussion, STR Friendliness is used solely as the indicator of strictness of STR regulation.

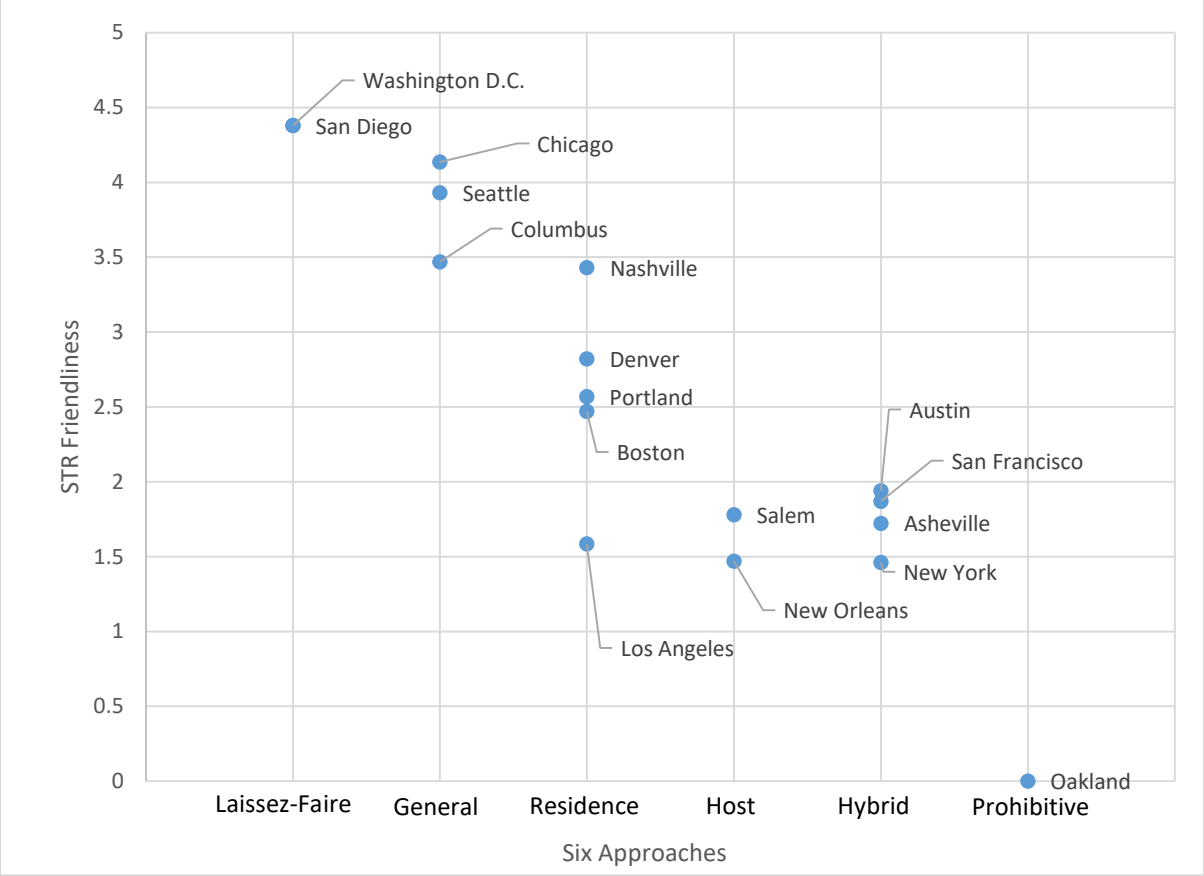

Figure 3. STR Friendliness and Six Regulatory Approaches

Figure 4 shows the correlation between STR Friendliness and the growth of home rent. No linear relationship is seen in the graph: cities with various annual home rent growth rates are found to be close in terms of friendliness to STRs. This result represents the difficulty in isolating the effects of STRs from other factors influencing the housing market, the problem pointed out in existing studies (Stors and Kagermeier, 2017; Ioannides et al., 2018).

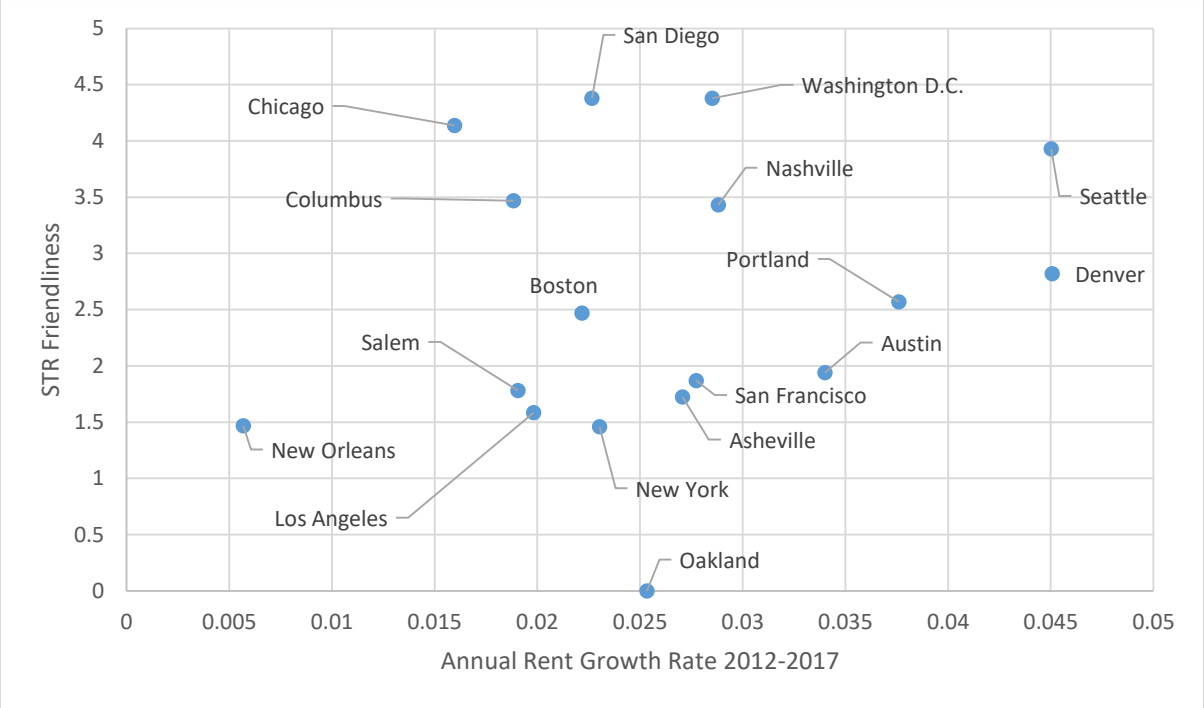

Figure 4. STR Friendliness and Home Rent

The ratio of the lodging industry in the payroll of the city, on the other hand, suggests a potential correlation with STR Friendliness [Figure 5]. For cities where the contribution of the lodging sector to economy is under 1%, the ratio seems to have little to no effect on STR Friendliness. However, those the ratio of which exceeds 1% tend to have lower friendliness to STRs, with the outlying San Diego which abolished proposed STR regulation with a referendum (Weisberg, 2018; Martineau, 2019a). Again, future empirical studies are necessary to draw a solid conclusion, but STR Friendliness and the significance of the lodging industry may have a hyperbolic relationship, i.e., the effect of lobbying by the industry stays negligible as long as they constitute below 1% of the local economy.

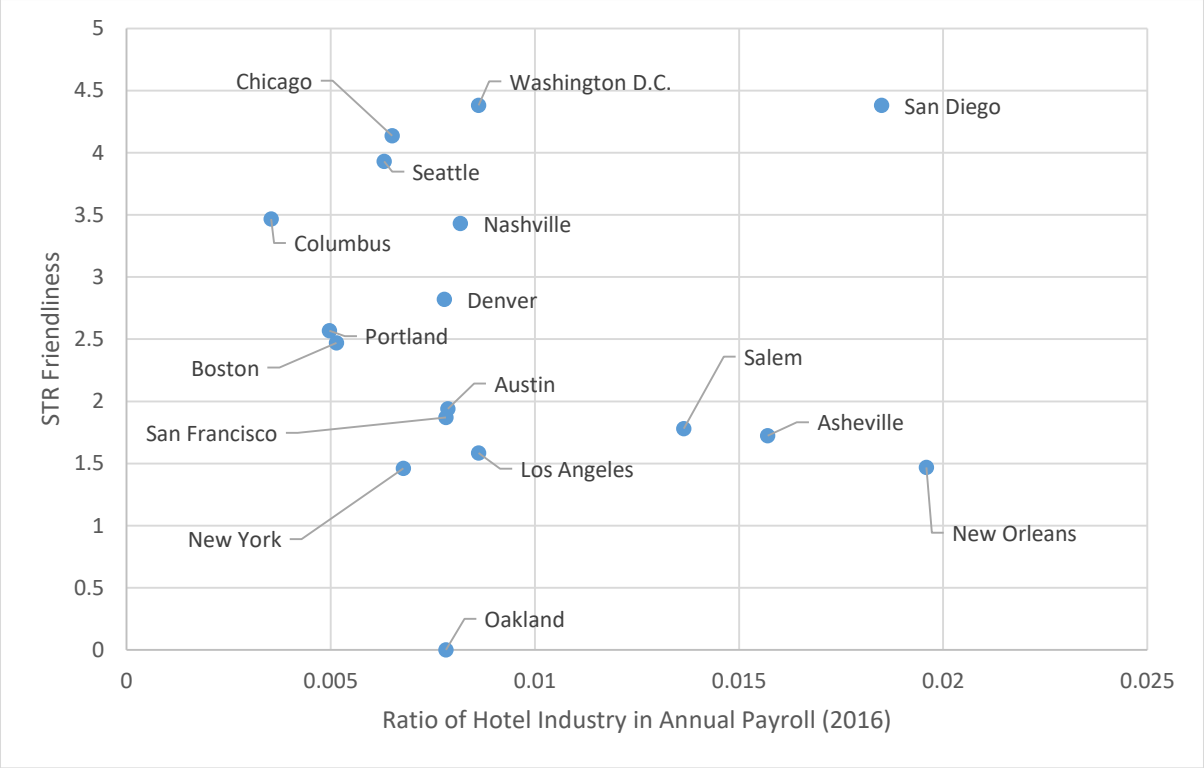

Figure 5. STR Friendliness and Local Hotel Industry

3.5 Conclusion of Chapter 3

The rigor of STR regulation can be assessed qualitatively and quantitatively with measures based on the values of regulatory variables, such as specific limits for STR operation and unique amounts of fees and fines. Although the rigor matches with the negative impacts of STRs on hotel industry, it does NOT with those on rent increase.

Stricter regulation of STRs is necessary to address housing shortage and cities with faster growth of rent indicates the lack of affordable housing. As discussed in Chapter 2, STR regulation of a city influences that of other cities. Policymakers in different cities can compare their own regulation with each other and adjust the values of the regulatory variables according to the situation faced by the residents.

4 THE EFFECTS OF SHORT-TERM RENTAL REGULATION

4.1 Aim of Chapter 4

The last research question of the study is concerned with whether the existing STRs regulation has reached the aim set by local policymakers. In a recent impact assessment of STR regulation, Valentin (2019) investigated how STR regulation found a significant reduction of Airbnb listings in districts of New Orleans where STR operation is restricted and hypothesized that STR regulation may be an effective tool to tackle gentrification by lowering rent. On the other hand, in a case study of Santa Monica, Chaves Fonseca (2019) studied the effects of STR regulation on Airbnb listings and rent; he found negative impacts of the regulation on the listings (i.e., expected reduction of the listings) but found no effect on rent. He also discovered that, within a year from the implementation of STR regulation, Airbnb listings, having dropped significantly once, rose back to the former level. Further studies are called for to understand how STR regulation works.

This chapter examines the effects of the STR regulation in San Francisco, California, the first city to legalize and regulate STRs in 2015. Like the case studies in New Orleans and Santa Monica, it investigates how the implementation of STR regulation affects the number of Airbnb listings, home values and rent. Furthermore, the study seeks to uncover the effects of the regulation on evictions of tenants by homeowners, as they are important part of the process of STR-led gentrification (Coelho et al., 2016). The next section provides a review of the STR regulation in San Francisco including its background, development and structure. Next, the method of investigation, which involves both time-series and panel analyses, is explained. After an examination of the results, the chapter is concluded with key insights from the authors' interviews with stakeholders and practitioners of the STR regulation in San Francisco along

with policy recommendations for containing the promulgation of STRs within a harmless extent.

4.2 Housing Shortage in San Francisco

The city of San Francisco has been struggling with its well-known "housing crisis": the city's one-bedroom median rent ($3,700) and median home price ($1.3) are the highest in the United States (McCamy, 2019, Gibson, 2019). According to San Francisco Homeless Count & Survey Comprehensive Report 2019, there are around 8000 people experiencing homelessness in the city of the population of roughly 800,000. Critics argue that the crisis was fomented over a century as the city has favored interests of developers and property owners rather than public housing (Baranski, 2019; Hartman and Carnochan, 2002). Their analyses are consistent with earlier criticism of San Francisco's urban development steeply inclined for private interests: Jackson (1987) had pointed out that San Francisco's citywide zoning policy introduced in 1920 in a reaction to the 1906 earthquake "was a device to keep poor people and obnoxious industries out of affluent areas… They sought minimum lot and setback requirements to ensure that only members of acceptable social classes could settle in their privileged sanctuaries". The former director of the San Francisco Planning Department Amit Ghosh admits "the underlying use of zoning to segregate people and income levels is undeniable. It was part of the original intent" (Oatman-Stanford, 2018). The city's Planning Department released a general plan in 1945 which identified "blighted" working-class neighborhoods as older parts of a machine needing replacement and drafted plans to replace them and part of Golden Gate Park with a system of elevated freeways; citizen activists petitioned with more than 30,000 signatures and halted the project by the end of the 1950s. At that moment, neighborhood coalitions and environmentalists proved powerful and started to influence San Francisco's urban planning dominated by

developers and businesses theretofore. As a result, the 1960 zoning code of the city was catered to homeowners in affluent neighborhoods around the city's fringe, and the 1971 Urban Design Plan and the 1978 Residential Rezoning of the city focused on preserving and improving the livability in those neighborhoods (Oatman-Stanford, 2018).

Such was also the state level trend of that decade, epitomized by the 1970 California Environmental Quality Act, and Sowell (2010) contends that these policies were the main drivers of the extensive increase of housing values that led to the Great Recession. Since then, most areas of San Francisco are left with the restriction that residential buildings must be under 40 feet with no more than three units, and even projects that meet these criteria have been easily stopped and scrapped with discretionary reviews, the process in which virtually any individual can file a complaint and intervene with construction projects for reasons such as that a new building would cast a shadow over the edge of their garden. Critics have pointed out that homeowners have been abusing discretionary review in order to increase the values of their properties by keeping the housing supply lower than the demand (Oatman-Stanford, 2018). As a result, the Bay Area lost a net total of around 35,400 people between 2013 and 2017 without counting births and arrivals from other countries, and a 2019 poll conducted by organizations in the area found that 44% of surveyed individuals were likely to leave the area within a few years due to the housing and living costs (Deruy, 2019). Zillow Rent Index shows that the median rent in San Francisco peaked around the end of 2016 and has been fluctuating at around a slightly lower level to date: it may not be an overstatement for Gibson (2019) to say that San Francisco has passed its Golden Age.

4.3 STR Regulation in San Francisco

Struggling with the housing shortage as discussed above, tenants in San Francisco fiercely opposed the legalization of STRs which would further deplete already insufficient housing supply. The Ordinance 218-14, a.k.a. the Airbnb law, passed and received the mayor's signature in October 2014, leading to the regulation of STRs as legal businesses (Stone, 2017). STR hosts were required to obtain a license for $250 annual fee and allowed to operate only with their primary residences; the operation of STRs without the host's presence, i.e., renting out of the entire home, was limited to 90 days per year, while the maximum number of guests per night was set at five people; the hosts were also required to pay 14% transient occupancy (lodging) tax; illegal operations would be fined $484 per day. Seeking a stricter regulation, a local coalition of housing activists and the hotel industry called Sharebetter SF spent $1 million to initiate a ballot called Proposition F (Cutler, 2015). Airbnb's global head of public policy Chris Lehane deployed a team of campaign organizers with an $8 million budget to mobilize the local user base group called San Francisco for Everyone. Joined by the Home Sharers Democratic Club, an organization of STR hosts in the city led by a semi-retired lawyer Peter Kwan, they succeeded to dismiss Proposition F with 67,000 votes against the 15,000 signatures for the proposition (Gallagher, 2017; Stone, 2017).

The enforcement of the law started in February 2015. In the mid-April, San Francisco's Planning Department announced that hosts were not complying: only 455 hosts registered to obtain an STR license while there were estimated to be 5000 hosts in the city (Marzorati, 2015). Taking control of the Board of Supervisors (city council) in June 2016, Sharebetter SF managed to place Ordinance 105-16 to require STR platforms to eliminate illegal listings; Airbnb, together with another STR platform HomeAway, sued the city of San Francisco (Conger, 2016). In August, the city responded with Ordinance 178-16 to make listing unlicensed STRs a

misdemeanor that would punish the platforms with a fine of $1,000 per night for each illegal operation; Airbnb and HomeAway renewed their motion, suing the city for the latter ordinance in September. Airbnb had sued New York for a similar regulation as well, but in December, dropped its litigation. In May 2017, the company also dropped its joint litigation with HomeAway against San Francisco and reached a settlement with the city.

During this legal battle, STR listings in the city kept growing. Figure 6 visualizes the STR density, i.e., the ratio of entire home Airbnb listings in April 2017 estimated by Inside Airbnb, a non-profit STR watchdog, to total housing units reported in American Community Survey 5-year estimates (2013-2015) in 27 zip codes of San Francisco. A month before Airbnb and HomeAway reached an agreement with the city, STRs had become so rampant that STR density reached 5% in the Mission and 3% in several districts. These rates were much higher than those in 2015 and 2016 as shown below. However, as Airbnb complied with the city's requirement of the elimination of illegal STR operation, the company deleted its listings by half as the regulation entered force in January 2018 (Said, 2018).

Although media coverages of this drop of listings imply the effect of the new STR regulation, within a year from the implementation of the regulation, Airbnb listings resurged to the former level: the effect of the regulation seems to be short lived. To draw a solid conclusion over this suspicion, a quantitative analysis of relevant data was conducted. In the rest of the chapter, the methodology, results and conclusion of the analysis follow in the order.

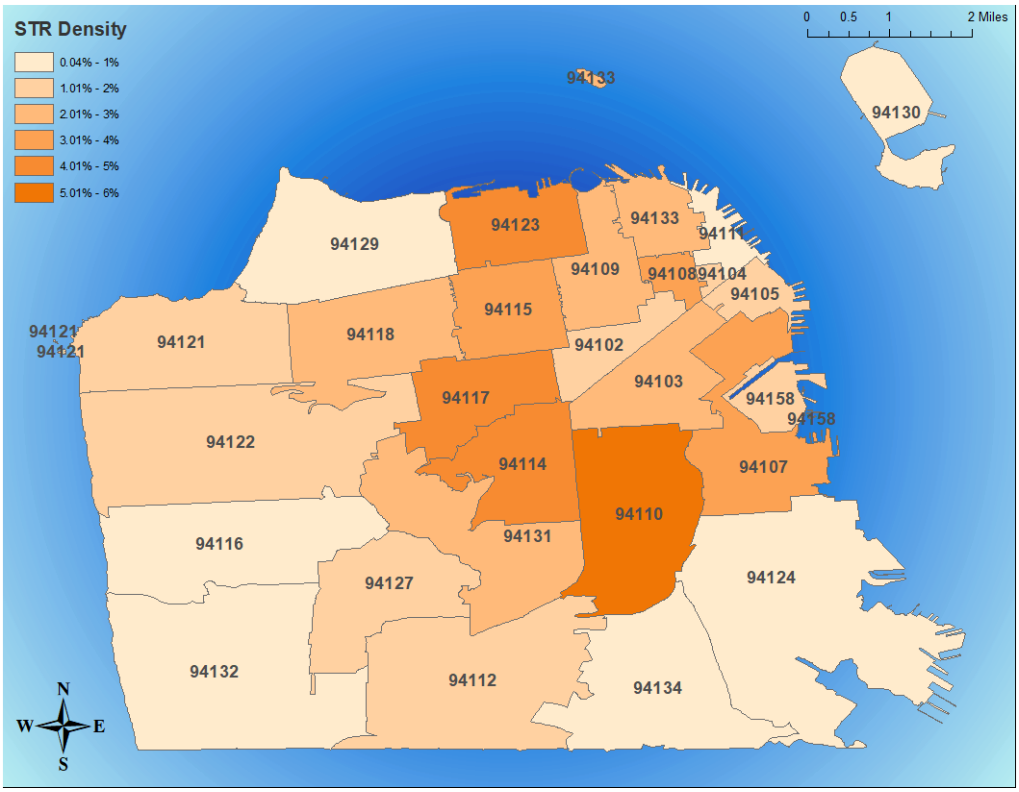

Figure 6. Peak STR Density in San Francisco within Data Period (April 2017)

4.4 Methods

4.4.1. Interrupted Time Series and Panel Analyses

While the experimental study design with randomized controlled trials (RCTs) is considered the ideal approach to measure the effects of interventions, public policies targeting the entire population of interest without leaving comparable control groups, such as the case of the STR regulation in San Francisco, require quasi-experimental alternatives for investigation; interrupted time-series (ITS) analysis is one of the most well established methods for this purpose (Kontopantelis et al., 2015; Linden, 2015; Bernal et al., 2017) and suitable for studying the effects of public interventions (Bernal, 2017; Briesacher et al., 2013; Muller, 2004) with a clear time period of implementation like the case at hand starting in the beginning of January

2018. Given multiple observations in both the preintervention and postintervention periods in the data, ITS will provide a high degree of internal validity (Linden, 2015; Shadish et al., 2002; Campbell and Stanley, 1966). Therefore, ITS analysis was used to estimate the effect of the STR regulation on San Francisco as a whole; in order to take the heterogeneity among the zip codes shown in Figure 1 and Figure 2 into consideration, a panel data analysis with fixed effects (FE) and random effects (RE) models (Greene, 2008; Baltagi, 2008; Bell et al., 2019), also frequently used for studying policy interventions (Bell et al., 2019), was conducted. Both analyses used the software R (3.6.1), and the codes shared by Bernal et al. (2017) were applied with necessary modification for the ITS analysis.

4.4.2 Data

Table 1 summarizes the descriptive statistics of the data. The panel data of 5 variables for 27 zip codes in San Francisco from May 2015 to March 2019 were collected (the original data of houses sorted by census tracts were reclassified with zip codes using the USPS zip code crosswalk files provided by the U.S. Department of Housing and Urban Development). The values of str were obtained from Inside Airbnb, an organization that scrapes and publicly share data of Airbnb listings in dozens of cities in the world including San Francisco monthly. The numbers of houses, entertainment and recreational facilities, and food and drink services are estimates reported by the U.S. Census Bureau. The open source Data SF lists a plethora of data sets related to San Francisco, and numbers of civic arts and tenant evictions were adopted for the study. Finally, home prices and rents were retrieved from Zillow Indices. A database of panel data with these variables were constructed with MySQL (5.0.12) from which the time-series data were aggregated [Table 1]. There are 47 time periods in the dataset while STR and str have missing observations in 7 periods.

Table 1. Summary Statistics of Data for the Analyses

Variable	Description	Mean	Median	Minimum	Maximum	Sources
	Panel Data for 27 Zip Codes in San Francisco, May 2015 - March 2019					
str	Number of housing units that are listed on Airbnb for entire home rental in a zip code.	235.95	160	0	2509	Inside Airbnb
houses	Number of housing units in a zip code. The amount is invariant across the data period.	26350	25130	1350	59429	U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
naics71	Number of establishments of arts, entertainment and recreation in a zip code.	18.89	15	1	59	U.S. Census Bureau, 2012 Economic Census
naics722	Number of establishments food and drink services in a zip code.	137.3	141	2	337	U.S. Census Bureau, 2012 Economic Census
civicart	Number of civic arts in a zip code.	32.04	26	0	126	Data SF
eviction	Number of evictions that occurred in a zip code.	5.829	4	0	245	Data SF
price	Home price per square foot in a zip code.	1029.2	1064.5	522	1467	Zillow Home Value Index
	Time Series Data for San Francisco, May 2015 - March 2019					
STR	Sum of *str* of all zip codes.	6371	5212	2601	17050	Inside Airbnb
HOUSES	Sum of *houses* of all zip codes.	711462	711462	711462	711462	U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates
EVICTION	Sum of *eviction* of all zip codes.	157.4	146	86	434	Data SF
PRICE	Mean value of price of all zip codes.	1029.2	1021.2	917.7	1104.4	Zillow Home Value Index

4.4.3 Models

A harmonic quasi-Poisson regression was used for the ITS analysis to address the autocorrelation from seasonality and overdispersion in the data (Chatfield, 2003; Bernal et al., 2017) in the following form:

$$lnSTR_t = \beta_0 + \beta_1 Regulation_t + \beta_2 Time + \beta_3 Regulation_t * Time + \gamma\cos(\frac{\pi}{6}t) + \delta\sin(\frac{\pi}{6}t) + u_t \quad (4.1)$$

where *Regulation* is the dummy variable for the STR regulation (= 1 from January 2018 onward), *Time* is literally the passing of time, $\gamma\cos(\frac{\pi}{6}t) + \delta\sin(\frac{\pi}{6}t)$ is the harmonic term that captures the fluctuation due to seasonality with the frequency $\frac{\pi}{6}$ or $\frac{2\pi}{12}$ derived from a full cycle divided by 12 months, and *u* denotes the residuals. Alternatively, regression with *lnEviction* as the dependent variable was run as well. Since the regulation reportedly had immediate effects (Marzorati, 2015), time lag is not included in the model. It is assumed here that time-varying unmeasured cofounders change slowly enough so that the effects of the regulation can be distinguished from theirs (Linden, 2015).

From an overview of the panel data [Figure 6], it is assumed that there are time-invariant factors affecting the STR density; first, regression of *strdensity*, i.e., *str*/*houses*, to *Regulation* was conducted with the following simple FE model:

$$strdensity_{it} = \beta_1 regulation_{it} + \alpha_i + u_{it} \quad (4.2)$$

where α_i is the unique intercept for each zip code embodying the time-invariant effects of unobserved variables and u_{it} the error term for each observation. Then, an alternative estimation with additional variables are run in the following form:

$$strdensity_{it} = \beta_1 regulation_{it} + \beta_2 \overline{price}_i + \beta_3 attraction_i + \delta_1 T_1 + \delta_2 T_2 + \cdots + \delta_{46} T_{46} + \alpha_i + u_{it} \quad (4.3)$$

where $\overline{price}_i$ is a proxy for time-invariant STR user attraction of each zip code based on hedonic demand theory (Chen and Rothschild, 2010; Wang and Nicolau, 2017; Dogru and Pekin, 2017; Bell et al., 2019), $attraction_i$ is the sum of *naics71*, *naics722*, and *civicart* representing the neighborhood attractiveness to tourists (Stern et al., 2010; Aquino et al., 2012), and T_ts are dummy variables indicating each period (month) to account for seasonality and detect the effects of STR regulation from January 2018 in case it is time-specific rather than permanent causing $regulation_{it}$ to be biased and inconsistent (Kumbahkar, 1991). In the RE alternatives, α_i is replaced with $a + \varepsilon_{it}$ where a is the universal intercept and ε_{it} is the time-variant effects of unobserved variables. *Rent* was not used in the estimation due to its smaller variation across zip codes: the rent control policy in the city has likely caused this.

F-test was used to determine whether the FE specifications have significant effects in comparison with OLS. Similarly, the RE models were compared with their OLS counterparts with Breusch-Pagan Lagrange multiplier (LM) test. Finally, in order to evaluate the difference between the FE and RE models, Hausman test was conducted.

4.5 Results

4.5.1 ITS Analysis

Table 2 shows the result of the ITS harmonic regression. The estimated effect of the STR regulation on Airbnb listings is a 96% decrease ($\exp(\beta_0 - \beta_1)/\exp(\beta_0) \approx 0.04$). Remarkably, the regulation not only reduced the listings immediately but also kept the number at a very low level during the summer, the peak season, exhibiting its potency. However, the effect was soon cancelled out by the increased pace at which the listings grow in the post-intervention period (captured by Regulation*Time, the interaction term); like in the case of Santa Monica, the negative effect of STR regulation on Airbnb listings was short lived. In January 2018, the actual STR density dropped far below the forecast for the counterfactual San Francisco with no regulation represented by the dotted line in Figure 7.

Table 2. Results of the Interrupted Time Series Analysis

Intercept	8.509879***
	(0.193715)
Regulation	-3.148763***
	(1.134496)
Time	0.017729*
	(0.008997)
Regulation*Time	0.060838**
	(0.028355)
Gamma	0.078820
	(0.087834)
Delta	-0.180861*
	(0.089321)
Time Periods	40
R-Squared	0.3691

Notes: standard errors are in parenthesis; ***p<0.01, **p<0.05, *p<0.1

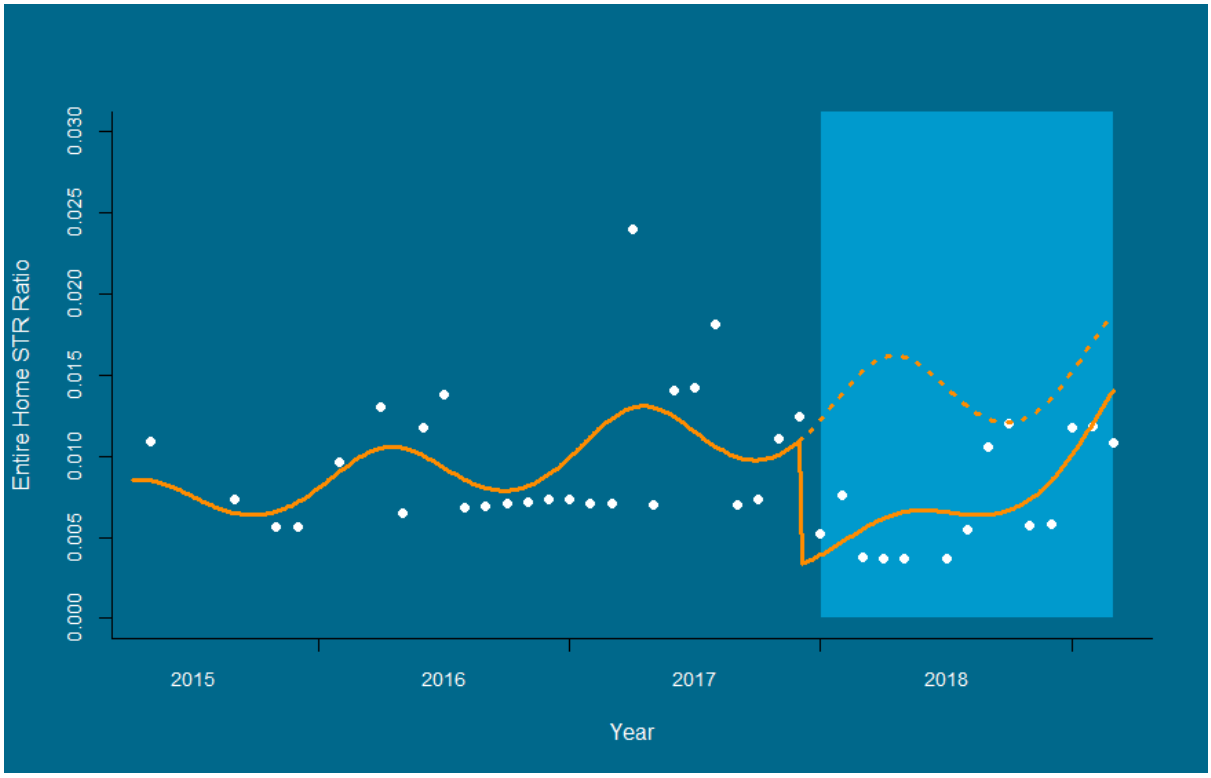

Figure 7. STR Density in San Francisco (white dots = observed STR Density; orange solid line = prediction by the model; orange broken line = prediction of the counterfactual with no regulation)

Nevertheless, the actual STR density resumed its growth and bounced back to the level of the pre-intervention period within a few months; the potential reason for this will be discussed in the concluding section. Figure 8 illustrates the regression of the eviction rate (number of evictions / number of housing units) to the same explanatory variables. Here the effect of the regulation is not clear. It seems that the eviction rate in the city has been decreasing over time regardless of the regulation. This may imply that the pool of tenants susceptible to displacement is shrinking due to displacement in the past.

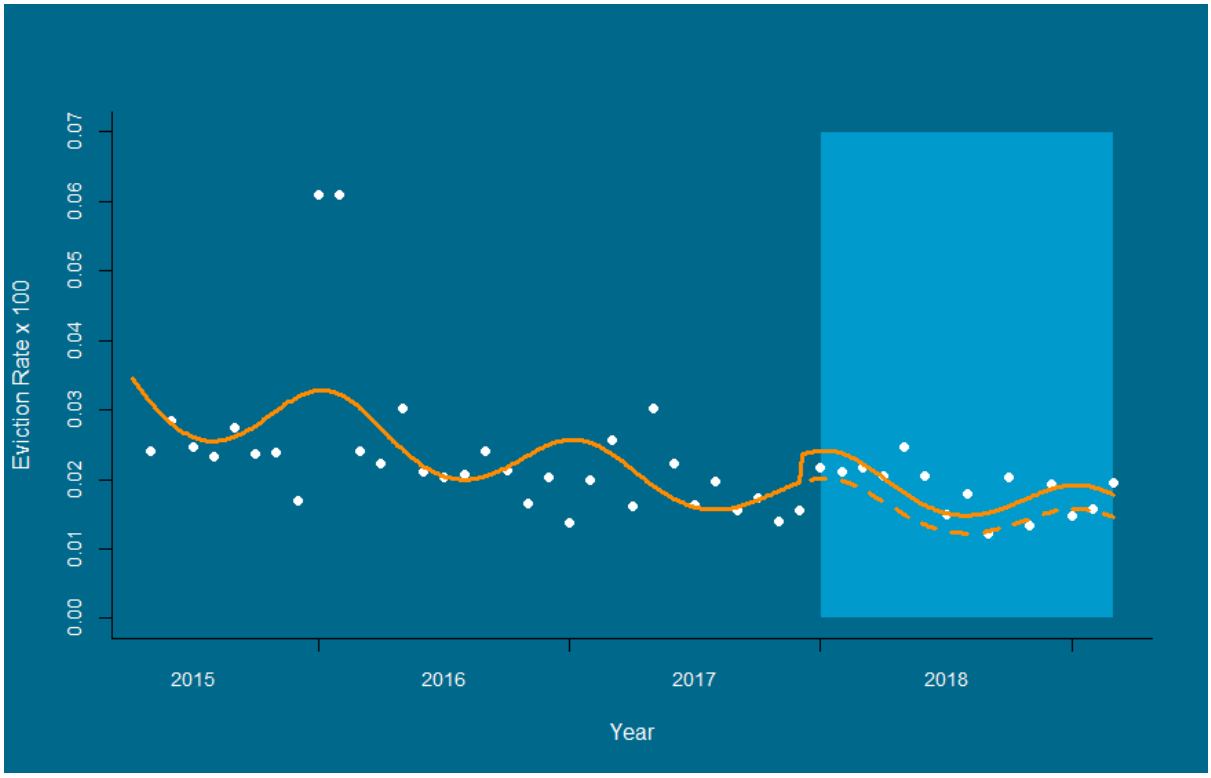

Figure 8. Eviction Rate in San Francisco (white dots = observed STR Density; orange solid line = prediction by the model; orange broken line = prediction of the counterfactual with no regulation)

4.5.2 Panel Analysis

Table 3 shows the results of FE and RE regression besides OLS and the test statistics. The simple regression of STR density to the regulation with Equation 4.2 indicates a slight negative effect of 0.2 percentage points as the density rose again toward the end of 2018. In the regression with Equation (4.3) with additional variables, however, the short-lived effect of the regulation was captured by the time dummy coefficients which indicate 0.7 percentage point decrease of STR density during the early 2018, which are much lower compared to the same season in the previous year. Furthermore, a $100 increase in the mean home price per square foot and an increase of tourist attractions by 100 items are correlated respectively with 0.06

and 0.1 percentage point increases in STR density of the zip code; higher hedonic values of a zip code predict STR concentration therein.

Hausman Test result does not reject the null hypothesis that the FE and RE estimates are distinct: unobserved characteristics of the zip codes influencing the STR density have not affected the effects of the STR regulation. It can be observed in Figure 9 as well that the regulation had effects on all zip codes homogeneously from the spring to summer 2018.

Table 3. Results of the Panel Analysis with Equation (4.3)

	OLS	FE	RE
regulation	-0.0010473	0.00035476	-0.00018893
	(0.0013755)	(0.0010467)	(0.00097523)
price	0.000011328***	0.000003194	0.00000635*
	(0.0000008)	(0.000004)	(0.0000028)
attraction	0.000010493***	-	0.000013531†
	(0.000001)	(dropped)	(0.000007)
time21 (January 2017)	-0.0039604**	-0.0032649***	-0.0035346***
	(0.0013694)	(0.00089786)	(0.00087818)
time22 (February 2017)	-0.0042393**	-0.003508***	-0.0037916***
	(0.0013696)	(0.00090341)	(0.00088172)
time23 (March 2017)	-0.0044167**	-0.0036382***	-0.0039401***
	(0.0013699)	(0.00091107)	(0.0008866)
time24 (April 2017)	0.011383***	0.012226***	0.011899***
	(0.0013703)	(0.00092213)	(0.00089368)
time25 (May 2017)	-0.0045816***	-0.0036676***	-0.004022***
	(0.0013708)	(0.00093533)	(0.00090217)
time26 (June 2017)	0.0019107	0.0028844**	0.0025068**
	(0.0013713)	(0.00094701)	(0.00090971)
time27 (July 2017)	0.0020414	0.0030547**	0.0026618**
	(0.0013716)	(0.0009551)	(0.00091495)
time28 (August 2017)	0.005467***	0.0065139***	0.0061079***
	(0.0013719)	(0.00096214)	(0.00091952)
time29 (September 2017)	-0.0049078***	-0.0038179***	-0.0042405***
	(0.0013723)	(0.00097143)	(0.00092557)
time30 (October 2017)	-0.0046614***	-0.0035152***	-0.0039597***
	(0.0013728)	(0.00098399)	(0.00093378)
time31 (November 2017)	-0.0010147	0.00015755	-0.00029704
	(0.0013731)	(0.00098997)	(0.00093771)

time32 (December 2017)	0.00022356	0.0013857	0.00093501
	(0.001373)	(0.00098763)	(0.00093617)
time33 (January 2018)	-0.0055486***	-0.0057699***	-0.0056841***
	(0.0013676)	(0.00084928)	(0.00084762)
time34 (February 2018)	-0.0033845*	-0.003554***	-0.0034883***
	(0.0013675)	(0.00084695)	(0.00084617)
time35 (March 2018)	-0.0070508***	-0.0071854***	-0.0071332***
	(0.0013674)	(0.00084572)	(0.00084541)
time36 (April 2018)	-0.0072153***	-0.0073254***	-0.0072827***
	(0.0013674)	(0.00084504)	(0.00084498)
time37 (May 2018)	-0.0072947***	-0.0073635***	-0.0073368***
	(0.0013674)	(0.00084418)	(0.00084445)
time39 (July 2018)	-0.0074433***	-0.0074332***	-0.0074371***
	(0.0013674)	(0.00084364)	(0.00084411)
time40 (August 2018)	-0.0054885***	-0.0054482***	-0.0054638***
	(0.0013674)	(0.00084382)	(0.00084422)
time41 (September 2018)	-0.00060434	-0.00052504	-0.00055579
	(0.0013674)	(0.00084436)	(0.00084456)
time42 (October 2018)	0.00065347	0.00077005	0.00072484
	(0.0013674)	(0.0008452)	(0.00084508)
time43 (November 2018)	-0.0052518***	-0.0051403***	-0.0051835***
	(0.0013674)	(0.00084507)	(0.000845)
time44 (December 2018)	-0.0050462***	-0.0049452***	-0.0049844***
	(0.0013674)	(0.00084481)	(0.00084484)
time45 (January 2019)	0.00092917	0.0010288	0.00099017
	(0.0013674)	(0.00084478)	(0.00084482)
time46 (February 2019)	0.001051	0.0011171	0.0010915
	(0.0013674)	(0.00084414)	(0.00084442)
Obs.	27	27	27
Time periods	40	40	40
R-Squared	0.52233	0.6606	0.65624
F-Test (FE vs OLS)	-	68.89***	-
LM Test (RE vs OLS)	-	-	84.385***
Hausman Test (X^2)	-	-	2.035

Notes: standard errors are in parenthesis; ***p<0.001, **p<0.01, *p<0.05, †p<0.1. The coefficients of the time variable are sellectively presented here to show the indication of the impact of STR regulation in 2018 in comparison with the values in 2017.

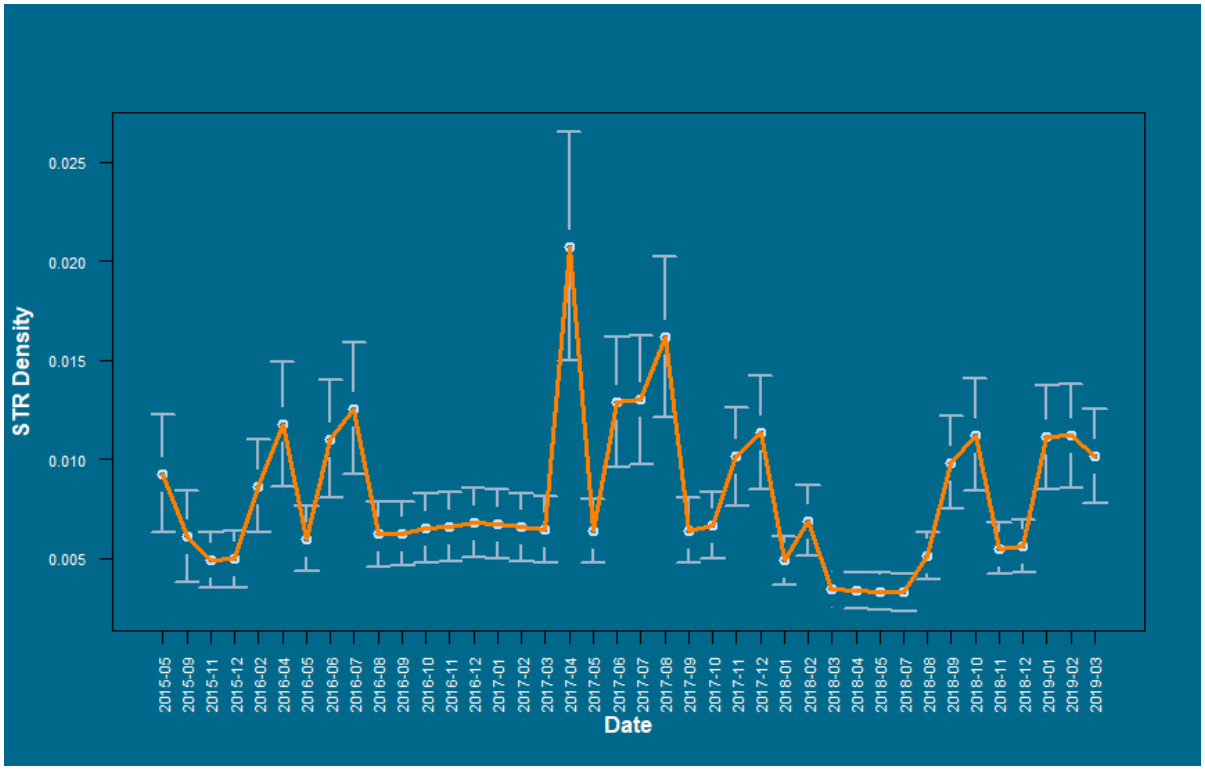

Figure 9. STR Density of 27 Zip Codes over the Data Period (vertical bars indicate 95% confidence)

The most remarkable finding in this investigation besides the effect of the STR regulation is very high STR densities in around the districts of Mission, Castro, Haight-Ashbury, Embarcadero and Chinatown (zip codes 94110, 94114, 94117 and 94104, see Figure 10). Interestingly, these districts are featured as the most notable places worth exploring in the city by Lonely Planet (Stimac, 2019). Furthermore, Brandt et al. (2017) analyzed Twitter messages sent from San Francisco between August 1 and October 31, 2013 and found that "high Twitter activity… can be observed in the entire greater downtown area, including iconic neighborhoods such as Mission, Castro, Haight-Ashbury, and stretches of Golden Gate Park", corroborating the findings of this study.

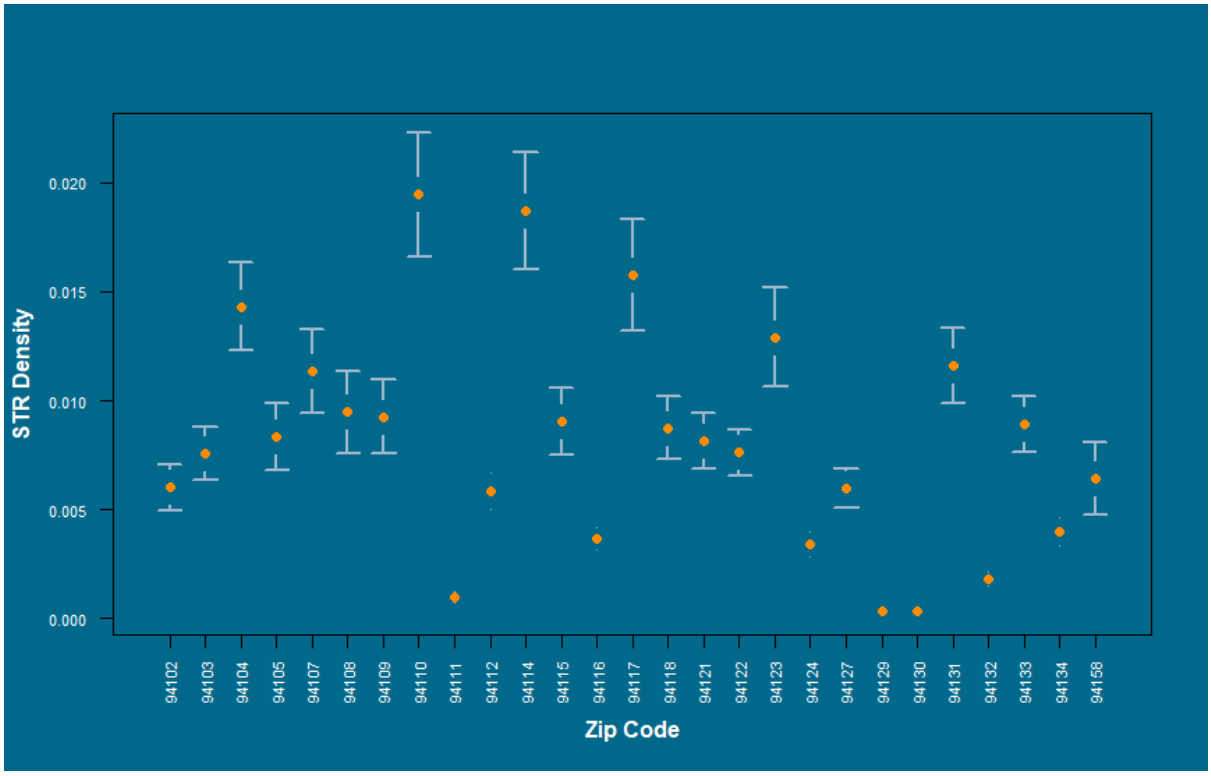

Figure 10. STR Densities in 27 Zip Codes (vertical bars indicate 95% confidence)

One of the reasons for the comeback of Airbnb listings after the regulation is a loophole discussed when the author interviewed San Francisco Tenant Union. According to their explanation, it is becoming a common practice for STR hosts to advertise their properties on platforms like Airbnb for a period longer than 30 days, which by definition is not STRs and therefore immune to STR regulation; after booking a rental, guests cancel a number of days to shorten their stay with refunding from their host. An increase of long-term rentals on Airbnb in the post-regulation period was also discussed in the authors' interview with the Office of Short-Term Rentals of San Francisco.

Observational data verify their claim. Figure 11 shows the monthly average of minimum nights set by Airbnb hosts calculated from the data of listings retrieved from Inside Airbnb. If a host sets the minimum night at 3, for example, the guest has to book at least 3 nights to stay

at the property. From 2015 to the middle of 2017, the average minimum nights fluctuated slightly around 5 nights[7]. However, the number started to hike a month or two before the beginning of the implementation of the STR regulation and jumped to above 15 nights in the August, in correspondence with the sudden comeback of Airbnb listings (Figure 7). It is unconceivable that STR guests suddenly started to stay three times longer on average in San Francisco from the summer of 2018; the dramatic increase of minimum nights can be regarded as the evidence of hosts in the city taking advantage of the loophole to circumvent the regulation.

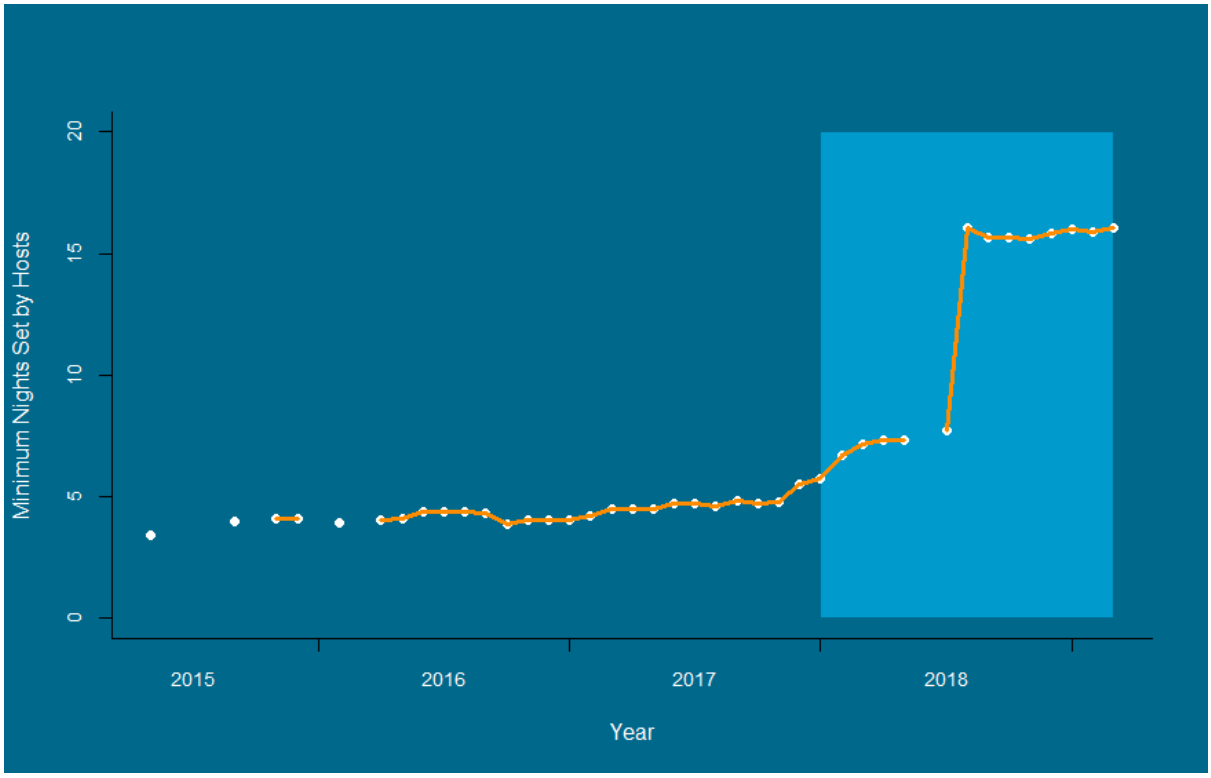

Figure 11. Monthly Average Minimum Nights Set by Airbnb Hosts in San Francisco

[7] There are a few (4 or 5 depending on the month) Airbnb listings with an extremely large number of minimum nights such as 450, 999, or even 100000000, that started to appear in 2017. Below these was 365 nights or one year, which was chosen as the threshold for outlier exclusion, and those extraordinary listings were omitted from the calculation of the average minimum nights to draw a consistent trajectory.

4.6 Conclusion of Chapter 4

The chapter investigated whether the STR regulation in San Francisco successfully achieved the aim of reducing STR listings (by eliminating illegal operation). Similar to Chaves Fonseca's (2019) Santa Monica study, this case study of San Francisco found a short lived negative effect of STR regulation on Airbnb listings. This is at least partly due to a loophole of booking more than a month then canceling with a refund according to the practitioners of the regulation. STRs concentrate in neighborhoods with higher amenity and attraction. STR regulation will be more effective if these factors are taken into consideration for the design of regulation.

Wegmann and Jiao (2017) proposed four principles of effective STR regulation: 1) utilization of web scraping for monitoring the compliance, 2) limiting the concentration of STR listings in certain areas, 3) employing dedicated staff for the enforcement, and 4) distinguishing types of STR operators, between "moms-and-pops" hosts and commercial hosts. Currently, the regulation in San Francisco is in accordance with principles 1, 3 and 4: the Office of Short-Term Rentals is dedicated to the enforcement of the STR regulation which restricts commercial STRs rigorously in collaboration with Inside Airbnb, an organization that scraps and provides Airbnb data to dozens of local governments. If the city needs to reduce STR listings once again, they would be advised to incorporate the second principle in their regulation. The STR regulation in Austin, Texas, for example, embodies this principle by capping the density of non-owner occupied STRs in each census tract at 3%; a similar tactic can be used in San Francisco. In doing so, close attention needs to be paid to cultural factors in the city that concentrate STRs in certain districts such as Haight-Ashbury and the Mission.

The root cause of the housing crisis, however, is not the spread of STRs. STRs are controversial in cities like San Francisco and New York with a lack of housing units due to

exclusionary land use policy. In a study of the rezoning of the Eastern Neighborhoods in San Francisco adopted in 2009, Nzau and Trillo (2019) found that 26% of affordable units within market-rate residential buildings or inclusionary housing units (Calavita and Mallach, 2010) built in the city between 2011 and 2015 were provided in the Eastern Neighborhoods which covers only 7% of the city area. The new Urban Mixed Use zoning of the area relaxed the building height restriction and removed conditional use requirements for housing. Seattle, Washington has seen rapid rent increase, yet high-density housing built in urban village areas in recent years led to falling rent (Furth and Hamilton, 2019). It is advisable for critics of STRs to consider such local deregulation, or state regulations that would prevent exclusionary regulation at the municipal level alternatively, as a solution to the housing shortage, provided the fact that STRs have not generated serious controversy in cities with no or little zoning restrictions like Houston and Dallas, Texas (Glaeser et al., 2017).

5 CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the Findings

Now, let us recapitulate the three research questions of the study and their answers.

The first question regarded whether the regulation of STRs emerge from debates involving a broad range of stakeholders. The investigation above found that the regulation DID emerge in a participatory and inclusive manner as Airbnb and the hotel industry, while lobbying governments with claims supported by media or academic studies, mobilized citizens on their own side to petition for common interests. The rivalry in the private sector necessitated inclusion of the public.

The second question was upon the correspondence between the rigor of the existing STR regulation and the severity of potential threats posed by STRs locally. Furukawa and Onuki (2019) found that the rigor of STR regulation can be assessed qualitatively and quantitatively with measures based on the values of regulatory variables, such as specific limits for STR operation and unique amounts of fees and fines. Although the rigor matches with the negative impacts.

Lastly, the study investigated whether the existing STR regulation is effective with a case study of San Francisco where the reduction of STR listings by eliminating illegal operation was aimed at. Similar to Chaves Fonseca's (2019) Santa Monica study, the case study of San Francisco here found a short lived negative effect of STR regulation on Airbnb listings. This is at least partly due to a loophole of booking more than a month then canceling with a refund according to the practitioners of the regulation. STRs concentrate in neighborhoods with higher

amenity and attraction. STR regulation will be more effective if these factors are taken into consideration for the design of regulation.

The present study investigated whether the design of the existing STR regulation is advisable from the perspective in Chapter 1 as well as whether it is effective for addressing the problems. The process and strategy in which the 17 cities studied in Chapter 3 have placed STR regulation are arguably advisable: citizens voice, heavily influenced by corporate interests may it be, was included in the decision for policymaking as discussed in Chapter 2; cities relying heavily on the hotel industry have placed stricter STR regulation. However, the regulation in cities experiencing faster rent increase is not necessarily more rigorous. The effectiveness of STR regulation, on the other hand, is limited, according to the literature including Chapter 4 of this thesis, since the effects of regulation do not last long as STR hosts adapt taking advantage of the loopholes.

The findings in this study shed light on how STR regulation can be improved to let STRs coexist with affordable housing and the hotel industry, providing people with opportunities to enjoy more flexible tourism experience and alternative income sources. There are two policy recommendations and two research recommendations.

5.2 Recommendations

5.2.1 Policy Recommendation 1: Algorithmic STR Regulation

Although cities tend to give an STR license to all qualified applicants and does not limit the concentration of STRs, some cities like Austin, Texas have placed STR density limitation for neighborhoods. Findings in Chapter 4 suggest that San Francisco may need to consider

adopting a similar measure for areas such as the Mission District which has seen an STR density of 5% if the policymakers in the city wish to cap STR density to protect housing affordability. They must first identify a tolerable maximum STR density for each area and find the number of STR licenses that can be given to hosts operating there. With the help from organizations such as Host Compliance and Inside Airbnb mentioned in Chapter 2, local governments then can check the latest data of STR usage and see if the density is under the target. If the density goes beyond the target, they can assume the existence of illegal operation. In the long run, in case the housing shortage in the city is ameliorated, the target density can be raised. This method is called algorithmic regulation (O'Reilly, 2013) and becoming viable thanks to web technology.

5.2.2 Policy Recommendation 2: Pairing STR Regulation with Housing Policy

For the provision of affordable housing, like that implemented by the San Francisco Mayor London Breed, to be effective, STRs may need to be prohibited in those buildings to keep them from becoming "affordable hotels". Chicago, Illinois has placed a building level regulation other cities can learn from. As discussed at the end of Chapter 4, however, STR regulation is inseparable from land use management in general. Cities such as Dallas and Houston, Texas have no STR regulation nor zoning restrictions. As scholars like Glaeser et al. (2017) have long argued, zoning restrictions are a major stressor on housing affordability. Cities like San Francisco and New York that have been suffering housing shortage have a very strict zoning code, and that is why STRs became controversial in these cities. Housing activists fighting Airbnb may need to reconsider what they should be really going after, and they may cooperate, not combat, with the company to deregulate the housing market. That will be a win-win strategy for those parties as they will be able to enjoy affordable housing and unregulated STRs if they can rebut the lobbying from the hotel industry.

5.2.3 Research Recommendation 1: Investigation of Loopholes

The loophole of "booking a month with refunded cancelation" surfaced in the investigation, and there might be more. Amsterdam, the Netherlands has a unique measure to fill this type of loophole. In the city, one can operate STRs only with their primary residence. Every time a landlord or tenant rents their property, they have to report to the city government. STR hosts in the city are allowed to operate Primary Unhosted STRs (see Chapter 3), which are called *Holiday Rentals* in Amsterdam, only 30 days a year. Every time they invite guests, they have to report to the city government through a website and inform the latter the dates of guest arrival and departure. Partial cancellation of the stay is not possible in the system, and if a stay needs to be shortened, the host needs to cancel the entire booking first and register a shorter stay anew (Gemeente Amsterdam, n.d.). This new rule introduced in January 2019 seems to be able to address the problem of partial cancellation. Yet whether this is really enough to fill the loophole is unclear since this rule applies to STRs only. Property owners may be able to rent multiple properties to "tenants" for a long term, for a few months for example, who would leave the property after a week from arrival and be asked to pay only for the actual stay. To achieve the desired outcome of STR regulation, it may be necessary to review and reform the general rules of housing rental. For example, the payment of rent may need to be forced to take place before tenants' arrival, refunding for the first month prohibited by law. But such reform can complicate the entire housing regulation system and therefore careful studies must be conducted to understand the implications of such changes.

5.2.4 Research Recommendation 2: Further Assessment of Existing STR Regulation

More case studies on the effectiveness of STR regulation are necessary to understand and evaluate the performance of existing regulations. Especially case studies in other regions, such as Latin America and Asia, will help develop the knowledge of STR regulation since fewer studies have been conducted in these areas compared to others as Guttentag (2019) pointed out.

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