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International Conference on Information Resources Management (CONF-IRM)

5-2018

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Abstract

The controversial short-term rental (STR) industry and the relevant STR regulation have been in the spotlight in recent years. Despite all the pros and cons of regulating the STR industry, yet it is unclear what the real effects of the STR regulation are. This study seeks to shed light on the questions regarding how the city STR regulation and should be conceived as well as what the outcomes of the regulation implementation are. We employ a comprehensive data set assembled from multiple resources to analyze the effects of the STR regulation from different geographic levels. Indeed, STR regulation turns out to be effective in improving the STR business. Registration requirement would encourage people from affluent neighborhoods to list their properties online. And internal requirements of the listed properties are critical in preventing listings from those non-affluent neighborhoods. At the clause level, the clauses vary in their effects in different types of neighborhoods. The clause specifically requiring listing to achieve certain standards would be more efficient in crowding out the listings with low quality from the STR market. STR regulation would be able to raise the quality of the listings online and standardize the listing process. Consequently, STR regulation would reduce the information-based uncertainties exist in the online STR mediatory platforms. Overall, the results suggest that STR regulation helps release the "lemon problems" in the STR market by encouraging listings with good quality while crowd out the "bad apples" from the platforms by adjusting the STR business in different types of neighborhoods.

***Keywords**:*

Sharing economy; short-term rental; Airbnb; regulation

1. Introduction

As a prominent platform for Internet-based short-term rental (STR), Airbnb.com matches homeowners (thereafter term as hosts) with slack housing resources to individuals (thereafter term as customers) who need STR[1]. The hosts could make efficient use of vacant accommodation units or rooms by renting them out for a short time, thereby translating slack, unutilized resources into economic returns. The STR hosts could make efficient use of the vacant accommodation units or rooms by renting them out for a short period of time, thereby translating slack, unutilized resources into economic returns.

While seemingly beneficial, STR is fast drawn legislation attention on whether the increasingly active business operation should be regulated. Cities like New York, San Francisco have imposed or contemplating to impose regulation to legalize the STR business.

[1] Source: http://www.economist.com/news/leaders/21573104-internet-everything-hire-rise-sharing-econom

The real estate owners in New York argued that STR is supposed to be functioning as a free market where they should have the freedom to rent out rooms at their own will. Real estate owners and proponents for sharing economy tout that sharing economy would be able to adjust the market through the market dynamism. However, the city governments caution that there could be quality heterogeneity among the individual-hosted accommodation and there is a need to better protect the customers. Indeed, it is not uncommon for customers to complain about the quality of the STR service, which is different than what the properties appear to be on the platform[2], and doubts on the reliability of the hosts. The question is then whether STR needs to be regulated. In other words, does regulation serve as a key impediment (or enabler) to the accommodation listing in Airbnb.com? This study, hence, seeks to empirically study STR regulation from the law and economics perspective in a technology-enabled platform like Airbnb.com with the following questions: 1) What is the overarching consequence of imposing STR regulations on the STR business? 2) Would the business impact of the STR regulation vary across different types of neighborhoods within a city?

By answering these questions, this study could shed light on whether the government should impose STR regulation and how such regulation should be conceived (i.e., the regulation clauses to consider). Measuring the consequence of STR regulation based on accommodation listing, as reflected by new listing and delisting of real estate posts in Airbnb.com, is able to reflect the change in the Airbnb supply. This measure accords to the Zervas et al. (2014) who use the number of listing as important indicators of the Airbnb supply. Our quest to answer the above question extends to the inquiry of the consequences of specific clauses in STR regulation (granularity in insight) and the varying neighborhood type (robustness in finding).

Our study would be able to contribute in several ways: First, this study adds to the literature on the STR and STR regulation by examining how the STR regulation would affect the online STR business. The controversial STR regulation has attracted attention from different parties. Regulation is supposed to be evaluated by the outcomes. Through the empirical analysis based on a longitudinal panel research design, we provide empirical support that the STR regulation could the raise the quality of the listing on the platform by encouraging listings with good quality to list online and prevent underqualified properties to list on the online platform. In addition, we evaluate the effects of the STR regulation in multiple geographic levels including the city-level general effects as well as the neighborhood level effects. The results show that the same regulation does vary in its effects on different types of neighborhoods: hosts from the affluent neighborhoods are encouraged to participate in house sharing activities compared to those from non-affluent neighborhoods. Second, the study would add to the literature in the law and economics by providing empirical evidence on how the regulation would be able to help prevent market failure. Information asymmetry in the online platform might lower the customers' willingness to conduct transactions (Thierer et al. 2015). However, STR regulation specified the requirements for the hosts including the safety and health facilities in the apartment which would ensure that the listings online have reached certain standards. After going through the legal process from registration to equip with relevant facilities in the rooms, the remained listings are those that have reached certain levels of quality. As a result, the overall quality of the listings on the platform could be improved. Standardization of the STR listings turns out to be useful in releasing the "lemon problem" in the STR market. Practically, the study would help city government in STR regulation implementation decisions by evaluating the effects of the STR at the clause-level. City governments are responsible for STR regulation implementation and they often went through multiple meetings to discuss the brewing debate on short-term rental regulation. We identify

[2] Source: http://www.airbnbhell.com

two perspectives of STR regulation that would be useful in improving the average quality of the listings on the platform (i.e. registration and internal requirements). Though the clauses could vary in their effects, the city governments can require the hosts to go through the registration process at the beginning and ensure their properties have equipped with safety and health facilities to protect the customers' safety during their stay. In the regulated environment, properties with higher quality are more willing to list online and unqualified listings are prevented from the market. Consequently, the government is likely to witness improvement on the average listing quality.

2. Literature and Theory

2.1 Sharing economy and STR business

Previous studies in sharing economy emphasize the phenomena itself as well as its effects including the economic consequences and the social impact of the sharing activities. For instance, found that the important drivers for people's participation in the sharing activities involve sustainability, enjoyment and economic gains. In STR business, they suggest that the monetary benefit is the main driver in the STR business. STR business is suggested to be able to create opportunities for the local residents to earn monetary benefits and contribute to local wealth. It helps spread tourist dollars beyond typical hotel and tourism districts. In addition, it offers both tourists and property owners with valuable social and cultural exchange. However, the benefits of STR activities are inevitably accompanied by concerns. For instance, it could aggravate the racial discrimination online for the hosts and the customers. From the customer perspective, the quality of STR service is uncertain without proper standards compared to the traditional branded hotels. Services of sharing economy are often described as "deprofessional" especially compared to the professional hotel services. The "deprofessionalization" is likely to raise concerns regarding the customer protection. The problem of uncertainty in online transactions could become obstacles to the prosperity of online business requiring the city government to take corresponding measures.

2.2 Information asymmetry and customer protection

It is recognized that the primary motive for discussing STR regulation is not to discourage the flourish of it but to institutionalize checks and balances so that STR could grow and the "bad lemons" in the market could be crowded out from the market. The issue of lemons is rooted in the classical economic problem of information asymmetry, which occurs when one party lacks important information that the dealing party withholds. For instance, the host would provide description and photos about their properties from which the customers get to know about the listing. Customers are only able to evaluate the condition of the listings through the provided information. Thus, the goal of the legislation is to ensure the hosts provide the properties as they are described online and avoid misleading actions to protect customers from unfair, inaccurate and deceptive trade practices conducted by the hosts. Relating to the STR accommodation, this would typically represent as habitability warranty, that is, the hosts are required to provide housing with fundamental services (e.g., basic facilities such as heating mentioned earlier) to the guests. And customers have the rights to require the facilities and services to be delivered as the ways they are expected and required replacement or repairment if necessary. To the issue of information asymmetry, STR regulation could achieve customer protection by restricting the source of the STR listings and standardizing the listing quality. The government could restrict the source of STR listings and require the listing to reach certain standards if the hosts wish to list their properties for STR. From the other hand, listings with permission could signal the prospective customers that they are qualified listings

for STR business: the listings are well recorded by the official department and they are equipped with necessary facilities to ensure the safety of the customers.

3. Data and Method

We collected the data from multiple sources. We first identified the cities that have legislation regulating STR from the Airbnb official website and market research reports. Airbnb provides a summary of the city-level STR ordinances across the world on their website. The RoomScore Report published by the R Street Institute evaluates different cities' existing STR legal framework of STR and grades the cities according to the STR legal framework in the United States[3]. Based on the two sources of regulation summary, we identified 15 cities in U.S. that have passed and implemented STR regulation in November 2014 - November 2016 (Appendix A provides the information of 15 cities). We then downloaded these cities STR laws from the city governments' websites, and content analyzed the clauses that focus on consumer protection. We identify two important perspectives of the STR regulations related to consumer protection: requirement for property registration (i.e., registration) and requirements for the properties to equip with necessary facilities (i.e., internal requirements) as shown in Table 1.

We used the Airbnb data to calculate two dependent variables: the number of newly listed properties, and the number of properties delisted in that month. The reason we selected these two variables as the dependent variable is because in the two-sided platform, the number of suppliers in the platform is an important indicator of market efficiency in the platform. In our case, the number of suppliers is related to the number of new listing and the number of delisting. The STR regulation is supposed to help standardize the STR business and sustain the development of the STR business including preventing potential market failure. To achieve the goal, the government only permit the qualified listings to list online and delist the unqualified ones from the platform which could be reflected by hosts' listing and delisting behavior. Thus, both of the measurements are critical when considering the healthy development of the STR business. The majority of the properties listed on the Airbnb.com are apartment and houses. Cities allow different types of properties to be listed for the STR business as long as they live up to the standards required by the STR regulation. Thus, we consider it as appropriate to consider the different types of listing properties as a whole.
We also control for the city level demographics including *household income, vacancy ratio, household number,ethnic ratio, hotel size, crime rate* and *airport traffic* to control or the neighborhoods characteristics. Year dummies and month dummies are also incorporated to control the seasoning effects.

Table 1 Coding Scheme of the STR Regulation

	No	Clauses	Purpose
Registration	1	Whether the regulation requires registration or permit for the property	Identify the unit that would be used for STR Collect information of the hosts
	2	Whether the regulation requires the hosts to include the STR registration or permit number on all advertisement	To assist with the enforcement of registration
Internal	3	Whether the regulation requires the property	Keep guests information

[3] Source: http://www.rstreet.org/policy-study/roomscore-2016-short-term-rental-regulation-in-u-s-cities/

Requirements		host to keep records	for inspection and investigation
	4	Whether the regulation requires STR hosts to adhere to basic standards for health and safety of their guests or a general liability insurance to cover the health and safety of guests	Raise the standards for STRs and ensure the safety of the guests

4. Data Analysis and Results

We first examined the general effects of STR regulations. Because STR regulations were enacted and implemented in different time, we used a two-step DID econometric model following Greenstone and Hanna (2014) to measure the impacts of the STR laws passed in different time. Compared to the one-step DID model that is commonly adopted in previous studies, the two-step models is adopted in the study because the STR regulation implementation date is different from city to city. Thus, the one-step approach would be difficult to achieve in that it requires the collapse of the data to the group-level. The two-step models could avoid such problem while achieving the numerically identical to the one-step procedure. The first step of the two-step econometric model is to estimate the event study-style equation:

$$\ln Y_{ct} = \alpha + \sum_{\tau} \sigma_{\tau} D_{\tau,ct} + \gamma_c + \mu_t + \beta \ln X_{ct} + \varepsilon_{ct} \quad (1)$$

Y_{ct} is the dependent variables that we used to measure the STR business on the platform. γ_c is the city fixed effects accounting for the time-invariant unobserved elements that are likely to affect the behavior of the hosts on the platform such as the cultural factors. μ_t is the month fixed effects that control for the seasoning trend of the popularity of the STR activities. X_{ct} incorporate the set of city demographic characteristics and the other control variables that account for the different characteristics of the cities that might affect the STR business. We specify all the demographic variables in logarithm since the empirical analyses would fit better with economic variables in logarithm form (Goh et al. 2012). Following Greenstone and Hanna (2014), we use a vector $D_{\tau,ct}$ that is composed of dummy variables representing each month before and after the regulation is implemented. In the month when the regulation is implemented, $D_{\tau,ct}$ is set to be 1. Otherwise, it is set to be 0. τ is normalized to 0 in the month that the regulation is implemented. Before the regulation implementation, τ equals to – n (n months before the policy implementation) and n (n months after the policy implementation). If the city does not have short-term rental regulation, the τ would be set as zero. The estimated σ_{τ} measures the average effects of short-term rental regulation in the time before and after the policy implementation at the time.

The second step of the model has been used to test the mean effects on the change of the new listing and delisting after the implementation of the regulation. Using the σ_{τ} estimated from equation (1), equation (2) tests whether the regulation is related to the behavior of the hosts reflected through the dependent variables:

$$\sigma = \pi_0 + \pi_1(\text{Regulation}) + \varepsilon_{\tau} \quad (2)$$

Controlling pre-existing time trend

It is likely that there are pre-existing trends before the regulation implementation. For instance, as the platform is growing more and more popular, there could be an increase in the number of new listing. To control for the potential time trend, the following model is fitted:

$$\sigma = \pi_0 + \pi_1(\text{Regulation}) + \pi_2\tau + \varepsilon_\tau \quad (3)$$

Equation (3) incorporates the variable τ to account for a linear time trend. It could help to adjust the different trend exist predate the short-term rental regulation implementation.
Equation (2) and (3) estimate the average effects of regulation implementation, however, it has been suggested that the effects of the regulation could vary as the time goes by. It could be changed over time due to the government taking necessary measures such as checking the online listings and fine hosts with illegal listings to enforce the regulation. To control for the changes of regulation effects over time, the following model is estimated:

$$\sigma = \pi_0 + \pi_1(\text{Regulation}) + \pi_2\tau + \pi_3(\text{Regulation} \times \tau) + \varepsilon_\tau \quad (4)$$

In equation (4), the interaction term of *Regulation* and linear time variable τ is added to test the effects of the regulation evolve over time. We estimated the above equations in Stata 14.
It is shown that on average, the number of new listings is around four times to the number of delisting in the sampled city. The correlation between the listing and delisting and the city demographics is within acceptable range. Our dataset measure the new listing and delisting numbers on the platform are structured as city-monthly level. We structure the data set the city-month level in that the STR regulation is city-specific and is usually implemented from certain month. We measure the change at month level because the regulation would become effective from after some time. Estimation of the changes of the new listings or the delisting before and after the STR regulation implementation is more suitable compared to another level of data aggregation.

Table 2 provides the estimated results from equations (2) ~ (4). The first column reports estimated coefficients from equation (2) reporting the average effects of regulation implementation on the estimated σ. The second column reports the estimated results from equation (3). Two coefficients are reported: π_1 shows the average effects from the implementation of the regulation after taking into the consideration pre-existing time trend in the behavior of the hosts. And π_2 is the coefficients of the time trend. Column (3) reports the estimation results including the average effects on the STR business from policy implementation after accounting for the time trend and a mean shift.

The first dependent variable reported in Table 2 is the number of new listings in each month. Column (1) in Table 2 shows that there is an increase in the number of new listing on the STR platform after the implementation of the regulation indicating increasing incentives of the potential hosts to list their properties on the platform for short-term rental. Taking into consideration the potential pre-existing time trend, column (2) and column (3) in Table 2 show that there exists an increasing trend that the owners are more likely to list their properties online for the STR activities after the regulation is implemented. Implementation of the STRs regulation could prevent some of the unqualified hosts that wish to begin their rental business at the beginning. However, as the time goes by, the number of new listing would still increase even after certain kind of properties are prohibited from listed for short-term rental business.
The second part of Table 2 shows that number of delisting on the platform is also affected by the implementation of the regulation. It is required that some of the unqualified listings be removed from the online sharing platform. It is shown in column (1) that implementation of the regulation would increase the number of delisting properties. However, taking into consideration the time trend, the number of delisted properties would finally decrease after a

certain period. In the beginning, some of the unqualified listings are removed from the platform. As the time goes by, the number of delisted properties would decrease. This could be attributed to the fact that after the regulation implementation, the listings remained on the platform as well as the newly listed properties are those that satisfy the STR regulation requirements. And the hosts are more comfortable to list their properties online after they obtain certification.

To investigate the effects of the clause and the clause category on the STR business, we implement fixed-effect model to evaluate the effects of the clauses among the cities that have implemented differences of different clauses and the clause categories identified in Table 1.

$$\ln Y_{it} = \alpha + \sum_{k} \beta_k \ln x_{ik} + \lambda_j (Clause)_{ij} + \delta_i + \tau_t + \varepsilon_{it} \quad (5)$$

Y is the set of control for the city differences and the zip code level demographics. δ_i is the individual differences fixed effects and is the month dummies control for the seasoning change. The focal variable is the clause and the regulation category and clauses. We fit equation (5) to evaluate the effects of different clauses on the STR business. It is likely that these clauses could vary in their effects on the STR business and it is important for the policymaker to understand what the effective clauses are in regulating STR business. Thus, the focus of the analysis is to evaluate the effects of the single clause. To study the effects of the clauses, we constructed the data at the zip code level and separated the sample into by the types of neighborhood based on the average housing price of the neighborhoods compared to the city average housing price (Guerrieri et al. 2013). Indeed, the regulation could vary in its effects on the STR activities in different types of neighborhoods. The reason that we distinguish the types of neighborhood is that we expect hosts from various neighborhoods would respond to the STR regulation differently due to the dissimilar conditions in their properties. In the analyses, we separately analyze the effects of the regulation on these two subsamples. We merged the housing price data with the Airbnb data and separate the sample by dividing them into two types of neighborhoods i.e. affluent neighborhoods vs. nonaffluent neighborhoods by the average housing price (Li and Brown 1980).

Table 3 and Table 4 show the effects of each clause on the STR business. From the results, we can tell that the effects of the clauses vary in different neighborhoods. The results show that most of the clauses imposing constraints on the property listed for STR turn out to be able to encourage people from better neighborhoods to list their properties on the STR platform. In the meantime, they would prevent properties with lower quality to be listed for STR. For instance, the clause requiring registration could encourage people to register and list their properties on the platform. In fact, implementation of the regulation is not prohibiting the hosts from listing their properties but instead giving out the signal that the city government allows the STR activities. Cities requiring registration (Clause 1) intend to standardize the STR industry with proper legal process instead of banning the whole STR business. Thus, the regulation from the government finally turns out to give out the signal that encourages them to list their property through the legalized approach. Similarly, requirements for the hosts to list their license number in the advertisement (Clause 2) could achieve the similar effects. Requirements for the hosts to keep record has slightly positive effects on the number of new listing from the affluent neighborhood. And it is negatively related to the number of new listing from a less affluent neighborhood. The requirement for records keeping (Clause 2) is an additional operating cost for the hosts. Clause 3 and Clause 4 are more specific clauses in requiring the hosts to protect the customers' safety by keeping relevant records and providing certain safety facilities even insurance. These two clauses would increase the hosts' operating

costs. As a result, both good neighborhoods and bad neighborhoods are affected by the clauses reflected by the decrease in the number of new listing. However, the effects are more significant in the bad neighborhoods. For the hosts from the bad neighborhoods, the concerns of the upfront costs are more likely to inhibit their willingness to list their properties online.
The clauses would also affect the number of delisting properties differently as shown in Table 4. The clause would increase the number of delisting from the nonaffluent neighborhoods. Instead, the hosts from the affluent neighborhoods are less likely to drop out the market after the regulation implementation. After the regulation implementation, it is suggested that the remained listings are those satisfying the government requirements. After the regulation giving detailed instruction instructions, they might feel more comfortable to operate their STR business. In addition, the hosts have to pay for the upfront cost such before they are qualified to operate. And the increase in the clauses implies an increase in the operating cost. Thus, the remaining hosts are less likely to withdraw from the market even if the STR regulation is stricter.

4. Discussion

In summary, this study seeks to contribute to the extant knowledge in three ways: it adds to the literature in law and economics by providing cornerstone understanding of the economics of imposing STR regulation. The implication could have bearing on policy-making and offer indicative suggestions on how policymakers could make sense of digital disruption. The research provides clarity to the sharing economy and related understanding of it. By answering the questions, we are able to provide empirical evidence on whether STR regulation could alleviate the concerns of information-based uncertainty and promote the overarching sustainability of the sharing economy platform. Rather than just looking at STR regulation as a whole, we take a granular look at the regulations and identify the clauses in the regulations that could vary across cities. By doing so, the study could also provide suggestive guidelines for the city governments and policy-makers on how they could legalize STR business.

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Table 2 General effect of STR regulation

	(1)	(2)	(3)
Dependent Variable	**New Listing**		
Regulation	0.122***	-0.020	-0.033**
	(0.011)	(0.015)	(0.014)
Implementation time		0.012***	0.007***
		(0.001)	(0.001)
Regulation* Implementation time			0.013***
			(0.002)
Constant	-0.192***	-0.155***	-0.176***
	(0.004)	(0.005)	(0.005)
Observations	732	732	732
R-squared	0.136	0.319	0.384
Number of city	30	30	30
Dependent Variable	**Delisting**		
Regulation	0.522***	-0.183*	-0.116
	(0.076)	(0.101)	(0.099)
Implementation time		0.058***	0.084***
		(0.006)	(0.007)
Regulation* Implementation time			-0.066***
			(0.011)
Constant	-2.258***	-2.071***	-1.956***
	(0.028)	(0.032)	(0.036)
Observations	709	709	709
R-squared	0.065	0.182	0.227
Number of city	30	30	30

Table 3 Clause-level analysis on new listing

	FE Model							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Affluent	Non Affluent	Affluent	Non Affluent	Affluent	Non Affluent	Affluent	Non Affluent
VARIABLES	DV=New Listing							
Clause1	0.454***	-0.006						
	(0.065)	(0.075)						
Clause2			0.003	-0.196***				
			(0.041)	(0.042)				
Clause3					0.123	-0.169**		
					(0.076)	(0.083)		
Clause4							-0.152***	0.014
							(0.033)	(0.034)
Observations	2,346	3,193	2,346	3,193	2,346	3,193	2,346	3,193
R-squared	0.650	0.608	0.642	0.611	0.643	0.609	0.646	0.608
Number of zipcode	106	152	106	152	106	152	106	152

Table 4 Clause-level analysis on delisting

	FE Model							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Affluent	Non Affluent	Affluent	Non Affluent	Affluent	Non Affluent	Affluent	Non Affluent
VARIABLES	DV=Delisting							
clause1	-0.380	0.705***						
	(0.375)	(0.224)						
clause2			-0.332**	0.0834				
			(0.138)	(0.143)				
clause3					-0.662*	0.323*		
					(0.360)	(0.175)		
clause4							-0.0752	-0.315***
							(0.189)	(0.101)
Observations	1,834	2,445	1,834	2,445	1,834	2,445	1,834	2,445
R-squared	0.187	0.147	0.179	0.137	0.188	0.144	0.190	0.146
Number of zipcode	96	125	96	125	96	125	96	125

Response Letter

1. Theory: We lends theory foundation from the traditional online platform transactions. Online transactions are often suggested to accompanied by information asymmetry that could generate negative effects on the customer welfare protection. In the study, we investigate whether the STR regulation would achieve one of the goals in customer welfare protection. We empirically support that the STR regulation could raise the quality of the listing on the platform by encouraging listings with good quality to list online and prevent underqualified properties to list on the online platform. To achieve the goal, we identified two perspectives of short-term regulation that are related to the customer welfare protection including registration and internal requirements. The reason that we focus on these two categories is that they could help standardize the STR listings and raise the quality of the listings. Our study would be able to contribute in several ways: First, this study adds to the literature on the STR and STR regulation by examining how the STR regulation would affect the online STR business. The controversial STR regulation has attracted attention from different parties. Regulation is supposed to be evaluated by the outcomes. Second, the study contributes to the literature in the law and economics providing empirical evidence on how the regulation would be able to help prevent market failure. Information asymmetry in the online platform might lower the customers' willingness to conduct transactions (Thierer et al. 2015). We found that in the regulated environment, properties with higher quality are more willing to list online and unqualified listings are prevented from the market.

2. Methodology and Identification: To illustrate the two-step DID, we divide the models into several parts. The benefits of the model compared to one-step DID model is that it could take into consideration the different implementation time in different cities. In addition, the one-step approach would be difficult to achieve in that it requires the collapse of the data to the group-level. The two-step models could avoid such problem while achieving the numerically identical to the one-step procedure (Greenstone and Hana, 2014). The first step of the model is used to estimate the matrix D with the coefficients to be used in the following equation (2) to (4). Equation (2)-(4) estimate the effects of the regulation on the STR business. To further control for the time trending, we incorporate the time trend in the model in equation (3) and equation (4). Thus, our models would be able to examine the effects of regulation.

3. Model: To control for both economic indicators and neighborhoods characteristics. We consider there are several perspectives of elements that would affect the STR business in the neighborhoods: the economic status of the neighborhoods (*household income, unemployment rate*) and the demographics of the neighborhoods (*ethnic ratio, vacancy ratio, household number*). In addition, we also control of the city-level characteristics including the city's crime rate and the city's traveler flow (*airport traffic*) to control for the demand side effects on the STR business. Considering that the STR business is related to both demand side and supply effects, we tried to incorporate the elements from both sides. However, we would consider taking into consideration the overall economic status such as GDP.

4. Results and discussion: As suggested, we measure the dependent variables as The reason we selected these two variables as the dependent variable is because in the two-sided platform, the number of suppliers in the platform is an important indicator of market efficiency in the platform. In our case, the number of suppliers is related to the number of new listing and the number of delisting. Thus, we used the two dependent variables to measure the change in the STR business.

5.Implications: our study would be able to contribute to several streams of literature including the IS literature. As an internet-mediatory innovation, sharing economy is supported by the

development of Internet. Since the effects of IT-enabled sharing economy on the society is significant, we are interested in investigating whether government intervention would effective in adjusting the innovation.