

Impact of a Home Sharing Platform on the Rental Housing Market
in New York City

A Thesis Presented to the
Faculty of Architecture, Planning and Preservation
Columbia University in the City of New York

In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Urban Planning

By
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May 2016

Impact of a Home Sharing Platform on the Rental Housing Market in New York City

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ABSTRACT

Home sharing platforms have been creating a disturbance to existing rules and balances in rental housing market by expanding the use of traditional rental apartments as places for tourist, by facilitating the conversion of long-term apartment to short-term rentals, and by providing the way for landlords to capture full market values with their properties. The alternation of dynamics among stakeholders in rental housing market triggered a huge debate. In determining whether a home sharing platform affecting on the rental housing market in New York City, this paper tested if Airbnb units take rental units off, increase rents, exacerbate rent burdens on renter population, and cause renter evictions by using difference-in-differences methodology which looks at values in two different neighborhood groups in two different time periods. The result showed that the home sharing platform did not have significant influence upon New York City's rental housing affordability nor showed any evidence of causing renter evictions. Even though numbers do not support the existing arguments, things can be interpreted differently by adding different contexts in the housing market. The number of Airbnb units and duration of the Airbnb effect may not be yet reached to the point where it starts to effect on rental housing market and cancels out other factors that effects on the market. Further studies are necessary in the future to capture its impact on rental housing market.

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1. INTRODUCTION

New York City has about 8 million residents and the majority of those are renting their homes rather than owning one. As such, fluctuations in the rental housing market may impinge on 68 percent of the population in the city. The rental housing landscape in New York City is extremely tight. Demand for rental housing has surpassed its supply and this is reflected in the city-wide low rental vacancy rate. Since housing is a necessity and comprises a substantial amount of renter household's income, the state government has enacted rent stabilization measures and capped rent increases on certain types of housing to protect its renter population. Amidst the market's mismatch of supply and demand, the introduction of home-sharing platforms have disrupted the already-tight rental market. Concerns have been raised that short-term rental platforms provide a loophole for homeowners to opt out of rent stabilization and earn full market-rate rents, thereby removing housing units from the traditional rental apartment inventory. If true, such behavior would hinder the ability of affordable housing programs to operate as designed. These effects have not been verified clearly. This paper attempts to look at the phenomena closely and validate the effects of a home-sharing platform.

2. BACKGROUND

2.1. RENTAL HOUSING MARKET IN NEW YORK CITY

RENTAL HOUSING DEMAND

Most New Yorkers live in rental housing, so the city's housing stock is largely renter-occupied. According to the 2014 American Community Survey, New York City had a total of 3,407,932 housing units, and renter occupied units comprised 68 percent of available housing stock, which counted as 2,107,128 and owner units numbered 1,033,226 or 30 percent of the housing stock (American Community Survey, 2014).

New York City has had more renters than homeowners for the last decade, with renters comprising between 66 and 69 percent of the population from 2006 to 2014. This is significantly higher than the United States average of around 36 percent during the same period.

While the majority of New York's population is living in rental housing, renting an apartment in New York City can be difficult to afford. In 2014, the city's median gross rent was \$1,234, about \$300 more than the median gross rent at the national level. About 15 percent of the City's rental units had a gross rent of less than \$800, while 46 percent had a gross rent in the \$800 and \$1,499 range. 39 percent of rental units cost more than \$1,500 per month (Housing and Vacancy Survey, 2014). In inflation adjusted terms, the median gross rent rose by 4.3 percent from 2011 to 2014. Because many

renters live in rent-stabilized apartments, receive rent subsidies, or pay lower rates as a result of long-term tenancy, the median gross rent paid by all renters does not accurately reflect the current landscape for new rental unit seekers in the city (New York City Rent Guidelines Board, 2015). The median asking rent of apartments advertised for rent on StreetEasy in 2013 was \$2,900—more than double the median rent paid by all New Yorkers.

Looking at median household income helps us to see population's purchasing power for rental housing. The median renter income in 2014 was \$41,060. Applying the 30 percent of income threshold, units have to be below \$1,026 to be affordable for households earning the median renter income. The actual median gross rent in 2014 was \$1,234, about \$200 more than the affordability threshold (Housing and Vacancy Survey, 2013). From 2006 to 2014, rent increases far outpaced income growth, with median rent increasing by 12 percent while median renter income increasing by only 2.3 percent. Rental prices surged while median renter income remained stagnant.

Rental housing demand is usually measured by vacancy rate, and New York City's vacancy rate has always remained very low. As of 2014, 3.9 percent of rental units were vacant. With little exception it has been below 4 percent from 2005 to 2014, well below the 5 percent threshold required for rent regulation under New York State law. As of 2014, the rental vacancy rate in Manhattan was found to be 4.07 percent. The Vacancy rate in the Bronx was 3.77 percent, while in Brooklyn it was 3.06 percent. In Queens the rental vacancy rate was only 2.69 percent (Housing and Vacancy Survey, 2014). The

rental vacancy rate translated into the availability of just 81,632 vacant units out of 2.1 million rental units in the city.

RENTAL HOUSING SUPPLY

While demand for rental units is very high, New York's rental stock has grown more slowly than that of other major cities in the United States (NYU Furman Center, 2015). In the 9 years between 2006 and 2014, the number of rental housing units in New York increased by 5.5 percent. During the same period, the number of homeowner units decreased by nearly as much—5.3 percent—implying that conversions from owner-occupied units, rather than new construction, might account for much of the increase in rental units.

The number of permits issued for new housing construction reflects the new dwelling units that will be completed and ready for occupancy in the near future. The number of permits issued by the city has increased since their dramatic recession in 2009, but have not yet returned to the pre-recession levels of 2008. In 2014, permits were issued for 20,483 new housing units, a 14 percent increase from the 17,995 units in 2013. Despite five years of consecutive increases, permit levels are still more than 13,000 units lower than the 2008 peak of 33,500 (U.S. Census Bureau). Almost 91 percent of all permits in 2014 were for units in five-family or greater buildings. Such multi-family buildings contain 45 units on average for the city as a whole, and 80 units on average in Manhattan. In 2014, 11,867 new housing units actually entered the rental housing

market (New York City Department of City Planning, 2015). The addition of these units increased the existing rental housing stock by less than 0.5 percent.

RENT STABILIZATION

New York City has attempted to regulate rent prices through various measures, including rent stabilization, which is unusual in the United States. Rent Stabilization is a New York State law that restricts how much rent for certain residential housing units can increase annually. The law applies to buildings constructed before 1974 that have six or more units. Rent stabilization was adopted to protect renters from abrupt increase in rents and to protect their right to renew their leases. In 2011, about 1 million units—roughly 45 percent—of New York City’s rental housing stock were rent stabilized. By 2014, there were slightly more than 1 million rent-stabilized units, comprising 47 percent of the rental stock (Housing Vacancy Survey, 2014). About 30 percent of rent stabilized units were located in Brooklyn, 28 percent in Manhattan, 23 percent in the Bronx, 19 percent in Queens, and less than 1 percent in Staten Island (NYU Furman Center, 2014).

2.2. HOME SHARING

SHARING ECONOMY AND HOME SHARING

While demand for housing already far outpaces supply and the city government fighting to make rental units more affordable, the new platforms for home-sharing have further

complicated the rental market. Home-sharing platforms have expanded the use of rental apartments as temporary lodging for tourists. The search technologies used by such platforms have made it easier for unit providers and unit seekers to connect, simplifying the allocation and capitalization of an otherwise idle asset (Sundararajan, 2015). As a result, more lucrative options are now within reach for providers of rent stabilized housing units. Converting long-term rentals into short-term rentals enables landlords to capture full-market rent rates from less price sensitive tourists who are generally willing to pay more for a for short period of time. The spoils of the home sharing economy go solely to its participants, while non-participants are left to suffer its negative effects on the traditional rental market.

AIRBNB

This paper specifically focuses on Airbnb. There have been many companies facilitating short-term housing rentals before Airbnb entered the market. However, since its founding in 2008, Airbnb has quickly grown to become the most dominant player in the industry, with over 1 million listings in 34,000 cities and 190 countries worldwide (Airbnb). Airbnb was introduced in New York City in 2009, and as of February 2016, the total number of listings in the city was nearly 36,000.

Airbnb provides a digital digital platform that facilitates the exchange of short-term housing between hosts and guests. Hosts can be property owners, leaseholders, or a management company working on behalf of the property owner. Hosts can list three

different types of units on Airbnb: entire homes, private rooms, and shared rooms. For an entire home or apartment, the guest is renting the entire space, and the host is not present in the unit. For private room rentals, the guest is using a room with some degree of privacy within a host's home or apartment. The host is present in the unit during the stay. For shared rooms, the guest is using the same living space as the host. Airbnb generates revenue by charging hosts a three percent commission and by charging guests a six to twelve percent commission, thus generating a nine to fifteen percent commission for every booking.

Positively reframing perceptions about participating in the home sharing economy has been critical to Airbnb's explosive growth. The rating and review systems they provide enable hosts and guests to publicly share information about one another, which allows for some degree of screening to take place, and helps to build trust between participants and the service itself (Lewyn, 2015).

2.3. SUPPORTERS AND CRITICS OF AIRBNB

Short-term rentals provide new supplemental income for hosts. Renting out spaces can drive up the host's ability to afford housing costs. Moreover, expanded purchasing power can provide hosts with more housing options and increase their ability to move to better rental housing. A survey of 344 hosts conducted by Airbnb found that 56 percent of hosts did in fact use income from rentals listed on the service to pay for part of their rent or mortgage. Other supporters of short-term rentals have said that their hosting

business allows them to afford the cost of living expenses in New York City (Sperling, 2015). A 2013 survey by Rosen Consulting Group found that 42 percent of Airbnb users reported using short-term rental income to supplement living expenses. However, it is rather difficult to evaluate to what degree extra income from home sharing supports housing costs.

On the other hand, some argue that short-term rentals exacerbate the city's already-acute housing shortage by offering more profitable alternatives to the traditional long-term housing market. Short-term rental platforms may deprive renter populations of available rental housing and encourage landlords to evict current tenants. The most common argument against Airbnb is that making short-term lodging more approachable reduces the supply of apartments that are usually leased for a month or more at a time. The argument continues that units listed on Airbnb for a few days at a time would, in the absence of Airbnb, be rented out as traditional apartments. Therefore, Airbnb reduces the housing supply and raises rents. However, it is also difficult to determine if units that are currently rented out using Airbnb used to be long-term rental housing or merely vacant units used for recreational or other purposes before.

3. LITERATURE REVIEW

3.1. RENTS INCREASE

Some of the prime neighborhoods in New York City have several hundred Airbnb rentals. While a few hundred units may not sound like much, it is enough to significantly impact neighborhood rent prices. A quantifiable relationship has been identified between changes in total rental inventory and changes in neighborhood rental costs (Ellen, 2015). In New York, for every 0.5 percent that rental supply contracts, rent rises by 1 percent. If a rental market consists of 1,000 units with a median price of \$1,000 per month, removing 50 of those units increases median rent in that market by \$100, to \$1,100 on average.

The study exemplified the Airbnb units in Williamsburg and Greenpoint. In 2015, Airbnb units represented around 0.6 to 1.15 percent of the total rental housing stock in these neighborhoods respectively. Removing that percentage of units elevates median rent by around 1.2 and 2.3 percent. Based on the claim of this study, if those units were instead listed on the long-term rental market, neighborhood monthly median asking rent, \$3,055, according to StreetEasy, would be around \$35 and \$69 lower, respectively. However, this study connects the supply of rental housing with rent increases rather too directly without any controls.

Airbnb rentals slightly drive up rents in some prime neighborhoods in major cities (Davidoff, 2015). It was mentioned that Airbnb “increase[s] the price of a one-bedroom unit by about \$6 a month.” Specifically, in San Francisco, it “increase[s] rent by on average about \$19 a month.” To come up with this estimates, he did not take into account units that locals can still live in long-term. With the assumption that all listings are renting out

solely on Airbnb, in New York, rent would go up around \$24 a month. Importance of dividing listings by possibility of being used as a long-term rentals or solely as short-term rentals.

According to his findings, listings are not evenly distributed and tend to be clustered in prime neighborhoods. This implies that popular neighborhoods attract more Airbnb rentals and this causes more pressure on rents in such neighborhoods. Airbnb is less an issue of citywide affordability than it is of people's right to stay in desirable neighborhoods. Thus Airbnb is affecting housing affordability in New York City's most desirable neighborhoods, not throughout the city. This paper hopes to evaluate this claim by looking at gross rents before and after the emergence of Airbnb.

3.2. RENTER EVICTIONS

LAANE, a union-affiliated policy organization based in Los Angeles, issued a report in 2015 claiming that Airbnb removes 7,316 units from the Los Angeles rental market. This "is equivalent to seven years of affordable housing construction in Los Angeles" (Samaan, 2015). Considering that Los Angeles provides little in terms of affordable housing, this argument might not be very meaningful. The report also pointed out that Airbnb creates incentives to take units off the rental market. The study exemplified the Morrison Apartments in Venice Beach, a complex with 21 units covered by the City of Los Angeles Rent Stabilization Ordinances. Coldwell Banker Commercial (CBC) listed the Morrison for sale and suggested converting the Morrison to Airbnb rentals as the

prudent financial choice for its future owners. CBC estimated that a landlord could earn about \$200,000 in annual income by renting the rent-controlled units out on the market. Converting the building to Airbnb units could bring more than \$477,000 per year, assuming the 2014 United States hotel occupancy rate of 67 percent. LAANE showed concern that this new potential income stream may stimulate rental unit conversions.

Moreover, according to the report prepared by San Francisco Budget and Legislative Analyst, approximately 71.9 percent of San Francisco's rental stock is rent stabilized below market rate. Rental rates in San Francisco have been increasing so rapidly over the past few years that some landlords have been inclined to evict their tenants to capture full market value. The report continues that Airbnb creates additional incentives for the higher revenue for landlords. The San Francisco Rent Board reported that notices of eviction increased from 2,039 to 2,789—or 37 percent—between 2011 and 2014. The Rent Board did not track what happened to units after evictions occurred, so it is difficult to determine how many evictions resulted in housing units being converted to short-term rentals.

3.3. DISTINGUISHING CASUAL AND COMMERCIAL LISTINGS

The City and County of San Francisco conducted the impact of Airbnb by creating three scenarios based on the severity of its impact on rental housing market (San Francisco Budget and Legislative Analyst's' Office, 2015). Estimates of these three scenarios are

prepared using different assumptions about bookings and the thresholds that distinguishes causal and commercial short-term rentals.

Casual hosts are defined as those who occasionally make their place available for short-term rentals for extra income. In the case of renting a room where they live, casual hosts would not need or choose to have a roommate. The Budget and Legislative Analyst concluded that casual hosts are assumed not to be affecting the rental housing market because they would continue to live in their apartment in the absence of the short-term rental market.

Commercial hosts are defined as those who do not live in their unit and rent it out as a means of generating income. The report says that in the absence of the short-term rental market, they would be living in the unit themselves, placing the unit on the long-term rental market, or getting roommates. The Budget and Legislative Analyst concluded that commercial hosts are assumed to be removing rental housing units that would otherwise be available for the long-term rental market.

Three scenarios were developed with variations in assumptions. The medium impact scenario was the primary scenario and presented as the main analysis in the report. This scenario applied a threshold of 90 days or more for commercial hosts. While all scenarios showed an impact on the rental housing market, especially in certain neighborhoods, the impact varies lower to medium to higher.

4. AIRBNB SHORT-TERM RENTALS IN NEW YORK CITY

4.1. AIRBNB UNITS FOR THE STUDY

In this study, Airbnb units that are listed as an entire apartment with high availability are considered to have impact on the rental housing market because they have a greater chance of displacing renter housing units. High availability in this paper will be defined as 90 days or more per year, the most conservative approach in the City and County of San Francisco study. Airbnb units that are listed as entire apartments with availability of more than 90 days per year are assumed to be removing housing units otherwise available for the long-term rental market.

Table 1. -- Airbnb Units for the Study

			> 90 Days	10,818 (30.07%)
	Entire Unit	19,267 (53.6%)	< 90 Days	8,449 (23.49%)
			> 90 Days	10,113 (28.11%)
	Private Unit	15,576 (43.3%)	< 90 Days	5,463 (15.19%)
			> 90 Days	934 (2.6%)
TOTAL 35,957 (100%)	Shared Unit	1,114 (3%)	< 90 Days	180 (0.4%)

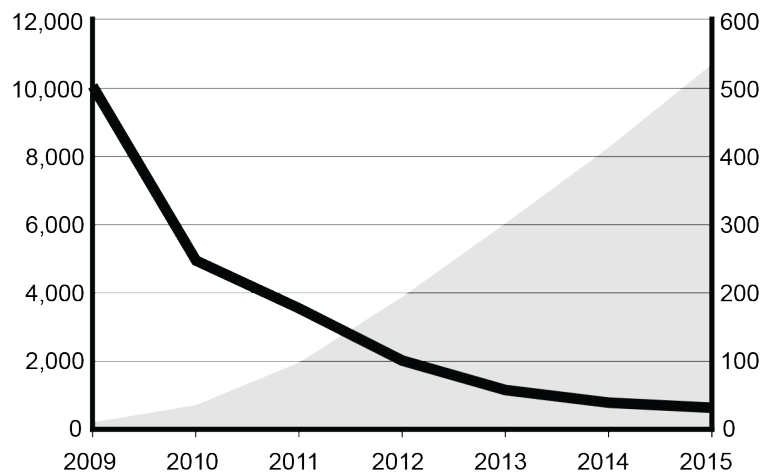
As of February 2016, there were 35,957 Airbnb rentals listed in New York City. Of those, 53.6 percent were listed as an entire apartment, and 43.4 percent were listed as private units. More than 60 percent of the total Airbnb listings in the city are rented out

more than 90 days per year, and more than 30 percent were rented out for more than 3 months per year.

4.2. NUMBER IS INCREASING

Table 2. -- Airbnb Units by Year

YEAR	UNIT COUNTS	GROWTH RATE
2009	206	501.08%
2010	710	244.66%
2011	1,952	174.93%
2012	3,870	98.25%
2013	6,022	55.61%
2014	8,238	36.80%
2015	10,670	29.52%
2016	10,818	



The number of Airbnb listings has increased gradually since 2009. As of February 2016, the inventory is almost equivalent to the number of rental units supplied from new constructions in 2013 and 2014 combined. The share of short-term rentals that are listed as entire units and rented more than 90 days a year was 10,818, which is 30 percent of all Airbnb units. The share was around 38 percent up until 2010. It has been slowly decreasing as years go by and in 2015, it was around 30 percent of total listings. Surely Airbnb units have been increasing in numbers, the growth rate has been decreasing over time. From 2009 to 2011, the number increased by 10 times, from 2011

to 2013, the number increased by 3 times, and from 2013 to 2015, number increased by 70 percent. Within 7 years, it has reached to 10,181 units by February 2016. This takes up 0.5 percent of the total rental housing stock in New York City. For now, portion that short-term rental takes up from traditional apartment unit seems quite small. The number is increasing but the pace is getting slower.

4.3. IN MANHATTAN AND BROOKLYN

Table 3. -- Airbnb Units by Borough

Borough	Counts	Percentage
Manhattan	6,340	58.6%
Brooklyn	3,663	33.83%
Queens	653	6%
Bronx	100	0.92%
Staten Island	20	0.18%
NYC Total	8,238	100%

Entire unit Airbnb rental properties are highly concentrated in Manhattan and Brooklyn. Out of 10,818 study units, Manhattan accounted for 6,340 Airbnb units, which is 58.6 percent, and Brooklyn accounted for 3,663 units, which is 33.86 percent. Together, 10,003 out of 10,818 units located in Manhattan and Brooklyn and this is over 90 percent of total number of listings. Among neighborhoods in Manhattan and Brooklyn, it is apparent that most of the Airbnb units are clustered in neighborhoods in lower Manhattan and the northern part of Brooklyn.

Figure 1. -- Airbnb Unit Distribution Throughout NYC



Table 4. -- Neighborhoods With More Than 500 Airbnb Units

Borough	Neighborhood	Counts	Rental Stock	Percentage
Manhattan	West Village	632	26,258	2.41%
Brooklyn	North Side - South Side	539	18,381	2.93%
Manhattan	Hudson Yards - Chelsea - Flatiron - Union Square	538	30,635	1.76%
Manhattan	East Village	526	20,445	2.57%
Manhattan	Clinton	503	22,439	2.24%

Out of all 195 neighborhoods, there are five neighborhoods in New York with over 500 Airbnb short-term rental units. The West Village contains more than 600 Airbnb units. North Side - South Side is the only neighborhood located in Brooklyn on the list. Due to its relatively smaller rental housing stock, the proportion of Airbnb units to total rental housing stocks were highest among neighborhoods over 500 or more short-term rentals. Hudson Yards - Chelsea - Flatiron - Union Square, East Village, and Clinton, neighborhoods that are located in mid- and lower Manhattan had over 500 Airbnb units in the neighborhood. Units that are located in these five areas takes up 25 percent of total number of the short-term rental listings.

4.4. MOSTLY 1 BEDROOM APARTMENTS

Table 5. -- Airbnb Units by Housing Type

Housing Type	Counts	Percentage
Apartment	9,690	89.57%
House	656	6.06%
Loft	289	2.67%
Townhouse	87	0.80%
Condo	48	0.44%
Other	48	0.44%
Total	10,818	100%

Table 6. -- Airbnb Units by Number of Bedroom

Number of Bedrooms	Counts	Percentage
Studio	1,605	14.84%
1 Bedroom	5,563	51.42%
2 Bedrooms	2,620	24.22%
3 Bedrooms	751	6.94%
4 Bedrooms	201	1.86%
5 Bedrooms +	78	0.72%
Total	10,818	100%

The most prominent type of short-term rental was multi-family residential in the form of apartments. 9,690 out of 10,818 units were located in apartments, accounting for nearly 90 percent of the total number of listings. Multi-family housing tends to have higher renter share than other types. Moreover, it is illegal to rent multi-family homes for less than 30

days while the owner is not present in the unit by the state law. Considering this, most of the study units are outlawed. Over the half of the listings were with 1 bedroom. Combined with studio and 2 bedrooms, it takes up more than 90 percent of the total listings. Considering that most newly built residential buildings in New York City are multi-family, with 45 units on average, new supply of rental housing has higher probability to be taken off from long-term rental market (New York City Rent Regulation Board, 2014).

4.5. INCENTIVE EXISTS

With the assumption of 67 percent occupancy rate from the LAANE's study, I compare the listing prices and median asked rents from StreetEasy since comparing listing prices with median gross rents does not reflect hosts' present financial incentives (See Appenix B). In most neighborhoods, it is financially more lucrative to rent an apartment out as Airbnb units than as a long-term rental. Homeowners would earn 921 dollars per month per unit on average. Clinton Hill, Brooklyn was the most profitable neighborhood, earning an additional 2,335 dollars per month per unit, and Midtown, SoHo-TriBeCa-Civic Center-Little Italy, Upper East Side followed with more than 2,000 additional dollars per month per unit. For most of New York City, there are financial incentives for landlords to convert their units into short-term rentals.

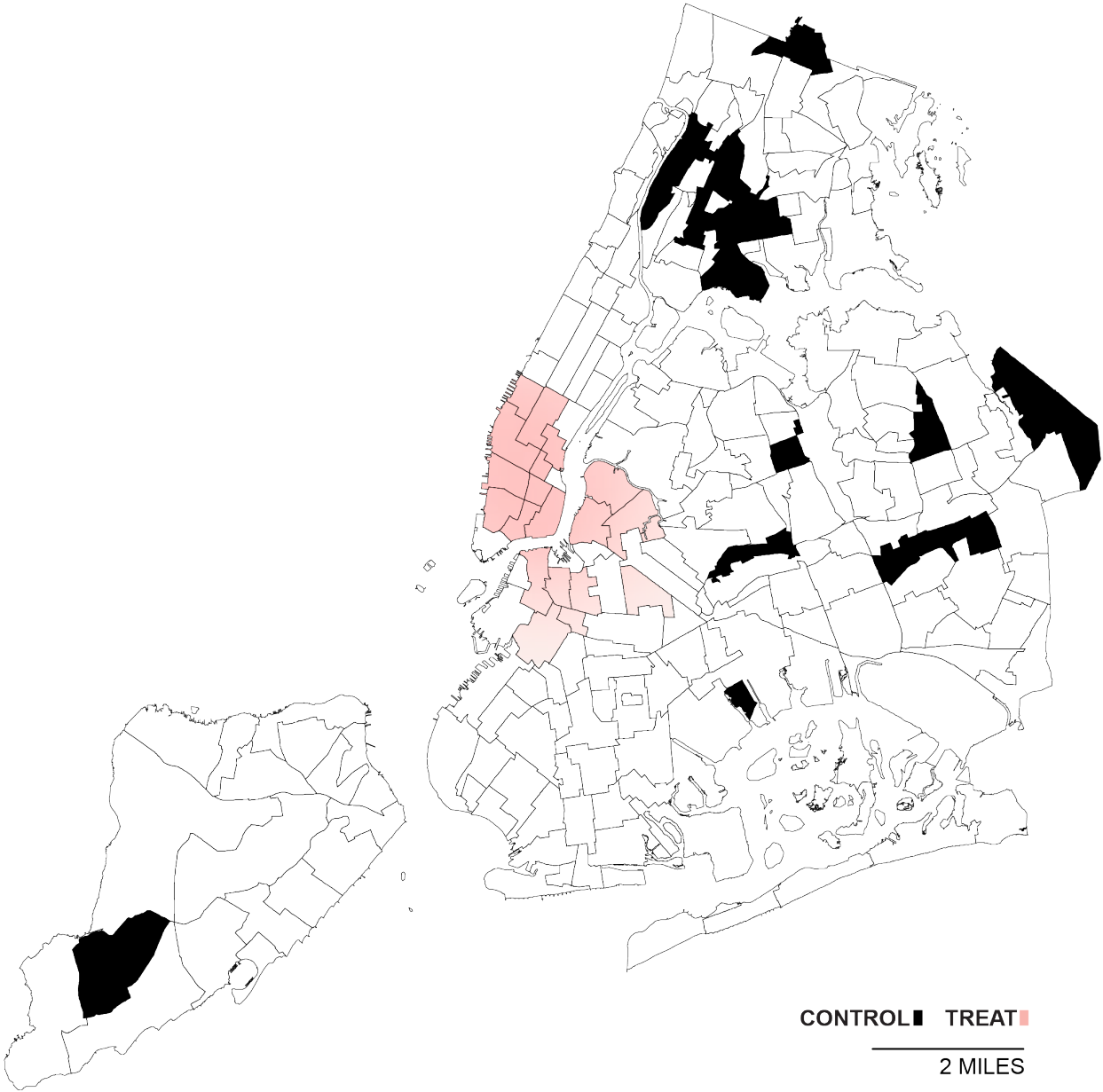
5. RESEARCH DESIGN

In determining whether Airbnb units affects the rental housing market in New York City, this paper attempts to test the following hypotheses: 1) Airbnb units increase rents on the long-term housing market, 2) Airbnb units exacerbate the rent burden of the renter population, 3) Airbnb units cause renter eviction and 4) Airbnb units deplete rental housing stocks. These hypotheses were tested with difference-in-differences estimations and regressions looking at two different groups in two different times.

5.1. DIFFERENCE-IN-DIFFERENCES

This paper hopes to evaluate the impact of Airbnb on New York's rental housing market by looking at two different groups in two different times. There are two neighborhood groups divided by treatment status, $Treat = 0,1$ where 0 indicates neighborhoods that do not receive treatment, i.e. the control group, and 1 indicates neighborhoods that receive treatment, i.e. the treatment group. Treatment group is the neighborhoods with Airbnb units more than 1 percent of its rental housing stocks and control group is the neighborhoods without any Airbnb units. Treatment and control groups are shown in Figure 2.

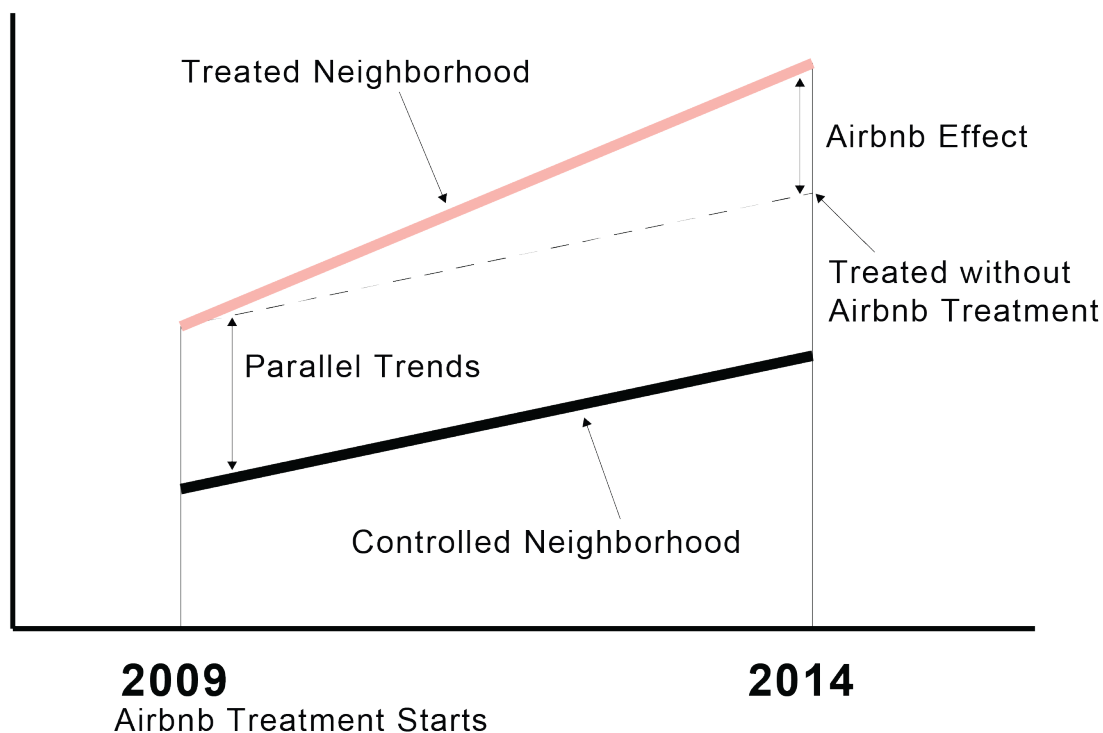
**Figure 2. -- Control and Treatment Groups
By Neighborhood Tabulation Area**



There are two different time periods, Post = 0,1 where 0 indicates a time period before the treatment group receives treatment, i.e. pre-treatment, and 1 indicates a time period after the treatment group receives treatment, i.e. post-treatment. Since Airbnb was

introduced to the market in 2009, the study looks at the value before and after 2009, more specifically value in 2009 and in 2014.

Figure 3. -- Difference-in-difference basic model

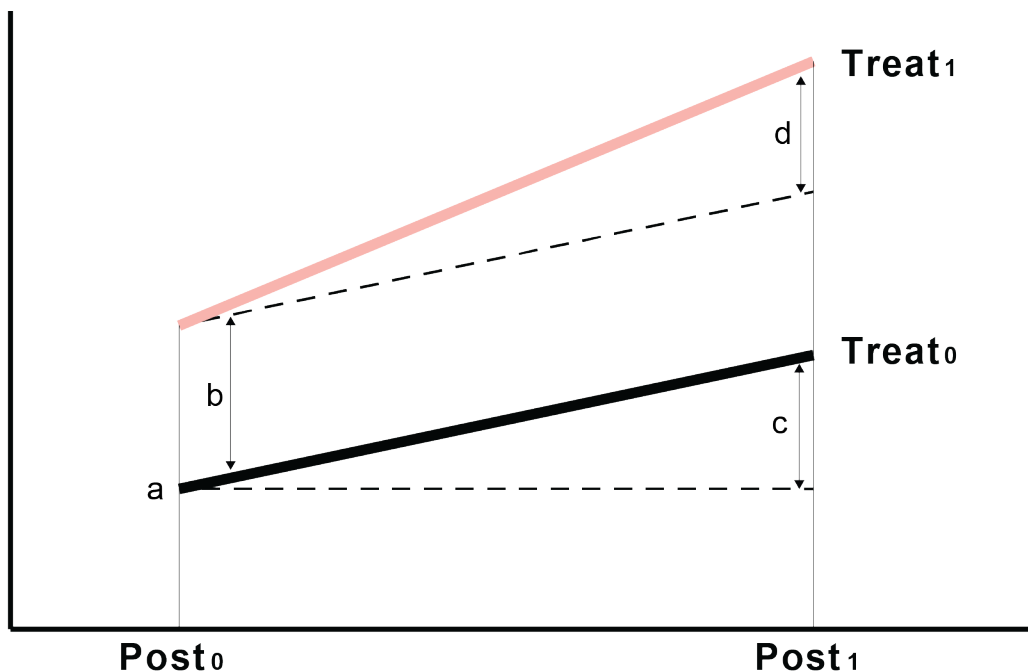


Difference-in-differences estimation uses four points to deduce the impact of a treatment on the treatment group. Four data points are the averages of the outcome for the treatment group before and after treatment, the corresponding averages of the outcome for the control group. The outcome is modeled by the following equation.

$$Y_{it} = a + b \text{Treat}_i + c \text{Post}_t + d(\text{Treat}_i * \text{Post}_t) + e_{it}$$

Based on this equation, observed average of the control group in 2009 is a , which is a constant term. Observed average of the control group in 2014 is $a + c$. c is time trend common to both control and treatment groups. Observed average of the treatment group in 2009 is $a + b$. b is a treatment specific effect and this is to account for average permanent difference between treatment and control groups. Observed average of the treatment group in 2014 is $a + b + c + d$. d is the true effect of treatment.

Figure 4. -- Difference-in-differences estimates and regression



$$\text{Neighborhood } [Y_{00}] = a$$

$$\text{Neighborhood } [Y_{01}] = a + c$$

$$\text{Neighborhood } [Y_{10}] = a + b$$

$$\text{Neighborhood } [Y_{11}] = a + b + c + d$$

$$\text{Neighborhood } ([Y_{11}] - [Y_{10}]) - ([Y_{01}] - [Y_{00}]) = d$$

The difference-in-differences estimator is defined as the difference in average outcome in the treatment group before and after treatment deducted by the difference in average outcome in the control group before and after treatment.

5.3. PARALLEL TREND ASSUMPTION

Difference-in-differences assumes parallel trends in the dependent variable. It assumes that without treatment, the average change for the treated would have been equal to the observed average change for the controls. It is often difficult and sometimes impossible to check the assumptions in the model as they are often unobservable quantities. One of the most common problem with difference-in-differences estimates is the failure of parallel assumption. This happens when there is a different trend for the treatment and control group. If the control group has a time trend of c , while the treatment group has a trend of $c+\Delta$, the difference-in-differences estimator will be biased as $d+\Delta$. The failure of the parallel trend assumption is a relatively common problem in many studies, causing many difference-in-differences estimators to be biased. One way to avoid these problem is to get more data on other time periods before treatment to see if there are any other existing differences in trends. This paper examines existing differences in trends by looking at average values of dependent variables in 2000.

5.2. VARIABLES

Table 7. -- Variables

Variable	Type	Explanation
Post	dummy	Before and after 2009, (0 = before 2009, 1 = after 2009)
Treat	dummy	Airbnb more than 1 percent of rental stock (0 = control, 1 = treatment)
Airbnb Effect	dummy	POST * TREAT (0 = time and neighborhood effect, 1 = treatment effect)
RENT	continuous	Median gross rent by census tracts (2014 dollars)
RENTINC	continuous	Median gross rent as a percentage of household income Median gross rent / Median household income (percent)
RENTOCCU	continuous	Renter occupancy rate Renter Occupant Unit / Total Occupant Unit (percent)
RENTVACA	continuous	Rental Vacancy Rate Vacant for Rent / Rental Stock (percent)

DUMMIES

Treatment group is neighborhoods that are with Airbnb units more than 1 percent of their total rental stocks. Control group is neighborhoods that are without any Airbnb units. Before treatment will be variables in 2009 when Airbnb was first introduced in New York City. After treatment will be variables in 2014. Airbnb effect is an interaction term of post and treat dummies. This variable gives us the change in dependent variables that seems to be occurred due to increase in Airbnb units.

RENT

Gross rent is the monthly amount of rent that includes the estimated average monthly cost of utilities and fuel (U.S. Census Bureau, 2013). This variable was taken into consideration since it gives an immediate sense that if the treatment has correlation with rent increase. Looking at gross rents in two different neighborhoods in two different times would make it possible to prove Thomas Davidoff's claim: Airbnb rentals pushes up rent in prime neighborhoods.

RENTINC

Gross rent as a percentage of income is the ratio of gross rent to household income. It is used as a measure of housing affordability. It is often referred to as a housing cost burden (U.S. Census Bureau, 2013). This variable was considered since gross rent variable alone does not cover income status of households in the neighborhood. This variable will make it possible to look at rent increase compared to the household income and help us to verify if Airbnb intervention impinge on housing affordability in the neighborhood.

RENTOCCU

Rental occupancy rate is the proportion of the renter-occupied housing units. It is computed by dividing the number of renter-occupied housing units by the total occupied housing units, and then multiplying by 100 (U.S. Census Bureau, 2013). This variable was considered to verify if increase in number of Airbnb units in the neighborhoods drive renter households out and to find any signs or evidence of renter evictions.

RENTVACA

Rental vacancy rate is defined as the proportion of the rental inventory that is vacant and “for rent.” It is computed by dividing the number of vacant units “for rent” by the sum of renter-occupied units, vacant units “for rent”, and vacant units that have been rented but not yet occupied, and then multiplying by 100 (U.S. Census Bureau, 2013). This variable was to measure if short-term lodgings lead to decrease in rental vacancy rate and make rental housing market even tighter than before.

5.4. DATA

Data regarding Airbnb listings in New York City was gathered from Inside Airbnb, scraped on February 2016 by technology professional Murray Fox. Murray Cox is a community activist based in New York City who utilizes his technology skills for various nonprofits and community groups. Webscrapes extract and compile data from the public-facing websites and allow for analysis that would otherwise not be able or practical to conduct using a standard browser. The database provides comprehensive collection of data on short-term rental listings registered from June 2008 to February 2016.

Every Airbnb listing locations was provided with xy coordinates. Airbnb units were counted by Neighborhood Tabulation Areas (NTAs) and Census Tracts by using spatial join in ArcGIS. Location points were mostly accurate but the short-term lodging company intentionally added faulty points and removed some of entire home/apt listings

in Manhattan (Cox & Slee, 2016). Fault points were not eliminated in analyses and instead, added in the neighborhoods in which they were specified in street and city column in the dataset.

I used NTA boundaries to choose control and treatment group, and actual difference-in-differences were conducted in census tract level. This is because census tract boundaries had changed in 2010. Neighborhood Tabulation Areas, or NTAs, are aggregations of census tracts that are subsets of New York City's 55 Public Use Microdata Areas, or PUMAs (New York City Department of City Planning). By using NTA boundaries, it was able to conduct regression capturing same geographical area before and after 2010. But due to PUMA constraints, NTA boundaries and their names may not definitely represent traditionally perceived neighborhoods.

I used secondary data for median gross rent, median household income, total occupied units, renter occupied units, units that are vacant for rent. It was provided by U.S. Census Bureau, 2005-2009 and 2010-2014 5-year American Community Survey. All data are gathered and compiled in census tract level. Since ACS 5-years estimates are based on data collected from 2010 to 2014, that covers most of the time periods that Airbnb was present in NYC, it has limitation to capture abrupt change in values after the Airbnb treatment. It would have been easier to capture change in values with 1-year or 3-years estimates. However, the unit of analysis of the study was the census tract level, which was only available in 5-years estimates.

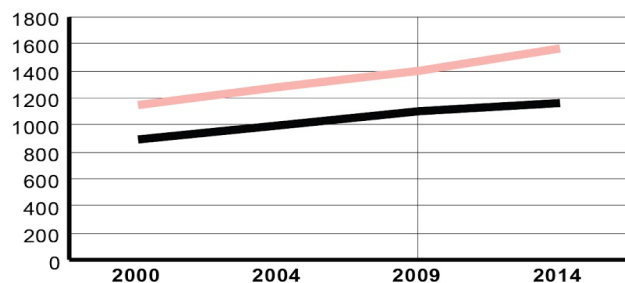
6. ANALYSIS

6.1. MEDIAN GROSS RENT

$$\text{RENT}_{it} = 1,085.54 + 317.23 \text{ Treat}_i + 79.04 \text{ Post}_t + 77.04 (\text{Treat}_i * \text{Post}_t) + \epsilon_{it}$$

VARIABLE	COEFFICIENTS	STD. ERROR	T VALUE	Pr(> t)
RENT				
INTERCEPT	1085.54	31.61	34.339	<2e-16 ***
POST	79.04	45.69	1.730	0.084 .
TREAT	317.23	42.75	7.420	3.03e-13 ***
AIRBNB EFFECT	77.04	61.41	1.255	0.210

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
 N: 787 R-squared: 0.1622 F-statistic: 50.73 on 3



	CONTROL ■	TREAT ■	DIFFER ENCE
2000	899	1,155	256
2009	1,086	1,403	317
2014	1,165	1,559	394
DIFFER ENCE	79	156	77

Median gross rent in control group in 2009 was 1,085.54 dollars and it increased 79.04 dollars by 2014. This implies that all neighborhood groups regardless of Airbnb treatment faced rent increase by about 79 dollars during five years of time. The initial difference in median gross rents between control and treatment neighborhood was 317.23 dollars in 2009. This assumes that rents in neighborhood with Airbnb units tend to be 317.23 dollars more expensive constantly over time. In 2014, the difference in

median gross rents between two groups was 394.27 dollars, which exceeds 77.04 dollars more and this is regarded as rent increase from Airbnb effect.

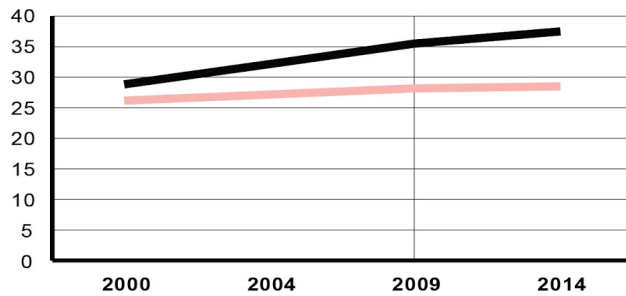
The Difference-in-Difference regression shows 77.04 dollars increase in median gross rents within 5 years in treatment neighborhoods where more than 1 percent of their rental stock used as Airbnb units. However, according to the t-test result, increase in median gross rent from the treatment is small and insignificant. It is rather hard to conclude that Airbnb clustered neighborhoods experience more rent increase compared to that of neighborhoods without any Airbnb units. It is hard to accept the statement that claims Airbnb units increase rents. The regression showed that a losing 1 percent of rental housing stock from a neighborhood level rarely cause significant increase in rents.

6.2. RENT IN PERCENTAGE OF HOUSEHOLD INCOME

$$\text{RENTINC}_{it} = 35.54 - 7.45 \text{ Treat}_i + 2.14 \text{ Post}_t - 1.92 (\text{Treat}_i * \text{Post}_t) + \epsilon_{it}$$

VARIABLE	COEFFICIENTS	STD. ERROR	T VALUE	Pr(> t)	
RENTINC					
INTERCEPT	35.5385	0.4811	73.867	<2e-16	***
POST	2.1401	0.6953	3.078	0.00216	**
TREAT	-7.4539	0.6506	-11.456	<2e-16	***
AIRBNB EFFECT	-1.9229	0.9346	-2.058	0.03996	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
 N: 787 R-squared: 0.2963 F-statistic: 110.3 on 3



	CONTROL ■	TREAT ■	DIFFER ENCE
2000	28.8	26.2	-2.6
2009	35.5	28.1	-7.4
2014	37.7	28.3	-9.4
DIFFER ENCE	2.1	0.2	-1.9

Rent in percentage of household income in control group was 35.54 percent in 2009. It increased by 2.14 percentage point in 2014. This implies that households in all neighborhood groups regardless of Airbnb treatment resulted in spending 2.14 percent more of their income on rents than before. In 2009, Airbnb-clustered neighborhoods tend to spend 7.45 percentage point less on housing compared to neighborhoods without Airbnb units. This tells us that households in treatment neighborhoods tend to spend less portion of their income on rents constantly over time. Considering that households in treatment neighborhood pay about 317 dollars more than those in control group, renter households in treated neighborhoods seem to have higher income than renters in controlled neighborhoods. Regression result shows that in 2014, the difference between two groups was about -9.37 percentage point and additional -1.92 percentage point difference is stemmed from 1 percent of rental housing stock used as Airbnb units.

The Difference-in-Differences regression displays that households in treatment neighborhood spent 1.92 percentage point less of their income on housing in 2014. The alleviation in rental cost was statistically significant with 99 percent confidence level. With this result, it is hard to prove the claim that Airbnb units exacerbate rent burden on

renter population. However, this can be also interpreted as renter households' having additional income source through renting their unit out to home-sharing platforms and alleviate their rental cost.

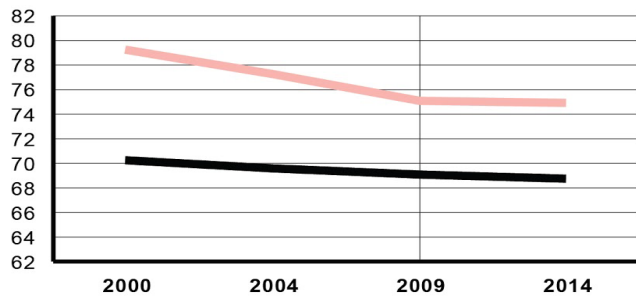
From 2000 to 2009, rent in percentage of household income in treated and controlled neighborhood showed different trends. Before 2009, rent burden on households in controlled group deteriorated faster than those in treated group. However, after 2009, after Airbnb treatment, the trend between two groups became relatively parallel.

6.3. RENTER OCCUPANCY RATE

$$\text{RENTOCCU}_{it} = 68.86 + 6.44 \text{ Treat}_i - 0.06 \text{ Post}_t - 0.38 (\text{Treat}_i * \text{Post}_t) + \varepsilon_{it}$$

VARIABLE	COEFFICIENTS	STD. ERROR	T VALUE	Pr(> t)
RENTOCCU				
INTERCEPT	68.85961	1.68574	40.848	<2e-16 ***
POST	-0.05799	2.43632	-0.024	0.98102
TREAT	6.44165	2.27970	2.826	0.00484 **
AIRBNB EFFECT	-0.37967	3.27459	-0.116	0.90773

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
 N: 787 R-squared: 0.01829 F-statistic: 4.882 on 3



	CONTROL ■	TREAT ■	DIFFER ENCE
2000	70.3	79.3	9
2009	68.9	75.3	6.4
2014	68.8	74.9	6.1
DIFFER ENCE	-0.06	-0.4	-0.38

Renter occupancy rate in control group was 68.86 percent in 2009. It decreased by 0.06 percentage point in 2014. This year effect explains 0.06 percentage point change within 5 years in renter occupancy rate in all neighborhood groups. The initial difference in renter occupancy rate between control and treatment neighborhood was 6.44 percent, that is to say, renter occupancy rate in treated neighborhood was 75.29 percent in 2009. This neighborhood effect describes that renter occupancy rate in neighborhood with Airbnb units have tendency to have more share of renter population continually over time by 6.44 percentage point. In 2014, the difference in renter occupancy rate between two groups was 6.06 percentage point, and that fell 0.37 percentage point short of expected renter occupancy rate. This amount is considered to be correlated with Airbnb units comprising more than 1 percent of neighborhoods' rental housing stock.

The Difference-in-Differences regression suggest that Airbnb cause 0.37 percentage point decrease in the share of renter household within 5 years in treated neighborhoods. In other words, 1 percent of rental supply contracts force out renter households by 0.37 percent. T-test reports that decrease in renter occupancy rate is negligible and insignificant. This result refutes the claim that increase in Airbnb units accelerate renter evictions in neighborhoods.

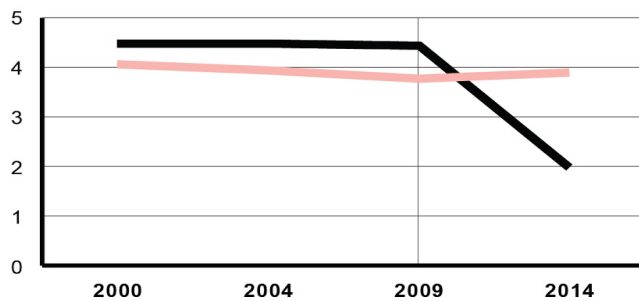
Parallel trends from 2000 to 2009 shows that renter occupancy rate decreased faster in treated neighborhood. That is to say, until 2009, owner occupant housing units were growing in treated neighborhood. However, after 2009, the trend between two groups became relatively parallel.

6.4. RENTAL VACANCY RATE

$$\text{RENTVACA}_{it} = 4.47 - 0.67 \text{ Treat}_i - 2.47 \text{ Post}_t + 2.57 (\text{Treat}_i * \text{Post}_t) + \epsilon_{it}$$

VARIABLE	COEFFICIENTS	STD. ERROR	T VALUE	Pr(> t)
RENTVACA				
INTERCEPT	4.4656	0.3199	13.961	<2e-16 ***
POST	-2.4743	0.4623	-5.352	1.14e-07 ***
TREAT	-0.6732	0.4326	-1.556	0.12
AIRBNB EFFECT	2.5748	0.6214	4.144	3.79e-05 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
 N: 787 R-squared: 0.03908 F-statistic: 10.66 on 3



	CONTROL ■	TREAT ■	DIFFERENCE
2000	4.48	4.07	-0.41
2009	4.47	3.79	-0.67
2014	1.99	3.89	1.9
DIFFERENCE	-2.47	0.1	2.57

Rental vacancy rate in controlled neighborhood was 4.46 percent in 2009. It decreased by 2.47 percentage point, to 1.99 percent within 5 years. This year effect suggests that regardless of Airbnb units presenting in rental housing stocks, both controlled and treated neighborhood groups were assumed to undergo shrinkage in rental vacancy rate. The gap between two neighborhood groups was -0.67 percentage point in 2009. This explains that rental vacancy rate in treated neighborhood was 3.8 percent in 2009. Rental vacancy rate in the neighborhood where 1 percent of rental inventory is taken over by Airbnb rentals tend to have lower rental vacancy rate by 0.67 percent. In 2014, the difference in rental vacancy rate between two groups was 1.9 percentage point, that outpaced point expected rental vacancy rate by 2.57 percentage point. This difference is considered to be derived from Airbnb units comprising more than 1 percent of neighborhoods' rental housing inventory.

The Difference-in-Differences regression suggest that Airbnb cause 2.57 percentage point increase in rental vacancy rate within 5 years in treated neighborhoods. That is, 1 percent of rental supply contractions creates more vacant units by 2.57 percentage point. According to T-test, this result is statistically significant. This may sound counterintuitive to most people who support anti-Airbnb arguments who thought vacancy rate would fall.

7. LIMITATIONS AND IMPLICATIONS

Difference-in-differences analysis showed a lack of correlation between increases in the number of Airbnb units and increases in rent. Even though rents did not surge in the treated neighborhoods, rent as a percentage of household income shrunk by about 2 percent. This indicates that renter households' income after housing cost increased in treated neighborhoods. This shows that Airbnb's presence has not influenced the affordability of rental housing in New York City. It is either household income in the treated neighborhoods increased more than rent did, or Airbnb-generated income might have played a bigger role in these neighborhoods. The share of renter population slightly decreased in Airbnb-popular neighborhoods but it was hard to find strong evidence of renter evictions in those neighborhoods. In the 5 years Airbnb has operated in New York, the rental vacancy rate has increased by 2.57 percent. This suggests that neighborhoods with Airbnb units tend to have more vacant units for rent. The increase in vacancy rate does not support the argument that home-sharing platforms make the rental housing market tighter.

Initially, I looked at the rental vacancy rate to see if Airbnb is making the rental housing market tighter by removing rental units from the market. However, based on my initial results, I could see that it is not possible to measure the tightness of the rental housing market using the conventional rental vacancy rate method. It was perplexing to find the rental vacancy rate in the most desirable neighborhoods to be above the city wide average rental vacancy rate. One explanation is that landowners are habitually

answering “vacant for rent” on the surveys while making their properties permanently available on Airbnb or other home sharing platforms.

It is still uncertain how vacant units that are rented out as short-term rentals are classified by the US Census Bureau. ACS 5-Year Estimates divide vacancy status into several categories: vacant for rent; rented but not occupied; for sale; sold but not occupied; for seasonal, recreational, or occasional use; and other vacant. In treated neighborhoods, the share of units categorized as vacant for rent increased significantly. It is possible that this class contains many Airbnb units. Owners may be creating permanently vacant rental units by classifying them as vacant for rent because ACS does not provide a clear categorization for short-term rental units.

Even though difference-in-differences analysis suggests Airbnb is not disrupting New York City’s rental housing market, Airbnb should be monitored. Airbnb has only operated in New York City since 2009, and already taking up 0.5 percent of its rental housing stock. It is possible that the critical mass needed to effect the rental housing market has not yet been reached. Moreover, the time in which Airbnb was introduced was amid the chaos following the economic panic caused by the subprime mortgage crisis of 2008. This intervention to the rental housing market might be strongly reflected in the analysis results. The financial incentives persist for people to take units off of the rental market, and the number is growing, especially in Manhattan and Brooklyn. If more units are added to those neighborhoods in long term, the same analysis may be capable of distilling the effects of Airbnb from those of the subprime mortgage crisis.

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APPENDIX A – Airbnb units in Rental Stock

NTACode	NTAName	COUNT	RENTAL STOCK	PERCENT
BK93	Starrett City	0	6230	0
BX06	Belmont	0	8631	0
BX08	West Farms-Bronx River	0	10560	0
BX27	Hunts Point	0	8361	0
BX30	Kingsbridge Heights	0	9374	0
BX36	University Heights-Morris Heights	0	18175	0
BX40	Fordham South	0	8505	0
BX55	Soundview-Bruckner	0	9667	0
BX62	Woodlawn-Wakefield	0	8650	0
BX75	Crotona Park East	0	6693	0
QN07	Hollis	0	2770	0
QN19	Glendale	0	6420	0
QN44	Glen Oaks-Floral Park-New Hyde Park	0	2072	0
QN45	Douglas Manor-Douglaston-Little Neck	0	2315	0
QN48	Auburndale	0	2328	0
SI32	Rossville-Woodrow	0	1584	0
SI48	Arden Heights	0	1067	0
BX01	Claremont-Bathgate	1	10110	0
BX35	Morrisania-Melrose	1	12374	0
QN61	Jamaica	1	12389	0
BX26	Highbridge	1	12586	0
QN25	Corona	1	13260	0
BX17	East Tremont	1	13822	0
QN51	Murray Hill	1	9819	0.0001
BX41	Mount Hope	2	16840	0.00012
BX03	Eastchester-Edenwald-Baychester	1	7492	0.00013
QN01	South Jamaica	1	7062	0.00014
BX59	Westchester-Unionport	1	6795	0.00015
BK88	Borough Park	3	20011	0.00015
BX05	Bedford Park-Fordham North	3	18198	0.00016
BX14	East Concourse-Concourse Village	4	20222	0.0002
BX28	Van Cortlandt Village	3	15046	0.0002
BX46	Parkchester	2	9893	0.0002
BK29	Bensonhurst East	3	14497	0.00021
BK45	Georgetown-Marine Park-Bergen Beach-Mill Basin	1	4731	0.00021
QN53	Woodhaven	2	8686	0.00023
BK30	Dyker Heights	2	8290	0.00024
BX33	Longwood	2	8176	0.00024
BX07	Bronxdale	3	12200	0.00025

NTACode	NTAName	COUNT	RENTAL STOCK	PERCENT
BX13	Co-op City	3	11482	0.00026
QN22	Flushing	5	18992	0.00026
BK26	Gravesend	2	7521	0.00027
BX37	Van Nest-Morris Park-Westchester Square	2	7231	0.00028
QN26	North Corona	3	10300	0.00029
QN02	Springfield Gardens North	2	6775	0.0003
BK27	Bath Beach	2	6753	0.0003
QN49	Whitestone	1	3331	0.0003
QN15	Far Rockaway-Bayswater	4	12482	0.00032
QN42	Oakland Gardens	1	3096	0.00032
SI54	Great Kills	1	3020	0.00033
BX52	Schuylerville-Throgs Neck-Edgewater Park	3	8780	0.00034
QN55	South Ozone Park	3	8334	0.00036
BX09	Soundview-Castle Hill-Clason Point-Harding Park	5	13851	0.00036
BK44	Madison	3	8231	0.00036
BK81	Brownsville	7	18589	0.00038
SI24	Todt Hill-Emerson Hill-Heartland Village-Lighthouse Hill	1	2471	0.0004
SI07	Westerleigh	1	2461	0.00041
QN29	Elmhurst	9	21208	0.00042
SI08	Grymes Hill-Clifton-Fox Hills	2	4693	0.00043
QN43	Bellerose	1	2328	0.00043
BK23	West Brighton	2	4490	0.00045
QN35	Briarwood-Jamaica Hills	4	8844	0.00045
BX49	Pelham Parkway	4	8781	0.00046
SI01	Annadale-Huguenot-Prince's Bay-Eltingville	1	2194	0.00046
BX29	Spuyten Duyvil-Kingsbridge	4	8747	0.00046
BX34	Melrose South-Mott Haven North	6	13054	0.00046
BX43	Norwood	5	10672	0.00047
QN23	College Point	2	4245	0.00047
BX63	West Concourse	6	12727	0.00047
BK82	East New York	13	26390	0.00049
BK46	Ocean Parkway South	2	3944	0.00051
QN41	Fresh Meadows-Utopia	2	3725	0.00054
QN46	Bayside-Bayside Hills	3	5558	0.00054
BK43	Midwood	7	12848	0.00054
BK28	Bensonhurst West	11	20159	0.00055
QN38	Pomonok-Flushing Heights-Hillcrest	4	6752	0.00059
QN54	Richmond Hill	6	9888	0.00061
SI11	Charleston-Richmond Valley-Tottenville	1	1608	0.00062
BX39	Mott Haven-Port Morris	11	17497	0.00063

NTACode	NTAName	COUNT	RENTAL STOCK	PERCENT
BX44	Williamsbridge-Olinville	10	15596	0.00064
QN47	Ft. Totten-Bay Terrace-Clearview	2	3039	0.00066
QN06	Jamaica Estates-Holliswood	3	4444	0.00068
BK25	Homecrest	7	9892	0.00071
BX22	North Riverdale-Fieldston-Riverdale	4	5591	0.00072
BK21	Seagate-Coney Island	7	9708	0.00072
QN57	Lindenwood-Howard Beach	2	2750	0.00073
QN62	Queensboro Hill	2	2746	0.00073
QN60	Kew Gardens	5	6729	0.00074
QN37	Kew Gardens Hills	5	6545	0.00076
SI05	New Springville-Bloomfield-Travis	3	3911	0.00077
SI25	Oakwood-Oakwood Beach	2	2534	0.00079
SI28	Port Richmond	2	2445	0.00082
BK96	Rugby-Remsen Village	12	14644	0.00082
BK34	Sunset Park East	14	16698	0.00084
QN52	East Flushing	4	4687	0.00085
QN33	Cambria Heights	1	1134	0.00088
SI12	Mariner's Harbor-Arlington-Port Ivory-Graniteville	4	4495	0.00089
QN10	Breezy Point-Belle Harbor-Rockaway Park-Broad Channel	4	4490	0.00089
BK41	Kensington-Ocean Parkway	8	8890	0.0009
QN34	Queens Village	5	5472	0.00091
BK83	Cypress Hills-City Line	10	10256	0.00098
BX10	Pelham Bay-Country Club-City Island	7	6923	0.00101
QN03	Springfield Gardens South-Brookville	2	1966	0.00102
BK19	Brighton Beach	11	10383	0.00106
QN30	Maspeth	6	5326	0.00113
SI37	Stapleton-Rosebank	6	5144	0.00117
SI35	New Brighton-Silver Lake	3	2566	0.00117
BX31	Allerton-Pelham Gardens	5	4215	0.00119
BK58	Flatlands	12	10027	0.0012
QN50	Elmhurst-Maspeth	6	5004	0.0012
MN01	Marble Hill-Inwood	21	17155	0.00122
QN56	Ozone Park	4	3132	0.00128
QN27	East Elmhurst	5	3902	0.00128
BK85	East New York (Pennsylvania Ave)	11	8432	0.0013
BK32	Sunset Park West	18	13384	0.00134
BK31	Bay Ridge	32	23556	0.00136
BK17	Sheepshead Bay-Gerritsen Beach-Manhattan Beach	18	13002	0.00138
QN63	Woodside	16	11445	0.0014
QN21	Middle Village	9	6384	0.00141

NTACode	NTAName	COUNT	RENTAL STOCK	PERCENT
QN18	Rego Park	11	7713	0.00143
QN28	Jackson Heights	35	24483	0.00143
QN17	Forest Hills	31	21398	0.00145
BK50	Canarsie	22	14849	0.00148
SI36	Old Town-Dongan Hills-South Beach	5	3163	0.00158
QN08	St. Albans	8	4758	0.00168
BK91	East Flatbush-Farragut	17	9812	0.00173
QN05	Rosedale	5	2881	0.00174
BK72	Williamsburg	13	7244	0.00179
QN66	Laurelton	3	1648	0.00182
MN36	Washington Heights South	54	27505	0.00196
SI22	West New Brighton-New Brighton-St. George	18	7957	0.00226
QN12	Hammels-Arverne-Edgemere	22	9055	0.00243
SI45	New Dorp-Midland Beach	5	2057	0.00243
QN76	Baisley Park	10	4084	0.00245
SI14	Grasmere-Arrochar-Ft. Wadsworth	6	2434	0.00247
QN71	Old Astoria	25	10051	0.00249
BK42	Flatbush	88	32211	0.00273
QN20	Ridgewood	55	19668	0.0028
BK95	Erasmus	25	8381	0.00298
MN35	Washington Heights North	70	22757	0.00308
MN50	Stuyvesant Town-Cooper Village	33	10636	0.0031
QN68	Queensbridge-Ravenswood-Long Island City	24	7026	0.00342
BK79	Ocean Hill	37	10343	0.00358
MN06	Manhattanville	29	8089	0.00359
BK63	Crown Heights South	53	13079	0.00405
QN70	Astoria	125	30108	0.00415
QN72	Steinway	61	14573	0.00419
QN31	Hunters Point-Sunnyside-West Maspeth	96	22666	0.00424
MN33	East Harlem South	110	22178	0.00496
MN09	Morningside Heights	87	16986	0.00512
BK60	Prospect Lefferts Gardens-Wingate	120	22639	0.0053
MN34	East Harlem North	131	22376	0.00585
BK77	Bushwick North	113	18168	0.00622
MN03	Central Harlem North-Polo Grounds	198	31662	0.00625
MN31	Lenox Hill-Roosevelt Island	224	34102	0.00657
MN32	Yorkville	231	34494	0.0067
BK40	Windsor Terrace	39	5718	0.00682
MN12	Upper West Side	340	49020	0.00694
BK09	Brooklyn Heights-Cobble Hill	47	6212	0.00757

NTACode	NTAName	COUNT	RENTAL STOCK	PERCENT
MN04	Hamilton Heights	130	17041	0.00763
BK78	Bushwick South	177	22757	0.00778
BK61	Crown Heights North	298	37476	0.00795
MN14	Lincoln Square	172	20318	0.00847
MN25	Battery Park City-Lower Manhattan	155	18191	0.00852
MN11	Central Harlem South	143	16503	0.00867
BK33	Carroll Gardens-Columbia Street-Red Hook	119	13435	0.00886
MN40	Upper East Side-Carnegie Hill	117	12617	0.00927
BK75	Bedford	202	21173	0.00954
MN19	Turtle Bay-East Midtown	174	17682	0.00984
MN28	Lower East Side	269	26710	0.01007
BK38	DUMBO-Vinegar Hill-Downtown Brooklyn-Boerum Hill	132	12211	0.01081
BK35	Stuyvesant Heights	259	20435	0.01267
MN20	Murray Hill-Kips Bay	246	18993	0.01295
BK37	Park Slope-Gowanus	258	19514	0.01322
BK68	Fort Greene	130	9389	0.01385
BK90	East Williamsburg	189	13144	0.01438
MN21	Gramercy	168	10171	0.01652
BK64	Prospect Heights	112	6673	0.01678
BK76	Greenpoint	221	12817	0.01724
MN13	Hudson Yards-Chelsea-Flatiron-Union Square	538	30635	0.01756
MN27	Chinatown	321	17371	0.01848
BK69	Clinton Hill	217	10810	0.02007
MN17	Midtown-Midtown South	292	13336	0.0219
MN15	Clinton	503	22439	0.02242
MN23	West Village	632	26258	0.02407
MN22	East Village	526	20445	0.02573
MN24	SoHo-TriBeCa-Civic Center-Little Italy	414	14430	0.02869
BK73	North Side-South Side	539	18381	0.02932

APPENDIX B – Listing Prices and Asking Rent

NTACode	NTAName	MONTHLY PRICE (100%)	MONTHLY PRICE (67%)	StreetEasy ASKING RENT	INCENTIVE
BK69	Clinton Hill	7291.21	4885.11	2550	2335.11
MN17	Midtown-Midtown South	8869.33	5942.45	3695	2247.45
MN24	SoHo-TriBeCa-Civic Center-Little Italy	9196.49	6161.65	4038	2124.15
MN40	Upper East Side-Carnegie Hill	7393.61	4953.72	2870	2083.72
QN31	Hunters Point-Sunnyside-West Maspeth	5398.60	3617.06	1650	1967.06
QN68	Queensbridge-Ravenswood-Long Island City	5769.63	3865.65	2100	1765.65
BK33	Carroll Gardens-Columbia Street-Red Hook	6554.34	4391.41	2750	1641.41
MN09	Morningside Heights	5268.56	3529.94	2000	1529.94
MN27	Chinatown	6021.40	4034.34	2570	1464.34
MN33	East Harlem South	5285.77	3541.47	2095	1446.47
MN28	Lower East Side	5804.80	3889.22	2570	1319.22
MN14	Lincoln Square	7384.38	4947.53	3635	1312.53
MN19	Turtle Bay-East Midtown	7135.61	4780.86	3480	1300.86
BK37	Park Slope-Gowanus	5569.20	3731.37	2450	1281.37
BK79	Ocean Hill	4134.86	2770.36	1550	1220.36
MN23	West Village	7920.95	5307.04	4090	1217.04
BX63	West Concourse	3585.00	2401.95	1200	1201.95
BX35	Morrisania-Melrose	3600.00	2412.00	1230	1182.00
BX39	Mott Haven-Port Morris	3645.45	2442.45	1265	1177.45
MN11	Central Harlem South	4859.83	3256.09	2085	1171.09
MN20	Murray Hill-Kips Bay	6869.14	4602.32	3435	1167.32
BK91	East Flatbush-Farragut	3796.00	2543.32	1395	1148.32
MN22	East Village	6022.81	4035.28	2895	1140.28
MN15	Clinton	6815.43	4566.34	3430	1136.34
MN13	Hudson Yards-Chelsea-Flatiron-Union Square	7581.99	5079.93	3950	1129.93
MN04	Hamilton Heights	4609.21	3088.17	2000	1088.17
BK32	Sunset Park West	4044.44	2709.78	1650	1059.78
BX34	Melrose South-Mott Haven North	3440.00	2304.80	1290	1014.80
BK77	Bushwick North	4833.28	3238.30	2270	968.30
MN36	Washington Heights South	4090.93	2740.92	1785	955.92
BX26	Highbridge	3200.00	2144.00	1250	894.00
BK50	Canarsie	3800.91	2546.61	1680	866.61
BK76	Greenpoint	5163.46	3459.52	2600	859.52
MN34	East Harlem North	4314.57	2890.76	2095	795.76
BK09	Brooklyn Heights-Cobble Hill	5498.13	3683.75	2925	758.75
BK58	Flatlands	3430.00	2298.10	1550	748.10
MN21	Gramercy	7232.67	4845.89	4100	745.89
MN25	Battery Park City-Lower Manhattan	6966.52	4667.57	3933	735.07

NTACode	NTAName	MONTHLY PRICE (100%)	MONTHLY PRICE (67%)	StreetEasy ASKING RENT	INCENTIVE
MN32	Yorkville	5334.34	3574.01	2870	704.01
BK61	Crown Heights North	4138.24	2772.62	2095	677.62
MN03	Central Harlem North-Polo Grounds	4101.69	2748.13	2085	663.13
BK42	Flatbush	3448.89	2310.75	1650	660.75
MN31	Lenox Hill-Roosevelt Island	5269.25	3530.39	2870	660.39
MN06	Manhattanville	3968.90	2659.16	2000	659.16
BK64	Prospect Heights	4672.66	3130.68	2500	630.68
QN70	Astoria	4050.43	2713.79	2100	613.79
BK41	Kensington-Ocean Parkway	3574.00	2394.58	1785	609.58
BK73	North Side-South Side	5830.31	3906.31	3300	606.31
MN01	Marble Hill-Inwood	3539.52	2371.48	1785	586.48
MN12	Upper West Side	6151.44	4121.47	3635	486.47
BK78	Bushwick South	4078.19	2732.38	2270	462.38
BX33	Longwood	2525.00	1691.75	1230	461.75
BK68	Fort Greene	4850.23	3249.65	2825	424.65
MN35	Washington Heights North	3265.36	2187.79	1785	402.79
BK38	DUMBO-Vinegar Hill-Downtown Brooklyn-Boerum Hill	5650.91	3786.11	3441	344.86
QN71	Old Astoria	3510.00	2351.70	2100	251.70
BK88	Borough Park	3266.67	2188.67	1990	198.67
BX14	East Concourse-Concourse Village	2562.50	1716.88	1580	136.88
BK72	Williamsburg	5010.77	3357.22	3300	57.22
BK40	Windsor Terrace	3865.59	2589.95	2570	19.95
BK81	Brownsville	2207.14	1478.79	1490	-11.21
BK63	Crown Heights South	3024.72	2026.56	2095	-68.44
MN50	Stuyvesant Town-Cooper Village	5569.36	3731.47	4100	-368.53