Introduction

New York City has been suffering through an affordable housing crisis for years. Between 2011 and 2017, New York City lost nearly 183,000 affordable units of housing renting for less than $1,000 – larger than the entire public housing stock. Affordable housing is increasingly hard to find, with vacancy rates for apartments renting for less than $1,000 at 1.54%.[1] Homelessness stands at a record high, with over 60,000 homeless people sleeping in shelters every night. Meanwhile, wages are stagnant and rents continue to climb in all five boroughs.

The rising popularity of homesharing websites such as Airbnb is adding to the problem.[2] The trendy replacement for hotels and hostels in effect removes housing units from the overall supply – units that might otherwise be available to rent to New Yorkers looking to rent an apartment. The most basic concept in the field of economics – supply and demand – says that, everything else equal, a reduction in supply will lead to higher prices. This report, by Comptroller Scott M. Stringer, evaluates the impact of homesharing on rents in New York City over the period 2009 to 2016.

Background

Between 2009 and 2016, rents rose 25% on average citywide, or $279 per month. Rents rose most rapidly in Brooklyn, by 35% ($340 per month) followed by Queens by 22% ($242 per month); Bronx by 21% ($171 per month); Manhattan by 19% ($276 per month); and Staten Island by 14% ($129 per month).[3]

During the same period, Airbnb listings skyrocketed, from 1,000 in 2010 to over 43,000 in 2015, before declining to slightly under 40,000 in 2016 according to data from AirDNA (Figure 1) – most in in violation of existing State or City laws.[4] Airbnb listings are most heavily concentrated in Manhattan (52% of all listings in 2016) and Brooklyn (35% of all listings in 2016), but are found in

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[1] Source: Department of Housing Preservation and Development: *Selected Initial Findings of the 2017 New York City Housing and Vacancy Survey* (dated February 9, 2018) (http://www1.nyc.gov/assets/hpd/downloads/pdf/about/2017-hvs-initial-findings.pdf).

[2] There are other homesharing websites, including HomeAway and VRBO, which have smaller presences in the City and for which listings data was not available. They were therefore not included in this analysis. Presumably their inclusion would have amplified the results.

[3] Source: U.S. Census Bureau, American Community Survey, 2009-2016.

[4] A report by Attorney General Eric Schneiderman found that 72% of short-term rentals on Airbnb appeared to be illegal (https://ag.ny.gov/pdfs/AIRBNB%20REPORT.pdf)

every borough. Airbnb listings are particularly concentrated in Manhattan below 59th Street, including Chelsea, Clinton and Midtown Business District (11.3% of all listings in 2016), Battery Park City, Greenwich Village and Soho (7.9%), Chinatown and Lower East Side (6.9%), Murray Hill, Gramercy and Stuyvesant Town (5.9%) as well as parts of Brooklyn including Greenpoint and Williamsburg (8.3%), Bedford-Stuyvesant (5.1%), and Bushwick (5.0%).

Rents in these eight neighborhoods rose at substantially higher rates than the borough average between 2009 and 2016. Average monthly rent in Greenpoint and Williamsburg went up by 62.6% ($659 per month), by 47.2% in Bedford-Stuyvesant ($407 per month), by 39.5% in Bushwick ($369 per month), by 25.9% Murray Hill, Gramercy and Stuyvesant Town ($488 per month), by 23.4% in Chelsea, Clinton and Midtown Business District ($398 per mont), by 23% in Chinatown and Lower East Side ($242 per month), and by 21.4% in Battery Park City, Greenwich Village and Soho ($411 per month).

Figure 1: Airbnb Total Listings by Year, 2010 - 2017
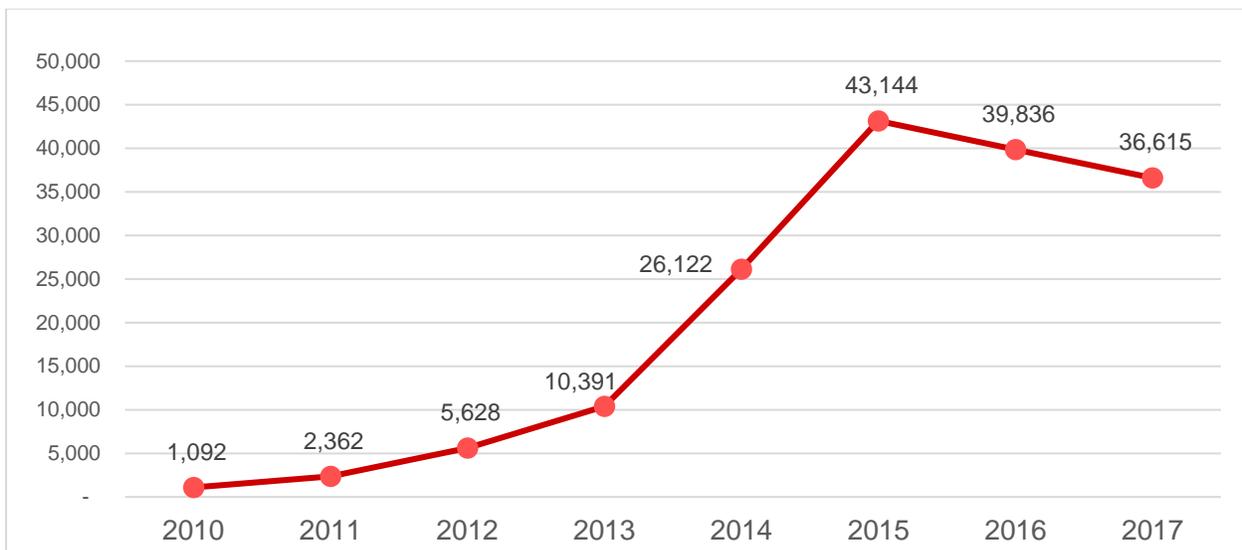
Findings

We sought to estimate the impact that Airbnb listings have had on neighborhood rents.

Utilizing neighborhood level data for the years 2009 to 2016, we found that:

- For each one percent of all residential units in a neighborhood listed on Airbnb, rental rates in that neighborhood went up by 1.58 percent.

- Between 2009 and 2016, approximately 9.2 percent of the citywide increase in rental rates can be attributed to Airbnb.

- Airbnb listings were heavily concentrated in parts of Manhattan and Brooklyn and had a greater impact on these neighborhoods. Approximately 20% of the increase in rental rates was due to Airbnb listings in midtown and lower Manhattan including neighborhoods such

as Chelsea, Clinton, and Midtown Business District; Murray Hill, Gramercy, and Stuyvesant Town; Chinatown and Lower East Side; Battery Park City, Greenwich Village, and Soho as well as parts of Brooklyn including Greenpoint and Williamsburg.

- In aggregate, New York City renters had to pay an additional $616 million in 2016 due to price pressures created by Airbnb, with half of the increase concentrated in the neighborhoods highlighted above.

Data and Methodology

We obtained Airbnb listings data from AirDNA (https://www.airdna.co/), which scrapes listings data on a daily basis from Airbnb. We gathered zip code level data going back to 2010 when Airbnb first listed dwellings in New York City, through the end of 2017. We then summed the data to the neighborhood level, defined by Census Bureau Public Use Microdata Area (PUMA).[5] Whenever a zip code crossed PUMA boundaries, we used 2010 population ratios as weights to divide the number of listings between PUMAs. The number of unique listings in New York City peaked in 2015 at just over 43,000 and dropped to under 37,000 by 2017.

Rental rate data comes from the annual American Community Survey (2009-16). We use average monthly gross rent for all renters as our rent measure.[6] We also control for neighborhood level economic and demographic characteristics using data from the American Community Survey.

We pooled eight years of data for 55 neighborhoods, bringing our total number of observations to 440. The dependent variable is the logarithm of average monthly gross rent by neighborhood in a given year. The independent variable with the coefficient of interest is the share of residential units listed on Airbnb which is calculated by dividing annual unique Airbnb listings in the neighborhood by total residential units in the same neighborhood.[7] We also control for demographic and economic changes in neighborhood level by including average household income (in log form), population (in log form), and the shares of college-educated and employed residents in the neighborhood. We also included year and neighborhood-level fixed effects (dummy) variables to control for otherwise uncontrolled-for trends and neighborhood characteristics.

A summary of the regression results is presented in Table 1. We find that as the share of units listed on Airbnb goes up by one percentage point, rental rates in the neighborhood go up by 1.58 percent, after controlling for neighborhood level demographic and economic changes. The result is statistically significant at the 1-percent level. Coefficients of other control variables including household income, population and share of college graduates are positive and statistically significant at 1-percent level. Employment rate is not statistically different from zero.

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[5] PUMAs are geographic units used by the US Census for providing statistical and demographic information. Each PUMA contains at least 100,000 people. There are 55 PUMAs in New York City. See https://www.census.gov/geo/reference/puma.html for more details.

[6] Gross monthly rent includes contract rent, utility costs, and fuel costs. Gross monthly rent amounts are more comparable across time and households than contract rent which may or may not include utilities and fuels.

[7] A table with Airbnb listings, Residential Units and Airbnb Share by PUMA in 2016 can be found in the Appendix.

In order to calculate the Airbnb contribution to total change in rents, we first predict the change in PUMA level average gross rents from 2009 to 2016 using the regression model coefficients with existing conditions (i.e. with existing demographic and economic conditions as well as Airbnb listings). We then compare these predictions with an alternative prediction in which Airbnb listings are set to zero throughout the entire time period. The difference between the latter and the former gives the rent change associated with Airbnb growth in the neighborhood. Results are reported in Table 2 (column labeled "Total Annual Rental Cost of Airbnb to the Neighborhood"), which shows rental change associated with increase in Airbnb listings at PUMA level. With existing conditions, from 2009 to 2016, citywide annual gross rents were predicted to go up by 25.3% (approximately $6.67 billion). If, however, there were no Airbnb listings, the rents would be predicted to go up by 23% (approximately $6.06 billion). Therefore, approximately $616 million, or 9.2 percent of the overall increase in rents for the period may be attributed to the rise in Airbnb listings.

Airbnb growth, however, was particularly high in certain neighborhoods. For instance, the share of Airbnb listings reached 4.1% of residential units in the Chelsea, Clinton & Midtown Business District neighborhood and 4.6% in Greenpoint and Williamsburg. The largest relative Airbnb effects on the rental market occurred in Chelsea, Clinton & Midtown Business District (21.6%) and Murray Hill, Gramercy & Stuyvesant Town (21.5%). Average monthly rents went up by in these neighborhoods by $398 and $488 respectively out of which $86 and $105 per month could be attributed to Airbnb growth. The largest absolute effect occurred in Greenpoint and Williamsburg where average rents increased by $659 between 2009 and 2016, of which $123 can be attributed to Airbnb growth.

Table 1: Regression Results

Dependent Variable: Logarithm of Average Rental Rate

Variables	Fixed Effects Model
AirBnb Share	1.584***
	(0.389)
Household Income (log)	0.152***
	(0.0349)
Population (log)	0.194***
	(0.0421)
Share of College Graduates	0.436***
	(0.109)
Employment Rate	0.154
	(0.111)
Constant	2.760***
	(0.554)
Observations	440
Number of PUMAs	55
R-squared	0.836
PUMA FE	YES
Year FE	YES

NOTE: Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2: Neighborhood Results

PUMA Code	Neighborhood Name	Rental Units (2016)	Airbnb Listings (2016)	Monthly Rent (2009)	Monthly Rent (2016)	Change in Monthly Rent (2009-16)	Change due to Airbnb (in $)	% Change associated with Airbnb	Total Annual Rental Cost of Airbnb to the Neighborhood
4001	Greenpoint & Williamsburg	45,147	3,296	$1,054	$1,713	$659	$123	18.6%	$66,401,795
3808	Murray Hill, Gramercy & Stuyvesant Town	54,579	2,355	$1,887	$2,375	$488	$105	21.5%	$68,820,035
3807	Chelsea, Clinton & Midtown Business District	59,679	4,486	$1,697	$2,095	$398	$86	21.6%	$61,451,469
3810	Battery Park City, Greenwich Village & Soho	51,596	3,123	$1,916	$2,327	$411	$79	19.3%	$49,121,185
4003	Bedford-Stuyvesant	34,555	2,047	$863	$1,270	$407	$59	14.4%	$24,288,659
4002	Bushwick	36,052	1,990	$935	$1,304	$369	$58	15.6%	$24,984,861
4004	Brooklyn Heights & Fort Greene	34,811	1,321	$1,270	$1,779	$510	$54	10.7%	$22,737,172
3809	Chinatown & Lower East Side	60,180	2,746	$1,052	$1,294	$242	$47	19.6%	$34,252,965
3805	Upper East Side	78,130	1,803	$1,780	$2,158	$378	$43	11.3%	$40,027,985
3802	Hamilton Heights, Manhattanville & West Harlem	37,380	1,433	$1,093	$1,338	$245	$39	15.9%	$17,452,649
4005	Park Slope, Carroll Gardens & Red Hook	30,750	787	$1,593	$1,906	$312	$39	12.4%	$14,341,390
4006	Crown Heights North & Prospect Heights	38,532	1,238	$931	$1,307	$376	$39	10.4%	$18,131,790
3806	Upper West Side & West Side	68,920	1,750	$1,722	$2,012	$290	$32	11.1%	$26,613,050
4101	Astoria & Long Island City	58,653	1,239	$1,075	$1,386	$311	$29	9.2%	$20,092,964
3803	Central Harlem	41,832	1,119	$798	$1,084	$287	$28	9.8%	$14,118,122
4109	Sunnyside & Woodside	36,068	647	$1,292	$1,608	$317	$22	6.9%	$9,431,814
3801	Washington Heights, Inwood & Marble Hill	60,473	995	$935	$1,214	$279	$21	7.5%	$15,253,929
4011	Crown Heights South, Prospect Lefferts & Wingate	32,957	585	$938	$1,213	$275	$20	7.4%	$8,067,130
4012	Sunset Park & Windsor Terrace	33,528	394	$991	$1,312	$321	$20	6.2%	$7,991,986
4014	Borough Park, Kensington & Ocean Parkway	31,126	263	$988	$1,405	$417	$19	4.6%	$7,113,264
4110	Ridgewood, Glendale & Middle Village	35,651	464	$1,049	$1,375	$326	$14	4.3%	$5,989,498
3804	East Harlem	37,814	1,003	$831	$960	$129	$13	10.4%	$6,114,647
4015	Flatbush & Midwood	41,110	396	$935	$1,196	$261	$13	5.1%	$6,618,526
4108	Forest Hills & Rego Park	27,313	216	$1,241	$1,600	$359	$12	3.5%	$4,088,401
4007	Brownsville & Ocean Hill	33,250	404	$705	$886	$181	$10	5.3%	$3,817,643
4010	East Flatbush, Farragut & Rugby	29,698	256	$929	$1,192	$264	$10	3.7%	$3,488,963
4013	Bay Ridge & Dyker Heights	27,982	195	$1,070	$1,354	$284	$9	3.2%	$3,041,981
4103	Flushing, Murray Hill & Whitestone	48,979	292	$1,177	$1,368	$191	$7	3.7%	$4,104,914
4107	Elmhurst & South Corona	33,304	190	$1,115	$1,320	$205	$7	3.5%	$2,895,541
4008	East New York & Starrett City	37,776	268	$839	$1,021	$182	$6	3.4%	$2,794,966

PUMA Code	Neighborhood Name	Rental Units (2016)	Airbnb Listings (2016)	Monthly Rent (2009)	Monthly Rent (2016)	Change in Monthly Rent (2009-16)	Change due to Airbnb (in $)	% Change associated with Airbnb	Total Annual Rental Cost of Airbnb to the Neighborhood
4016	Sheepshead Bay, Gerritsen Beach & Homecrest	27,490	167	$918	$1,222	$303	$6	1.9%	$1,880,709
4102	Jackson Heights & North Corona	32,819	228	$1,131	$1,288	$157	$6	3.9%	$2,389,733
4106	Briarwood, Fresh Meadows & Hillcrest	28,452	100	$1,064	$1,448	$384	$5	1.2%	$1,597,232
4114	Far Rockaway, Breezy Point & Broad Channel	22,373	177	$856	$995	$139	$5	3.5%	$1,302,810
3701	Riverdale, Fieldston & Kingsbridge	27,564	95	$1,011	$1,225	$214	$4	1.7%	$1,211,959
4009	Canarsie & Flatlands	27,002	146	$1,000	$1,242	$242	$4	1.6%	$1,236,019
4104	Bayside, Douglaston & Little Neck	12,621	83	$1,269	$1,542	$273	$4	1.6%	$667,138
4111	Richmond Hill & Woodhaven	23,544	126	$1,132	$1,354	$222	$4	1.9%	$1,169,156
3704	Pelham Parkway, Morris Park & Laconia	29,595	72	$887	$1,126	$239	$3	1.3%	$1,087,022
3903	Port Richmond, Stapleton & Mariners Harbor	26,520	125	$855	$1,061	$207	$3	1.5%	$1,013,387
4018	Brighton Beach & Coney Island	32,416	119	$770	$946	$177	$3	1.5%	$1,040,590
3706	Bedford Park, Fordham North & Norwood	39,929	66	$854	$1,032	$178	$2	1.1%	$942,338
3707	Morris Heights, Fordham South & Mount Hope	41,468	54	$777	$970	$193	$2	1.1%	$1,029,003
3708	Concourse, Highbridge & Mount Eden	40,145	86	$750	$934	$184	$2	1.2%	$1,095,031
3709	Castle Hill, Clason Point & Parkchester	50,936	64	$819	$1,025	$206	$2	0.8%	$1,006,744
3710	Hunts Point, Longwood & Melrose	42,778	114	$653	$811	$158	$2	1.1%	$876,036
4017	Bensonhurst & Bath Beach	34,275	87	$899	$1,214	$314	$2	0.7%	$941,936
4105	Queens Village, Cambria Heights & Rosedale	16,594	108	$1,178	$1,325	$147	$2	1.4%	$410,678
4112	Jamaica, Hollis & St. Albans	32,053	142	$990	$1,146	$156	$2	1.3%	$801,327
3702	Wakefield, Williamsbridge & Woodlawn	27,747	62	$966	$1,092	$126	$1	1.0%	$402,301
3703	Co-op City, Pelham Bay & Schuylerville	22,244	37	$970	$1,095	$125	$1	0.8%	$251,180
3705	Belmont, Crotona Park East & East Tremont	47,005	70	$712	$838	$126	$1	0.7%	$506,036
4113	Howard Beach & Ozone Park	11,866	58	$1,139	$1,254	$114	$1	1.0%	$167,533
3901	Tottenville, Great Kills & Annadale	8,205	20	$1,094	$1,074	($19)	$0	0.3%	($4,864)
3902	New Springville & South Beach	12,239	53	$1,048	$1,109	$61	$0	0.8%	$72,989

Acknowledgements

Appendix

Table A:1: Residential Units and Airbnb Listings by Neighborhood, 2016

PUMA Code	Neighborhood Name	Airbnb listings (2016)	Residential Units (2016)	Airbnb Share (2016)
3701	Riverdale, Fieldston & Kingsbridge	95	50,560	0.2%
3702	Wakefield, Williamsbridge & Woodlawn	62	53,892	0.1%
3703	Co-op City, Pelham Bay & Schuylerville	37	49,029	0.1%
3704	Pelham Parkway, Morris Park & Laconia	72	50,610	0.1%
3705	Belmont, Crotona Park East & East Tremont	70	70,636	0.1%
3706	Bedford Park, Fordham North & Norwood	66	50,419	0.1%
3707	Morris Heights, Fordham South & Mount Hope	54	52,433	0.1%
3708	Concourse, Highbridge & Mount Eden	86	55,131	0.2%
3709	Castle Hill, Clason Point & Parkchester	64	68,096	0.1%
3710	Hunts Point, Longwood & Melrose	114	67,852	0.2%
3801	Washington Heights, Inwood & Marble Hill	995	84,947	1.2%
3802	Hamilton Heights, Manhattanville & West Harlem	1,433	61,784	2.3%
3803	Central Harlem	1,119	67,946	1.6%
3804	East Harlem	1,003	61,588	1.6%
3805	Upper East Side	1,803	137,519	1.3%
3806	Upper West Side & West Side	1,750	125,673	1.4%
3807	Chelsea, Clinton & Midtown Business District	4,486	108,218	4.1%
3808	Murray Hill, Gramercy & Stuyvesant Town	2,355	101,111	2.3%
3809	Chinatown & Lower East Side	2,746	91,149	3.0%
3810	Battery Park City, Greenwich Village & Soho	3,123	95,239	3.3%
3901	Tottenville, Great Kills & Annadale	20	62,339	0.0%
3902	New Springville & South Beach	53	54,777	0.1%
3903	Port Richmond, Stapleton & Mariners Harbor	125	68,653	0.2%
4001	Greenpoint & Williamsburg	3,296	71,055	4.6%
4002	Bushwick	1,990	54,560	3.6%
4003	Bedford-Stuyvesant	2,047	59,405	3.4%
4004	Brooklyn Heights & Fort Greene	1,321	76,011	1.7%
4005	Park Slope, Carroll Gardens & Red Hook	787	52,216	1.5%
4006	Crown Heights North & Prospect Heights	1,238	62,837	2.0%
4007	Brownsville & Ocean Hill	404	56,542	0.7%
4008	East New York & Starrett City	268	63,601	0.4%

PUMA Code	Neighborhood Name	Airbnb listings (2016)	Residential Units (2016)	Airbnb Share (2016)
4009	Canarsie & Flatlands	146	71,956	0.2%
4010	East Flatbush, Farragut & Rugby	256	56,163	0.5%
4011	Crown Heights South, Prospect Lefferts & Wingate	585	48,350	1.2%
4012	Sunset Park & Windsor Terrace	394	51,043	0.8%
4013	Bay Ridge & Dyker Heights	195	52,955	0.4%
4014	Borough Park, Kensington & Ocean Parkway	263	47,063	0.6%
4015	Flatbush & Midwood	396	62,138	0.6%
4016	Sheepshead Bay, Gerritsen Beach & Homecrest	167	63,169	0.3%
4017	Bensonhurst & Bath Beach	87	69,620	0.1%
4018	Brighton Beach & Coney Island	119	52,290	0.2%
4101	Astoria & Long Island City	1,239	84,838	1.5%
4102	Jackson Heights & North Corona	228	61,099	0.4%
4103	Flushing, Murray Hill & Whitestone	292	97,693	0.3%
4104	Bayside, Douglaston & Little Neck	83	46,865	0.2%
4105	Queens Village, Cambria Heights & Rosedale	108	67,354	0.2%
4106	Briarwood, Fresh Meadows & Hillcrest	100	65,384	0.2%
4107	Elmhurst & South Corona	190	48,613	0.4%
4108	Forest Hills & Rego Park	216	57,309	0.4%
4109	Sunnyside & Woodside	647	61,224	1.1%
4110	Ridgewood, Glendale & Middle Village	464	68,089	0.7%
4111	Richmond Hill & Woodhaven	126	49,917	0.3%
4112	Jamaica, Hollis & St. Albans	142	79,376	0.2%
4113	Howard Beach & Ozone Park	58	41,837	0.1%
4114	Far Rockaway, Breezy Point & Broad Channel	177	51,028	0.3%