



# The Impact of Peer-to-peer Accommodation on Hotels, Rentals, and Welfare: Empirical Evidence from Airbnb

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## Background

- Within the past decade, the rise in popularity of many sharing economy platforms -- Uber, Lyft, Airbnb -- has enabled people to make use of underutilized resources by sharing.
- Flexible supply nature (peer-to-peer) facilitated by technological innovation (ie. built-in star rating system) is the key to success.
- Rapidly, these platforms are shaping traditional markets and affecting incumbent firms.
- They spark many questions related to societal welfare:
  - How can governments fairly regulate these platforms to maintain healthy revenue (tax) and market competition?
  - What are the benefits realized by consumers? By hosts?

## Focus on Airbnb

The body of knowledge on how peer-to-peer platforms shape the accommodation market is small.

- *Zervas et. al (2017)* found a 10% increase in Airbnb listings to be associated with a 0.39% decrease in monthly hotel revenue.
- *Farronato & Fradkin (2018)* estimated that Airbnb is responsible for over \$137 million in total welfare gain for 50 major US cities in 2014.
- *Horn & Merante (2017)* found a one standard deviation increase in Airbnb census tract-density to be associated with an 0.4% increase in asking rents.

### Research Questions:

- What is the impact of Airbnb on different outcomes of the hotel and rental markets in New York City?
- How big is its welfare impact in the hotel market?

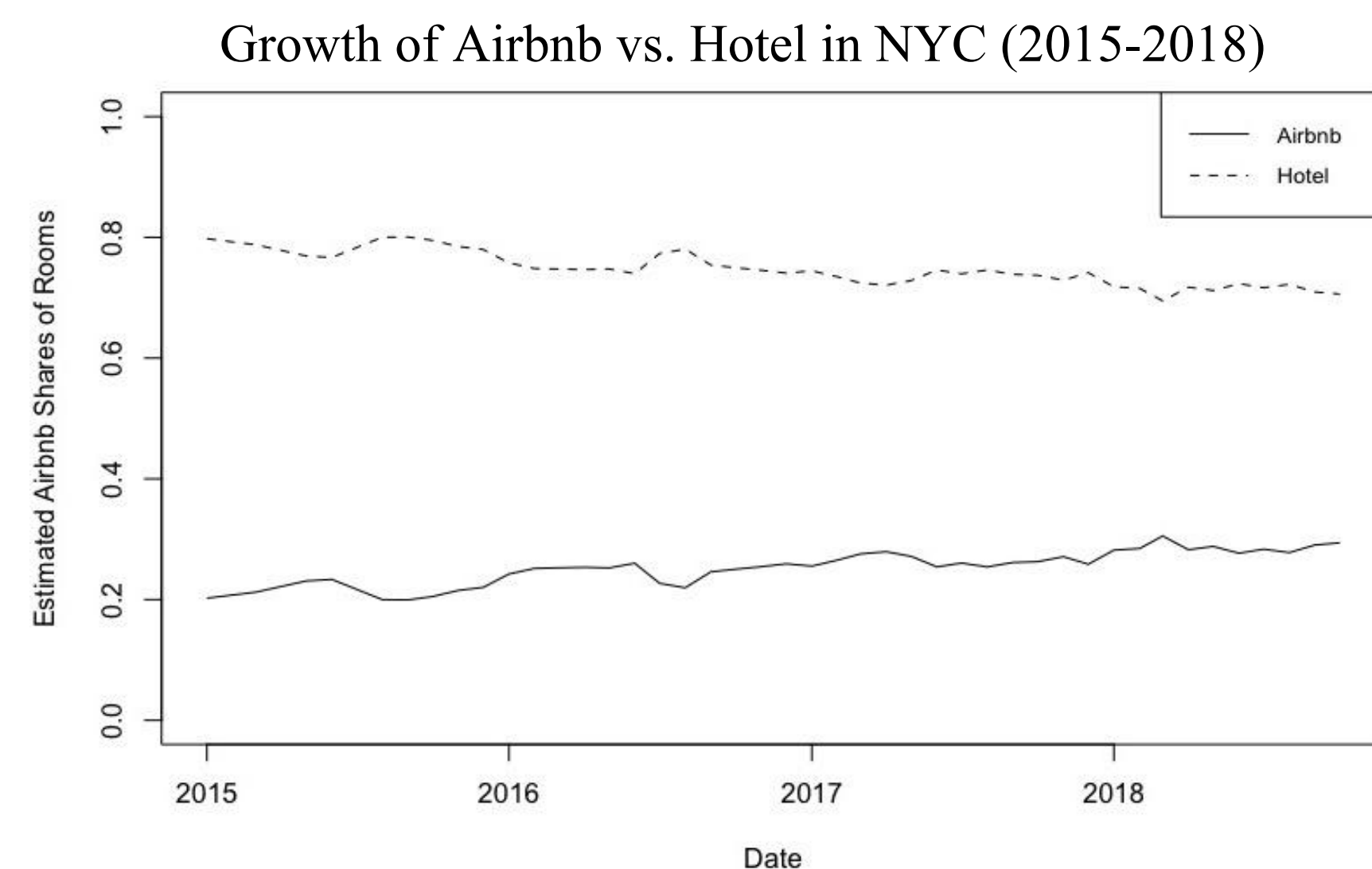
## Data

1. **Airbnb Data:** Web-scraped listing-level data. 42 daily scrapes representative of 42 monthly observations for NYC between January 2015-December 2018. ([Source](#): InsideAirbnb.com)
2. **Hotel Data:** Aggregated monthly-level data of hotel outcomes (price, occupancy, revenue) in NYC from January 2000. ([Source](#): STR Global)
3. **Rental Data:** Aggregated monthly-level data of rental outcomes (price index, inventory) by NYC boroughs form January 2010. ([Source](#): StreetEasy.com)
4. **Airport Passenger:** Aggregated monthly-level data of total arriving airport passengers at JFK and LaGuardia airports from October 2010. ([Source](#): Bureau of Transportation Statistics)

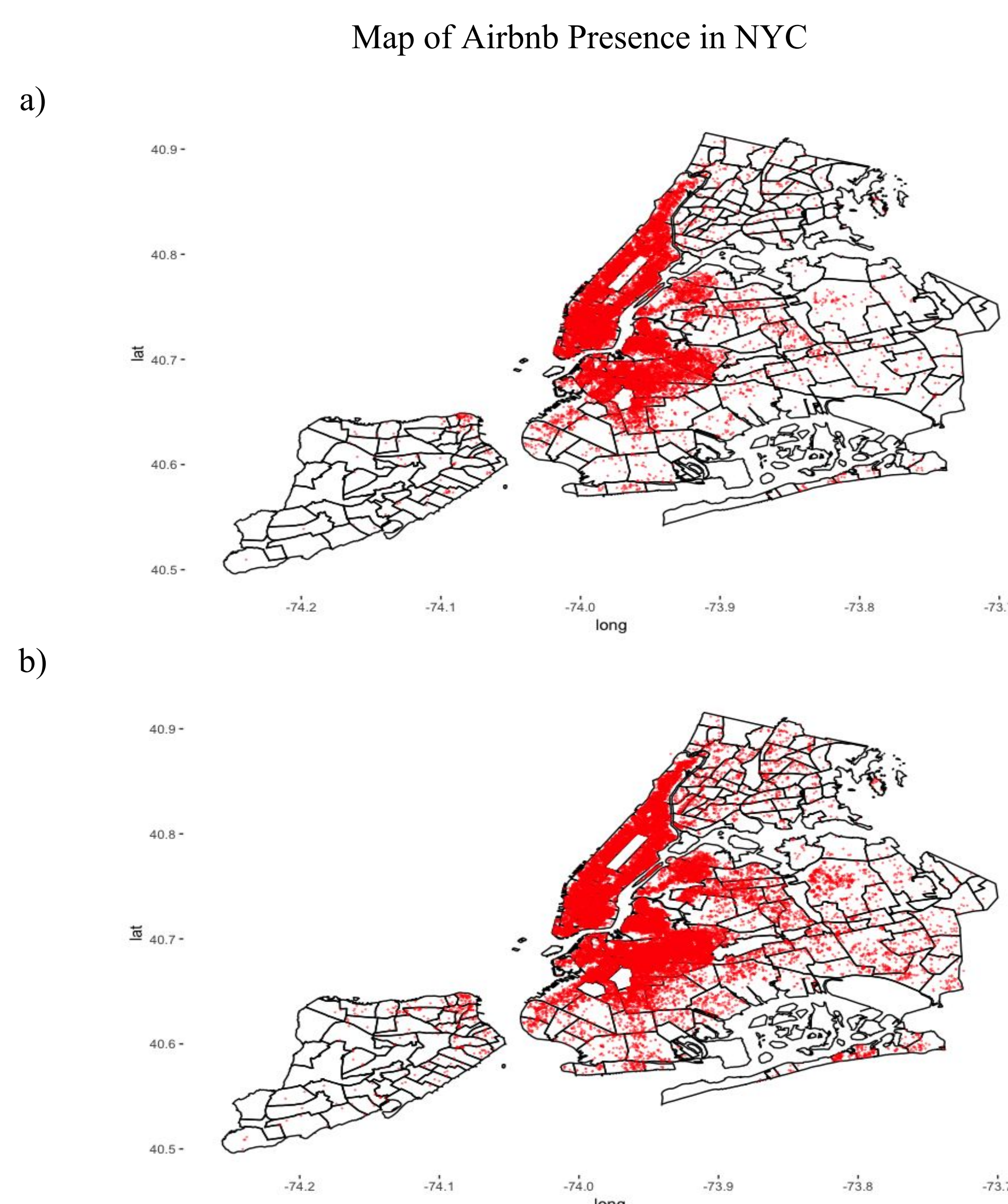
## Acknowledgements

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## Airbnb Growth



**Figure 1.** This plot shows the size of Airbnb vs. hotel as measured by monthly shares of total rooms available. Airbnb is trending upward for growth while hotels are slightly losing market shares.



**Figure 2.** Plot 2a) is a map of Airbnb presence in NYC at time of the earliest scrape in our data (15/01/2015). Plot 2b) is a map at time of the latest scrape (06/12/2018). While Manhattan remains deeply concentrated, Brooklyn, Queens, and The Bronx have gotten much more traction.

### Descriptive Statistics for Airbnb Attributes

Statistic	N	Mean	St. Dev.	Median	Pctl(25)	Pctl(75)
Price	1,778,253	150.113	209.326	110.000	70.000	175.000
Minimum Nights	1,778,253	4.541	345.959	2.000	1.000	3.000
Reviews Per Month	1,365,605	1.350	1.535	0.830	0.300	1.980
Host Listings Count	1,778,253	2.054	5.497	1.000	1.000	2.000
Number Of Reviews	1,778,253	16.369	31.090	4.000	1.000	17.000
Availability 365	1,778,253	151.521	143.975	103.000	0.000	310.000

**Table 1.** Table shows summary statistics for Airbnb attributes that are continuous variables. Median price per night of Airbnb (\$110) is much cheaper than median price of Hotel (\$267). There is a big price range. The average listing is available for more than 150 days out of 365 incoming days.

## Preliminary Conclusions

- Airbnb growth and its impact on the lodging industry is evident. We expect it to have the same significant impact on the rental market.
- When studying the sharing economy, it is important to consider heterogeneity across locations, as each city holds distinct characteristics and regulations standards.
- In the lodging industry, Airbnb brings positive consumer surplus in more than one way (DWL absorption, pricing pressure on hotels).

## Methodology

### Short-term Impact of Airbnb on Hotel Outcomes

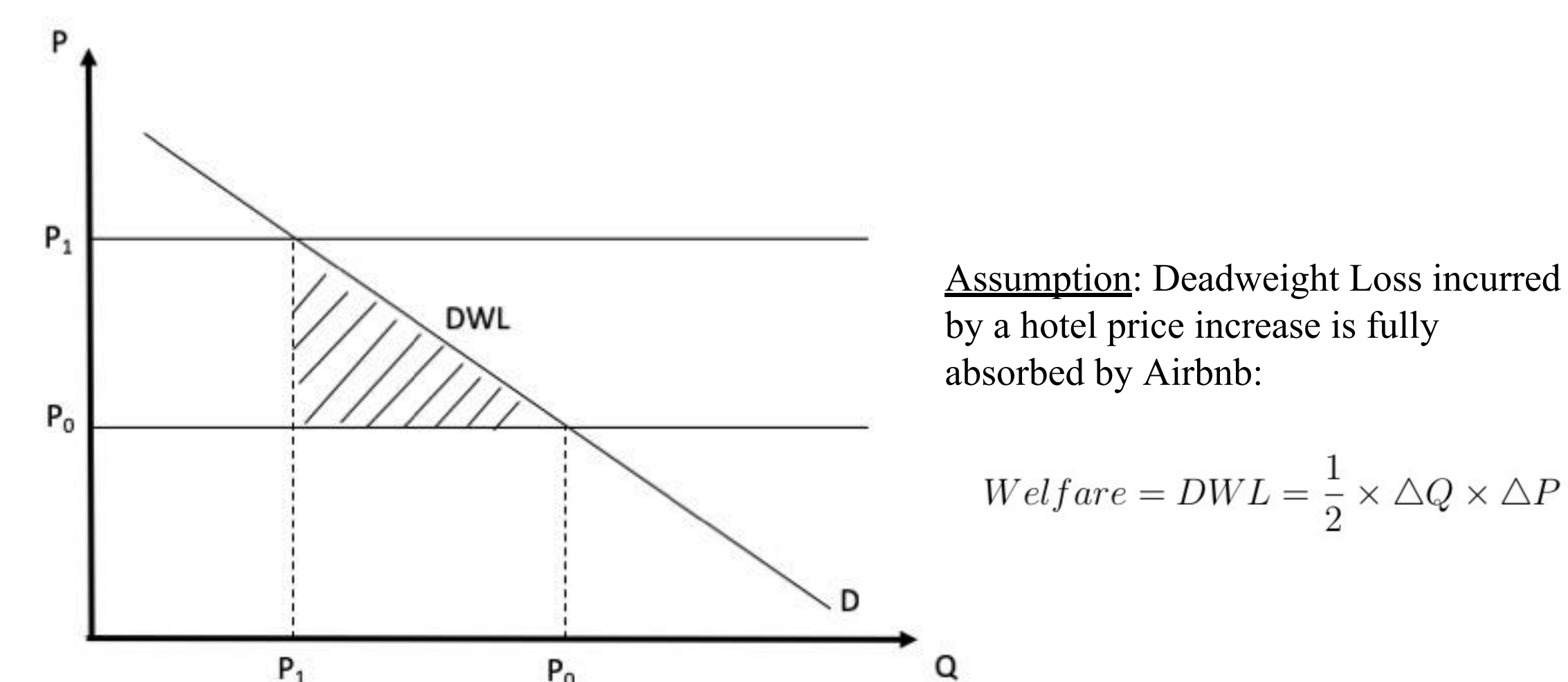
Baseline OLS linear specification:

$$y_t = \alpha + \beta \log(\text{QuantityAirbnb}_t) + \delta \log(\text{AirportPassengers}_t) + X_t + \varepsilon_t$$

- $y_t$  is one of 3 hotel outcomes:  $\log(\text{OccupancyRate})$ ,  $\log(\text{ADR})$ ,  $\log(\text{RevPAR})$
- $X_t$  is monthly fixed effects to capture seasonality
- Number of arriving airport passengers as proxy for accommodation demand (Farronato & Fradkin 2018)
- $\beta$  is the coefficient of interest

### Long-term Welfare Estimation

Hotel Competition Model:



Airbnb Hedonic Price Index:

Estimation of price indexes allows us to determine cross-price elasticity of demand between Airbnb and hotel. Here, a hedonic price regression was chosen to account for heterogeneity in listings types without having to specifically model detailed room characteristics (Kunovac & Lukinic 2018). Model specification with January 2015 as based month-year:

$$\log(p_{it}) = \alpha + \beta m_{it} + \sum_{j=2}^T \delta_j D_{ij} + \sum_{j=1}^I \gamma_j X_{ij} + \varepsilon_i, \quad i = 1, \dots, N$$

- $\log(p_{it})$  is price of  $i$  Airbnb listing in month-year  $t$
- $m_{it}$  is the number of properties owned by listing  $i$  (continuous)
- $X_{ij}$  is attribute  $j$  of listing  $i$  (discrete)
- $D_{ij}$  is month-year fixed effects
- $\Delta$  is the coefficient of interest

## Results

**Table 2.** Regression Results for Impact of Airbnb Supply on Hotel Outcomes

	Dependent variable:		
	$\log(\text{Occupancy})$	$\log(\text{ADR})$	$\log(\text{RevPAR})$
	(1)	(2)	(3)
$\log(\text{QuantityAirbnb})$	0.043* (0.025)	-0.095** (0.037)	-0.052 (0.052)
$\log(\text{AirportPassengers})$	0.138 (0.154)	0.445* (0.234)	0.581* (0.328)
Constant	1.747 (2.095)	-0.411 (3.179)	-3.233 (4.453)
Month FE	Yes	Yes	Yes
Observations	39	39	39
R <sup>2</sup>	0.976	0.989	0.989

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

An increase of 10% in Airbnb supply is associated with a 0.043% increase in hotel Occupancy and a 0.095% decrease in Hotel Price (Average Daily Rate). The positive association between Airbnb Supply and Hotel Occupancy is a surprise. Regardless, the coefficient is not economically significant.

Cross price elasticity on Hotel Demand:

$$Q_{\text{Hotel}} = -0.22P_{\text{Hotel}} + 1.87P_{\text{Airbnb}} + \text{MonthFE}$$

An increase in Hotel Price is associated with 0.22% decrease in Hotel Rooms Sold. An increase in Airbnb Price is associated with a 1.87% increase in Hotel Rooms Sold.

## References

- 1) Farronato, C. & Fradkin, A. (2018). "The Welfare Effects of Peer Entry in the Accommodation Market: The Case of Airbnb." NBER Working Paper No. 24361.
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- 3) Horn, K. & Merante, M. (2017). "Is Home Sharing Driving Up Rents? Evidence from Airbnb in Boston," *Journal of Housing Economics*, Vol. 38, Issue C, pp. 14-24.
- 4) Kunovac, D. & Lukinic, G. "Use of the Hedonic Method to Calculate an Index of Real Estate Prices in Croatia," Croatian National Bank.