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Battle of the Beds: The Economic Impact of Airbnb on the Hotel Industry in Chicago and San Francisco

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BATTLE OF THE BEDS:
THE ECONOMIC IMPACT OF AIRBNB ON THE HOTEL INDUSTRY
IN CHICAGO AND SAN FRANCISCO

BY:

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Abstract

The sharing economy is the private redistribution of goods via peer-to-peer sharing. Since internet use has saturated the U.S., the sharing economy has become widely internet-based. Airbnb, a website and app that facilitates the short-term rental of space to stay in another person's home, has become a major component of the sharing economy.

This study includes an empirical analysis of the hotel occupancy rates in two major markets, San Francisco and Chicago, and how they have or have not changed, from the 2008 launch of Airbnb through the end of 2014. The study hypothesizes that Airbnb has had a statistically significant negative impact on the hotel occupancy rate. The results serve as empirical evidence that Airbnb's introduction has had an insignificant impact on San Francisco hotel occupancy rates, but may have had a marginally significant negative impact on Chicago hotel occupancy rates. Major reasons why most travelers have not substituted Airbnb for hotel accommodations include the fact that nearly half of those traveling in the United States are traveling for work, Airbnb's lack of amenities that many business travelers demand, and the absence of an Airbnb loyalty program that is similar to what many hotels have.

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INTRODUCTION

Years ago, traveling meant deciding between three accommodation options: a hotel, a hostel, or the home of someone you know. Today, thanks to the growing sharing economy, more options exist, including the increasingly popular Airbnb.

Airbnb is a website, or online platform, where people list and rent short-term lodging accommodations. Those supplying lodging, called “hosts,” classify the space either as a “Shared Room,” a “Private Room,” or an “Entire Apartment” (Airbnb 2015). The idea for the startup began in 2007. Twenty-seven-year-old roommates Joe Gebbia and Brian Chesky were struggling to afford the rent for the large loft that they had recently moved into in San Francisco’s South of Market neighborhood. The two saw an opportunity to make extra income when a popular industrial design conference led to every hotel in the city to be completely booked. The pair made nearly \$1,000 when they decided to rent out sleeping space on the floor of their apartment to conference-goers, which they advertised as an “AirBed & Breakfast” (Botsman & Rogers 2010, Guttentag 2013). They allowed people to reserve space using airbedandbreakfast.com, a site they created whose web address now redirects to airbnb.com, which the two started in 2008 (Salter 2015). The company remains headquartered in San Francisco.

Airbnb has grown quickly in the seven years since it was established, now selling several million rooms each night around the world. It is a prominent member of the growing sharing economy that includes Uber, a mobile application in which people request rides from someone driving their personal car; JustPark, a website for renting privately-owned parking spaces; and DogVacay, a site that connects dog owners with dog sitters in their neighborhoods (Loper 2015). The sharing economy is the marketplace that connects people who demand a certain good or service with people who have an excess of things or time. Individuals interact with each other, often through a platform such as a mobile

application or website that introduces them. In most online sharing economy platforms, the person demanding the good or service pays the supplier through the platform rather than directly exchanging money.

Uber is perhaps the most widely known companies within the sharing economy. It is frequently criticized for displacing taxi workers. Although Airbnb offers a service that seems to be a substitute for the traditional hotel stay, it seems to face less of an uproar in the news than its transportation counterpart.

In the United States, 1.86 million people were employed by hotels in 2014 (American Hotel & Lodging Association, 2014). If Airbnb were to have a significant impact on the earnings of the traditional lodging industry and thus cause many hotels to go out of business, many jobs could be eliminated. On the other hand, people can earn additional income by being compensated for others' use of their un- or under-used space. This study examines the effect of Airbnb on hotel occupancy rates in San Francisco and Chicago. It focuses on San Francisco because it is the city where Airbnb was founded and remains headquartered, and Chicago because it is a major U.S. city where Airbnb has undergone less legal skepticism than in New York City. The research examines the effects of Airbnb on the hotel occupancy rates by reviewing existing literature about the effects of Airbnb on the hotel industry and conducting an empirical analysis of economic and hotel occupancy data from those two cities. The data indicates the extent to which the emergence of Airbnb has had an effect on demand in the brick-and-mortar hospitality industry.

LITERATURE REVIEW

Despite heavy media coverage of Airbnb, the company is so new that the scholarly literature about it, as with the sharing economy in general, is sparse. Airbnb is privately owned and does not release data, so most existing research on it is qualitative; only one study uses large amounts of data and statistical regressions.

The sharing economy is “a 21st century socio-economic system built on the sharing of human and physical assets” (Nadler 2014). Lisa Gansky¹ developed two business concept models. In her “Full Mesh” model, companies lease out assets that they own. In her “Own-to-Mesh” model, a company serves as a third-party platform to connect individuals who will re-distribute their goods or services between each other. Airbnb falls under the “Own-to-Mesh” model (Gansky 2014).

Similar to Gansky’s business concept models are those defined by Rachel Botsman². Botsman’s “Product Service Systems” model consists of commercially- or privately-owned products that multiple users share. Her “Redistribution Market” model consists of networks and platforms for exchanging used goods. Lastly, her “Collaborative Lifestyle” model is a platform that enables the sharing of non-physical assets such as time and talent between individuals (Botsman 2010). Airbnb does not fall into any of those three categories defined by Botsman. Nevertheless, it provides framework for much of the larger sharing economy.

The main appeal of using Airbnb as opposed to a hotel is the relative affordability: a Priceonomics study averaged the nightly hotel room rates and Airbnb rates for the “Entire Apartment” and “Private Room” categories in each major U.S. city. The analysis found that on average, consumers saved 21.2% and 49.5% compared to staying in a hotel when staying in an entire apartment or just a private room rented on Airbnb, respectively (Nadler 2014, Priceonomics 2013). Since the calculated

¹ Lisa Gansky is a serial entrepreneur and author of *The Mesh: Why the Future of Business is Sharing*.

² Rachel Botsman is a lecturer at Oxford University’s Saïd School of Business. She has given a TED talk about how the sharing economy will transform many people’s daily lives.

average price of a hotel room in major U.S. cities includes even the most luxurious hotels that are unlikely seen as substitutes for Airbnb listings, the mean calculated for the Priceconomics study is likely larger than the median hotel price in major U.S. cities. Thus, the report may overstate the price difference between hotel rooms and Airbnb listings.

Additionally, the report does not indicate whether it includes the cleaning fee that many Airbnb hosts charge in addition to the nightly rate of their listings. Whereas the cost of housekeeping is generally included in the price of hotel rooms, it is not included in the cost of Airbnb listings. If the report does not include the Airbnb cleaning fee charged by hosts, then it likely overstates the price difference between Airbnb and hotel accommodations.

Disruptive innovation theory “describes how products that lack in traditionally favoured attributes but offer alternative benefits can, over time, transform a market and capture mainstream consumers” (Guttentag 2013). This theory was developed by Clayton Christensen, a Professor at Harvard Business School. Airbnb cannot be expected to overtake the entire hotel industry due to several characteristics of hotels that Airbnb is, by nature, unable to rival. However, the platform fits the model for a business described by disruptive innovation theory because it currently underperforms in terms of qualities that the hotel industry offers, but is often cheaper and boasts certain benefits, such as exposure to local culture and access to kitchen and laundry facilities, that the hotel industry generally lacks.

There are several arguments against Airbnb’s potential to disrupt the hotel industry: By nature, Airbnb lacks the predictability and security of hotels. It also takes more time to book an Airbnb listing than a hotel room, since it takes time to exchange messages with a host who does not use the “Instant Book” feature. Also, Airbnb encourages travel for those who would not have otherwise visited a destination, and is thus parallel to the hotel industry than a substitute for it. These aspects of Airbnb are

actually consistent with disruptive innovation theory, which states that “the disruptive process generally begins with a product that initially appeals to only a small group of customers, typically in the low-end of the market or in a new market entirely, and the disruptive product is therefore dismissed by leading companies that are uninterested in the initial market’s limited revenue” (Guttentag 2013). Airbnb already has as many nightly bookings as some major hotel chains. Airbnb continues to grow exponentially. In early 2013, there were over 22,500 listings in New York City. This is a significant addition to the approximately 90,000 hotel rooms that the city has (Guttentag 2013).

Despite the company’s San Francisco roots, New York City may be the city where Airbnb is most controversial. The city has imposed many regulations on Airbnb, and is especially concerned with matters of tax evasion and housing affordability. In 2014, the New York Attorney General addressed Airbnb’s impact on housing prices in the city.

The data, referred to in the report as “Reviewed Transactions,” was produced by Airbnb and given to the Attorney General. The “Review Period” during which data was collected lasted from January 1, 2010 to June 2, 2014. To qualify as a “Reviewed Transaction,” the host must have listed the “Entire Apartment” or a “Private Room” for rent. “Shared Room” listings were not included in the study. Also, the stay had to be either shorter than 30 days, or between 30 and 180 days and excluded from the *de minimis* exception for hotel room occupancy taxes. Airbnb did not disclose the number of transactions that occurred during the Review Period and is excluded from the Reviewed Transactions, so there is missing data.

The report indicates that state and local laws prohibit many types of Airbnb short-term rentals. It was found that 72% of the Airbnb stays that occurred during the Review Period were illegal. The investigation also found that while 94% of hosts had only one or two listings, the other 6% of hosts,

which the report refers to as “Commercial Users,” supplied 36% of the city’s listings. Some hosts had over one hundred listings (Schneiderman 2014).

The New York Attorney General’s report also addresses the particularly salient issue of short-term rentals displacing long-term housing. According to the report, nearly 2,000 units in New York City were unavailable for long-term lease because they were being used by Airbnb hosts for short-term bookings that totaled over six months out of the year. This decrease in supply, in turn, has a negative impact on housing affordability--an issue with which the city already struggles.

To further complicate the supply and demand matters of Airbnb rentals in New York City, many Airbnb stays during the Review Period qualified as “illegal hostels” because multiple travelers shared the same Airbnb listing on one night when there were multiple “Private Room” listings in the same apartment, as evidenced by some apartments having over 365 bookings in one year (Schneiderman 2014).

The paper most similar to this one is “The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry.” It investigates the degree to which Airbnb bookings are substitutes to hotel stays and Airbnb’s impact on the earnings of hotels that face competition from the site.

The study uses luxury hotels as its control group, arguing that they boast amenities such as conference rooms and fitness facilities that most Airbnb listings lack, drawing business travelers to hotels without even considering Airbnb. The study collected consumer-facing data on hosts from Airbnb’s website of over 22,000 listings from 2008 to 2013 throughout the state of Texas, as well as quarterly tax revenue from more than 4,000 Texas hotels dating back to 2003, before Airbnb existed. Using that data, the study analyzed the impact of Airbnb’s emergence on tax revenue for the hotels. This data spans all of Texas’s cities, which have varying levels of Airbnb penetration, the highest

being in Austin. The study's statistics measure the spatial and temporal penetration of Airbnb in Texas's ten most populated cities (Byers, Proserpio and Zervas 2015).

A major concern with the statistical analysis from this time frame is the 2008 recession and the economy's recovery from it. However, these researchers are mindful of this and exclude the second half of 2008 and all of 2009 from their regression. They find that an extra 1% increase in the size of the Airbnb market would decrease total hotel revenue by 0.05%. While the emergence of Airbnb listings in Texas has hurt local hotel earnings, hotels seem to be faring well considering the popularity and attention that is drawn to the online platform.

However, a minority of business travelers do opt for Airbnb if they have an incentive to save money. For example, an employment attorney from the greater Austin, Texas area who travels to his primary office in Southern California about twice a month, uses Airbnb to save money for his practice, and enjoys the more authentic local experience it provides. He says that "hotels tend to be more predictable but also more expensive, especially when they gouge you on overnight parking" (Personal Interview 2015). However, he will sometimes stay in a hotel if he can use rewards from their loyalty program that have accumulated due to credit card purchases--an attractive feature to many consumers that Airbnb presently lacks. For many consumers, forgoing earning additional rewards points at a hotel chain is a switching cost of choosing Airbnb.

In addition to lacking the larger brand and rewards networks that hotel chains tend to have, Airbnb is also at a disadvantage to hotels when it comes to last-minute travel reservations. An inconvenient aspect of Airbnb that could deter business travelers is that a traveler's preferred listing is often unavailable. While hotels can become completely booked up, an entire hotel is less likely than a single Airbnb listing to be unavailable. This means that the well-reviewed hosts whose listings are located near a professional's business meetings can be booked up, and are more difficult to book for

last-minute business trips than hotels are. This characteristic of Airbnb puts it at a disadvantage to hotels for those who desire consistency and the ability to book at the last minute.

Despite the loyalty programs that serve as an economic moat for many hotel brands, the barriers to entry on the supply side are much lower for Airbnb listings than for hotels. Opening a hotel requires lots of capital to pay for high fixed costs such as a lodging license, as well as variable costs such as hiring staff (Cheng 2013). In contrast, most people who open an Airbnb listing are already paying for the space, whether by owning or renting it, and simply add a few things to make the space nicer for guests. For example, a couple in Monterey, California is opening a “Private Room” listing in an empty bedroom of the house that they own, with the goal of making enough revenue to cover their mortgage payments. They have redecorated the bedroom so that it has a “convenience bar” including a microwave, mini refrigerator, and coffeemaker. To differentiate their product from other local Airbnb listings, they have purchased two bicycles for guests to ride along the nearby trails and added a wheelchair-accessible ramp and door to the bedroom where guests will stay (Personal Interview 2015). Compared starting a hotel, the entry costs that this couple faces in opening an Airbnb listing are quite small.

The existing literature explains the appeal of Airbnb and the impact that the platform has on hotels in localities where Airbnb has a high penetration. It is clear that while state and city governments make moves to limit or ban Airbnb stays, their attempts are mostly unsuccessful and the Airbnb market continues to grow. Since people generally travel to a specific city instead of a specific state, it makes more sense to evaluate the effect that Airbnb has on hotels in certain cities rather than in an entire state, as the paper about Airbnb’s effect in Texas does. Thus, this study addresses Airbnb competition with hotels in San Francisco and Chicago, and examines the reasons for hotels’ continuing success in spite of the growing numbers of Airbnb listings. This paper hypothesizes that,

consistent with the findings of the Texas study, Airbnb has had a statistically significant impact on the occupancy rates of hotels in both San Francisco and Chicago.

DATA, MODEL AND RESULTS

To collect their data, Byers, Proserpio and Zervas of Boston University went through each Airbnb listing in Texas every day from the beginning of 2008 through the end of August 2014. Using quarterly hotel revenue data from public records supplied by the Texas Comptroller's office, they found that for every 1% additional Airbnb listings supplied in the state of Texas, total hotel revenue for non-luxury hotels in the state would decrease by 0.05%. It is interesting to see how their results compare with those of this study.

In the U.S., New York City has the most Airbnb listings. However, the city is spread over multiple islands, and most business activity takes place in Manhattan. This study uses San Francisco and Chicago as comparisons. San Francisco is physically simpler than New York since it is contained to a single piece of land that is 46.87 square miles (State & County Quickfacts 2015).

Airdna, a website that scrapes data from Airbnb's website with the objective of providing information to Airbnb hosts to help them maximize their earnings, considers a rental to be "active" if it has been posted in the last 60 days or had a reservation in the last 30 days (Shatford 2015). Listings classified as "Entire Home" comprise 55.9% of all active Airbnb listings in San Francisco, and "Private Rooms" are 38.6% of the active listings. The remaining listings are "Shared Rooms," which this study excludes from its analysis because those listings would compete with hostels rather than with hotels. The total number of listings in the city of San Francisco that Airdna considers to be "active" is 5,530. Thus, the number of "active rentals" that are either an "Entire Home" or a "Private Room" is 94.5% of 5,530, which is 5,226 (Airdna 2015).

Besides business amenities such as conference rooms, another factor that makes Airbnb listings less competitive with hotels is the hidden cost of the security deposit that most hosts charge. In San Francisco, the average security deposit for an entire home is \$320. For private rooms, it is \$200

(Airdna 2015). Unlike with hotels, which keep a guest's credit card number on file and only charge a fee in the event of an incidental, security deposits are charged to Airbnb guests' cards at the time that they book the listing and are only refunded after their stay if the host determines that there has been no significant damage to the space. This large up-front cost is not something that hotel users face, reducing the amount of money that Airbnb guests save up-front compared to those staying in hotels.

In addition to allowing hosts to charge a security deposit when their listings are booked, Airbnb encourages hosts to write guest reviews. In order for a host to view their guest's review, they must first write a review for each of the guest. This review is then published to the guest's Airbnb profiles, and is visible to other hosts that the guest may wish to stay with in the future. The aspect of being reviewed as a consumer may be uncomfortable for some would-be Airbnb guests, and drive them to stay in hotels instead.

The Law of Demand states that as the price of a good or service falls, the quantity demanded will decrease. Similarly, the Law of Supply states that as the price of a good or service rises, the quantity supplied will increase (Whitman 2015). These pricing theories do not hold true for Airbnb because, unlike Uber which has a surge pricing feature during high-demand times, the short-run prices of Airbnb listings remain the same regardless of demand. In the long run, hosts can adjust the price of their listings, but they cannot do so in reaction to the number of requests that potential guests have submitted for their listing on a given night (Airbnb 2015). The same is generally true for hotel rooms. However, in the short run, the supply of hotel rooms is fixed: regardless of how many people demand a hotel, hotels cannot close existing locations or open new ones immediately due to short-term demand. Based on these logistics, Figure 2 shows the short-run market for hotel rooms, which has a vertical supply curve.

Figure 1 illustrates the theoretical market for both hotel rooms and Airbnb listings in the short run. If people are willing to pay more to stay with Airbnb, then the theoretical equilibrium price exceeds some potential hosts' reservation prices--that is, the minimum amount a person would need to be paid to go to the trouble of renting out their space to others--and more people will become hosts, thus increasing the supply of listings. However, the supply curve for listings is asymptotic due to the implicit value of privacy and solitude--some people simply do not wish to share their space with others, no matter how much money they could earn by doing so.

This study uses hotel occupancy rates as a measure for hotel performance because the number of hotel rooms booked affects the revenue that a hotel earns. Past nightly hotel rates were not available. Since a lot of the variation in hotel occupancy rates may be due to the economic conditions rather than the growth of Airbnb, this study uses the United States Gross Domestic Product (GDP) from the beginning of 2003 through the end of 2014, as shown in Table 1 (Federal Reserve Bank of St. Louis 2015). This GDP measure is real (i.e. adjusted for inflation) and seasonally adjusted. Using data that beings several years prior to Airbnb's establishment in 2008 allows for the relationship between GDP and hotel occupancy rates without Airbnb to be accounted for.

This study runs two regressions. In the first, the hotel occupancy rate in San Francisco is the dependent variable. In the second, the hotel occupancy rate in Chicago is the dependent variable. The independent variables are the same in both regressions: GDP, a dummy variable that indicates if the time is post-recession, and an interaction term between the dummy variable and GDP. Unlike the study by Byers, Proserpio and Zervas, this study does not use luxury hotels as a control group. This is because there are luxury Airbnb listings, which may have an impact on luxury hotels.

The United States government indicates that December 2007 was the beginning of the recession. Thus, from that month through the end of 2014, the post-recession dummy variable takes on a value of 1. Prior to December 2007, the variable is equal to 0.

The hotel occupancy rate data is monthly, while the GDP data is quarterly. Thus, the study repeats the quarterly GDP for all three months of that quarter. As a result, the monthly GDP data used in this study is, on average, three times larger than it actually was. However, absolute value does not matter, as the regression measures rates of change.

The Breusch-Godfrey Test was used to detect for twelve lags, or twelve months, of autocorrelation. All twelve lags tested were found to have significant evidence of autocorrelation, so the Newey-West method was used to correct for that.

The significance of the post-recession dummy variable is of interest because Airbnb was officially established soon after the recession began. If the dummy variable is significant and has a negative coefficient, there is evidence that hotel occupancy rates grew more slowly after the recession began than they did before. Since GDP is also included as a dependent variable, the significance of the dummy variable does not explain poor economic growth, but may indicate that Airbnb's emergence has negatively affected hotel occupancy rates.

After correcting for autocorrelation, the regression results showed that GDP is statistically significant in both San Francisco and Chicago, with p-values of 0. The interaction term was statistically insignificant in both cities, with p-values of 0.970 and 0.356, respectively. In San Francisco, the dummy variable was statistically insignificant, with a p-value of 0.745. In Chicago, however, the dummy variable was statistically significant at a 10% level of significance, with a p-value of 0.087. Since the dummy variable was significant at a 10% level of significance but not at a 5% level, it is deemed to be marginally significant.

Note that Airbnb listings are often unavailable to guests during popular vacation times, such as around major holidays, when hosts want their apartments to themselves and do not wish to host an Airbnb guest.

CONCLUSION

The results show that Airbnb's entrance into the lodging industry did not have a significant impact on hotel occupancy rates in San Francisco from 2008 to 2014. However, the results suggest that the company's rise may have had a marginally significant impact on hotel occupancy rates in Chicago during the same time period. The San Francisco results serve as evidence against the hypothesis that Airbnb has had a significant impact on the city's hotel occupancy rates, while the Chicago results are consistent with the hypothesis. The disparity in the significance of Airbnb's impact on hotels between the two cities could be explained if people visiting Chicago are disproportionately visiting for business as compared to San Francisco's visitor population. This could cause a difference between the significances of Airbnb's impact on hotels in the cities because Airbnb appeals to a larger proportion of leisure travelers than business travelers. Another possible cause for the difference in significance between the two cities is that Chicago may have more budget-conscious travelers who are interested in saving money by using Airbnb. Additionally, Chicago may have a higher proportion of budget hotels than San Francisco does. Since budget hotels are more likely to be affected by the supply of Airbnb listings than luxury hotels are, this could mean that Airbnb listings are seen as substitutes for more hotels in Chicago than in San Francisco (Byers, Proserpio and Zervas 2014).

These results are important because they serve as evidence against news articles that claim Airbnb is driving hotels out of business. They also show that if current trends continue, the nearly two million people in the U.S. who work in the hotel industry do not need to be concerned about losing their jobs as a result of Airbnb's emergence. It is also important information for investors, who may be concerned that Airbnb is hurting the financial performance of hotel companies.

In 2011, 40% of consumers in the lodging industry were business travelers. Although Airbnb listings are generally more affordable than hotel rooms that business travelers stay in, most business

travelers--those employed by large companies--do not treat them as a substitute for hotels. These travelers lack incentive to reduce costs for their company, and find hotels more reliable and straightforward to use.

To evaluate Airbnb's impact on hotels, this study examined the occupancy rates of hotels in San Francisco from 2008 through 2014. The results for Chicago were consistent with those of Byers, Proserpio and Zervas: Airbnb has a small negative impact on the performance of hotels in both Chicago and Texas. The results for San Francisco, however, showed that Airbnb has not had a significant impact on hotel occupancy rates.

The results in this study suggest that Airbnb is unlikely to overtake the hotel industry. Rather, it may cause some lower-end hotels to cut costs to make their nightly rates more competitive with the prices of Airbnb listings. However, Airbnb *is* becoming more competitive with hotels in the market for business travelers. In 2015, it launched Airbnbbusiness, a product that allows companies to create accounts with Airbnb, and employees to charge their bookings to their employer using their work email addresses. This allows employees to avoid a reimbursement process.

As this new Airbnb feature gains popularity, it may start to hurt hotels that cater to business travelers. If Airbnb were to introduce a loyalty program, it would likely become more competitive with hotels, both in the market for business travelers and in the market for leisure travelers. Additionally, if the company were able to begin renting conference rooms and thus facilitate entire conferences run through Airbnb instead of hotels, it might have a larger negative impact on hotel occupancy rates.

Although the industrial design conference that caused all hotels in San Francisco to be booked and consequently inspired the idea for Airbnb was an outlier of the general occupancy rates of hotels, it is not the only time that Airbnb has been used as a solution to the shortage of hotel rooms in a particular location. Berkshire Hathaway, a conglomerate holding company started by the famous

investor Warren Buffett, has had remarkably well-attended annual shareholders meetings for years. The meetings are held in Omaha, Nebraska, where the company is headquartered. In recent years, hotel rooms had been difficult to book in Omaha, which is a rather small city to accommodate such a large event. The projected attendance for the 2015 meeting was a record high of approximately 40,000 (Crippen 2015). Buffett asked Omaha locals to open up their homes as Airbnb listings for the weekend of the meeting to help decrease the housing shortage (Kusek). In the future, Airbnb may continue to be used as a temporary solution to discrepancies between the supply and demand for lodging accommodations.

It is important to note that this study has several limitations. One is the small amount of previous scholarly research published on the topic. Another is that this study is not able to measure the impact that Airbnb has on the prices of hotels, since the past prices of hotel rooms were not available.

While the GDP measure used in this study is adjusted for seasonality, the hotel occupancy rates are not. This inconsistency may have caused inaccurate regression results, since hotel occupancy rates are highest in the summer months of each year.

Additionally, this study does not measure the per capita penetration of Airbnb listings in Chicago or San Francisco as Byers, Properpio and Zervas did with cities in Texas by means of data mining. If measuring Airbnb penetration in Chicago or San Francisco were feasible, this study could have analyzed the effects of changes in the penetration of Airbnb listings on the performance of hotels in the cities.

75% of Airbnb listings are located outside of the United States (Huston 2015). The scope of this paper is limited to two cities in the U.S., which limits its ability to describe the effects that Airbnb has had on hotels in other countries, especially where different cultural customs, demographics, and legal regulations might cause the platform's impact to be different than it is in American cities.

Data on Airbnb is currently very limited because the company is private and does not publish its data. If Airbnb goes public in the future, its financial data would be publicly accessible, enabling more substantial quantitative analysis. If Airbnb becomes publicly traded, it would be useful to conduct an analysis about the occupancy rates of Airbnb as compared to the occupancy rates of hotels, and whether one decreases as the other increases.

Future research about the relationship between Airbnb and the hotel industry should use updated data. It might also examine the growing popularity of Airbnb among the business traveler demographic, and how Airbnb business has or has not made Airbnb more competitive with hotels, especially those that cater to business travelers.

In addition to examining the effects of Airbnb's growing popularity on the hotel industry, future research might also evaluate the effects that other peer-to-peer lodging companies have had on the hotel industry, as well as the effects that the competition from those companies have on Airbnb itself. Evaluations of Airbnb's impact on the hotel industries in countries outside of the U.S. would also be valuable additions to the existing research on the topic, which is highly U.S.-centric. Finally, future research should investigate how cheaper hotels have or have not changed their prices or business models to remain competitive with Airbnb.

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GRAPHS AND TABLES

Figure 1: Short-Run Market for Airbnb Listings

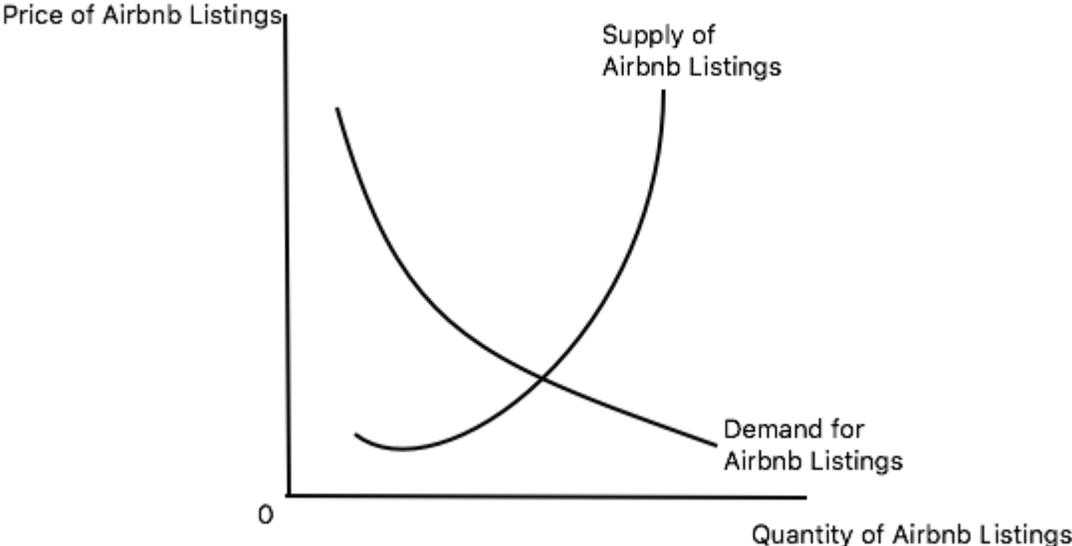


Figure 2: Short-Run Market for Hotel Rooms

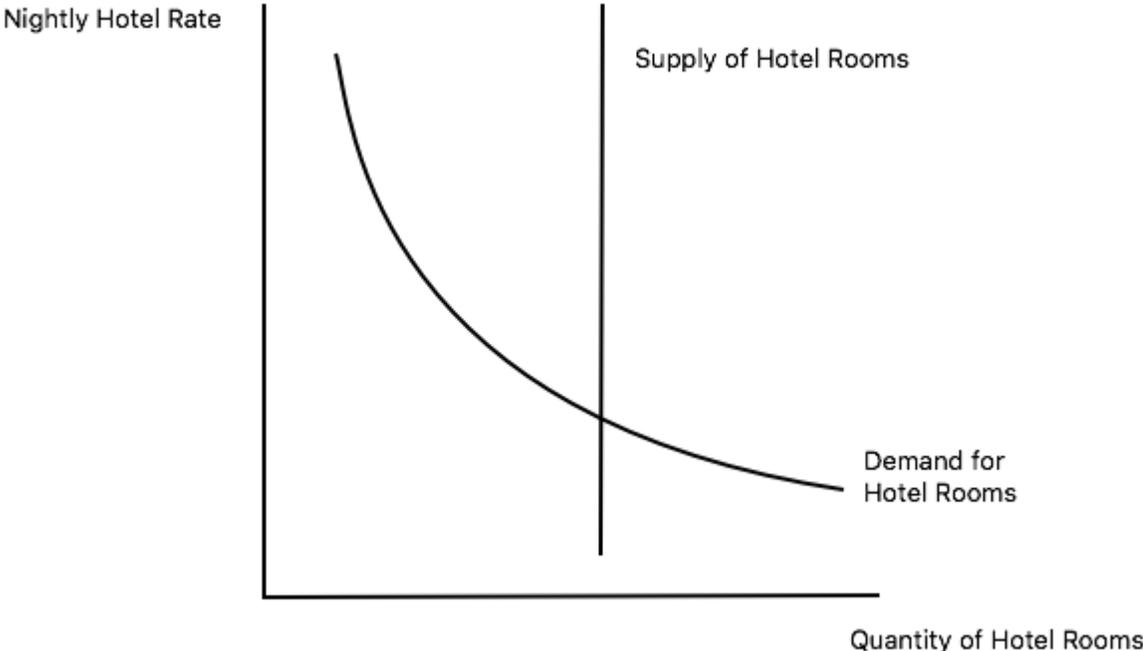


Table 1: U.S. Quarterly GDP (adjusted for inflation and seasonality)

Financial Quarter	GDP (billions of USD)
Q1 2003	11,230.1
Q2 2003	11,370.7
Q3 2003	11,625.1
Q4 2003	11,816.8
Q1 2004	11,988.4
Q2 2004	12,181.4
Q3 2004	12,367.7
Q4 2004	12,562.2
Q1 2005	12,813.7
Q2 2005	12,974.1
Q3 2005	13,205.4
Q4 2005	13,381.6
Q1 2006	13,648.9
Q2 2006	13,799.8
Q3 2006	13,908.5
Q4 2006	14,066.4
Q1 2007	14,233.2
Q2 2007	14,422.3
Q3 2007	14,569.7
Q4 2007	14,685.3
Q1 2008	14,668.4
Q2 2008	14,813.0
Q3 2008	14,843.0

Q4 2008	14,549.9
Q1 2009	14,383.9
Q2 2009	14,340.4
Q3 2009	14,384.1
Q4 2009	14,566.5
Q1 2010	14,681.1
Q2 2010	14,888.6
Q3 2010	15,057.7
Q4 2010	15,230.2
Q1 2011	15,238.4
Q2 2011	15,460.9
Q3 2011	15,587.1
Q4 2011	15,785.3
Q1 2012	15,973.9
Q2 2012	16,121.9
Q3 2012	16,227.9
Q4 2012	16,297.3
Q1 2013	16,440.7
Q2 2013	16,526.8
Q3 2013	16,727.5
Q4 2013	16,957.6
Q1 2014	16,984.3
Q2 2014	17,270.0
Q3 2014	17,522.1
Q4 2014	17,615.9

Table 2: Annual percent change for the occupancy rates of San Francisco hotel rooms:

2003-2004	+9.36%
2004-2005	+5.09%
2005-2006	+1.55%
2006-2007	+2.58%
2007-2008	+2.02%
2008-2009	-7.00%
2009-2010	+5.85%
2010-2011	+5.67%
2011-2012	+1.45%
2012-2013	+2.57%
2013-2014	+1.73%
Average	+2.64%

Table 3: Annual supply of and demand for San Francisco Hotel Rooms, 2003-2014

Year	Quantity Demanded	Quantity Supplied
2003	11,900,635	18,961,520
2004	12,882,682	18,988,611
2005	13,361,408	18,701,472
2006	13,664,595	18,773,137
2007	14,073,072	18,775,953
2008	14,126,102	18,830,854
2009	13,451,866	18,884,418
2010	14,142,381	18,817,952
2011	14,796,057	18,726,047
2012	15,020,122	18,703,827
2013	15,457,727	18,670,044
2014	15,666,775	18,635,871
Average	14,045,285	18,789,142

Table 4: Summary Statistics of Chicago Hotel Data

Variable	Mean	Std. Dev.	Min.	Max.
Time Trend	72.5	41.71311	1	144
Occupancy Rate (%)	74.73681	10.42995	49.5	93.8
Post-Recession Dummy	0.5902778	0.4934989	0	1
GDP	14,583.24	1,675.315	11,230.1	17,615.9
dGDP	9,250.823	7,773.756	0	17,615.9

Number of observations for each variable = 144

Table 5: Summary Statistics of Chicago Hotel Data

Variable	Mean	Std. Dev.	Min.	Max.
Time Trend	72.5	41.71311	1	144
Occupancy Rate (%)	64.11667	11.07089	39.1	81.9
Post-Recession Dummy	0.5902778	0.4934989	0	1
GDP	60.20833	53.77392	0	144
dGDP	14,581.29	1,671.804	11,230.1	17,522.1

Number of observations for each variable = 144

Table 6: Regression Results for San Francisco Hotel Data

OccRate	Coefficient	Newey-West Std. Err.	t	P> t	95% Confidence Interval
d	-3.949339	12.11628	-0.33	0.745	[-27.90388, 20.0052]
GDP	0.0046724	0.0007794	6.00	0.000	[0.0031315, 0.0062132]
dGDP	-0.0000333	0.0008745	-0.04	0.970	[-0.0017623, 0.0016957]
Constant	9.237564	10.15127	0.91	0.364	[-10.83204, 29.30717]

R-squared = 0.3577

OccRate = Occupancy Rate (%)

d = Post-Recession Dummy Variable

Note that the time trend variable was not included in the regression due to its high collinearity with the GDP variable.

Table 7: Regression Results for Chicago Hotel Data

OccRate	Coefficient	Newey-West Std. Error	t	P> t	95% Confidence Interval
d	-24.11875	13.98545	-1.72	0.087	[-51.76874, 3.531228]
GDP	0.0034785	0.0007736	4.50	0.000	[0.001949, 0.005008]
dGDP	0.0009076	0.0009805	0.93	0.356	[-0.0010309, 0.002846]
Constant	19.23824	10.07032	1.91	0.058	[-0.6713152, 39.1478]

R-Squared = 0.1428

OccRate = Occupancy Rate (%)

d = Post-Recession Dummy Variable

Note that the time trend variable was not included in the regression due to its high collinearity with the GDP variable.