Should Established Industries Fear Platforms Entering Their Markets?

Evidence on Airbnb and the hotel industry

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Master thesis:

Economics and Business

Specialization: International Economics

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2015

Abstract

In the last decade, platforms have made their introduction into several markets. This has led to a confrontation between those who oppose and those who are in favour. Those who oppose argue it destroys jobs and embraces illegal practices. Those who are in favour highlight the potential economic efficiencies. Both parties however, lack any evidence to support their claims as the effects of platforms are still under investigated. This paper provides evidence on the effects caused by platforms entering established markets by looking at the effects Airbnb has had in the hoteling industry.

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1. Introduction

Platforms in the broadest sense have existed for thousands of years. Without restrictions, it is an intermediary which enables the interaction between two or more end users. Historically, this can include market places, the market itself being the platform and buyers and sellers the end users. Nowadays, platforms are no longer restricted to physical places or face to face interaction. Credit cards connect consumers, merchants and banks, airline websites connects airlines to travellers, dating websites connect men and women and Google hooks up anybody with anything. An important aspect of these platforms, is that they exert positive network externalities. A merchant is willing to pay more for a stall at a busier market. Likewise, the consumers' value of the market increases with the amount of stalls. In much the same way, a store owner only maintains an expensive Visa connection if consumer makes use of it at the other end.

In the past, these platforms complemented an existing market, predominantly by improving matching efficiency, think of a market place, think of Google. Today we find a new branch of platforms, one for which the effect on their existing markets are still very unclear. Platforms such as Airbnb, Uber or Helpling, target a specific industry and allow anybody to directly compete with the hotel/apartment, taxi and cleaning industries respectively. By allowing individuals to engage as consumers, suppliers or both, the rules of the game changes. Any individual can run a ten hour shift through Uber, end their shift at a pub and order a designated driver home using Uber. An incredibly fast and efficient switch from supplier to consumer, unknown to earlier markets. What is more, using complicated algorithms, these platforms are able to match consumer and supplier preferences much more efficiently, thereby seriously threatening or complementing the existing industry.

Another unique aspect, is that both parties receive an invitation for feedback once the transaction is completed. This feedback is then made publicly available to all future consumers and suppliers minimizing the risk of information asymmetries or other rent seeking behaviour, assuming the individual wants to maintain a good rating.

Given the fact that these platforms are growing at impressive rates (the annual number of listings for Airbnb increased a hundred fold between 2009 and 2014[1]) this online novelty has received quite some confrontation as well as support.

London for example is famous for its black cabs. Obtaining a taxi permit is challenging at best. Requests must be made far in advance, several requirements must be met and multiple costs endured before being considered a candidate Transport for London (2015). UberPOP, a platform matching consumers with (un)qualified drivers, could thus be considered false as competition in the city of London. Likewise, most countries impose safety regulations and practise drills for hotels, not to mention food or alcohol permits and tourist taxes (Ascolli, et al., 2007). Airbnb guests should also incur these tax liabilities and although Airbnb mentions this to its users in the terms and conditions, this is much more difficult to monitor.

This paper looks at the market effects of platforms. Empirical evidence on this topic is very scarce, so this paper adds to the current field with new evidence using an improved research design. This evidence can then be used to argue in favour or against the introduction of platforms. Legislators and market participants alike will find this information crucial to form their own opinions and actions. Although the focus of this paper lies with Airbnb and the hotel industry, reference will be made to Uber and Helpling serving the taxi and house-maid market respectively.

The paper is structured as follows. Section two will provide a summary of the current literature on platforms. Section three moves on to develop a definition of a platform and argues why the old general definitions were inadequate. It then continues with the characteristics of a typical platform industry and their pricing mechanisms. This is succeeded by a welfare analysis in section four and a thorough description of Airbnb in section five. Once the reader has a good understanding of the topic, section six proposes the research hypotheses, investigated using the Data and methodology described in section seven and who's result are concluded in section eight. The paper rounds of with a summary of the main findings in section nine.

[1] According to this dataset,

2. Literature review

The literature review is split up into two sections. The older literature, which will be discussed in the first section, followed by a second section which summarizes the more modern point of view.

2.1 Early literature

The majority of early literature consists of several pricing models and some welfare effects. As data was scarcely available, or otherwise too costly to gather, only one simple empirical analysis supported these models. Theoretical economists such as Yannis (1998), Caillaud & Jullien (2003), Armstrong (2006), Rochet & Tirole (2006) and Hagiu (2006) have all constructed pricing models and surprisingly to the field of economics, all come to similar conclusions. All authors argue that profits must be gained from one side of the market, Caillaud & Jullien call this "divide and conquer". Positive network externalities make participation for one side more valuable as the size of the opposite user group growths. Using this characteristic, platforms gain market share by subsidizing one user group and generating revenues from the other. They then warn of the potential lock up effect that may arise from such pricing strategies and advice platforms to actively avoid this. The lock up effect occurs when a platforms' network becomes so big, it captures the whole market, resulting in race to the bottom.

One of the first to recognize the welfare gains in low search costs was American Nobel prize winner George A. Stigler in Economics of information, Stigler (1961). Stigler argued in favour of bargaining with multiple suppliers if search costs are relatively low. Although Stiglers work was unrelated to platforms, it is related considering the fact platforms severely decrease the search costs. Some of the authors above include a welfare analysis in with their pricing models. They find welfare gains through two related channels. First of all, a welfare gain as a result of improved matching efficiency, referring to the algorithms who theoretically perfectly match consumer needs with wants. Secondly, a general decrease in search costs. To welfare gains through improved matching and quicker matching.

As mentioned above, the empirical literature is much smaller. Lynch & Ariely (2000) attempt to investigate the welfare effects of wine retailers competing through online platforms. Although the platform was relatively small, it did resemble a platform, in this instance one that compliments the market it serves. They show that consumer welfare is increased as search cost have decreased. Consumers compare wine prices and then pick (match) the store with the lowest price. As a result, they see merchants differentiating their goods and attempting to increase consumer satisfaction to guarantee customer retention.

Unfortunately this literature is to a large extent no longer applicable. Different types of platforms have entered the market which serve different purposes. Although platform must still attract both sides, they do not necessarily subsidize a particular side, or have lock-in effects. As such, the literature remains interesting and is useful for a basic understanding of platforms, but is unfortunately, no longer always applicable.

2.2 Recent Literature

More recent literature moves away from models and attempts to use the data available to create empirical evidence. Two papers focus on the presence of Craigslist on the local market. Craigslist being a two-sided platform where users can post classified ads (items for sale, job vacancies, rental apartments etc.) at very little expense. Kroft & Pope (2012) study the effects of Craigslist by studying the number of adds on the platform on newspaper advertisement prices, unemployment within the region and rental housing vacancies. Kroft & Pope experience that prior to 2004, a relatively fixed percentage of job vacancies, was placed in newspaper advertisements. This changed between 2005-2007 when popularity for ink ads steadily decreased whilst many states showed an increase in Help Wanted ads posted on Craigslist. They find that unemployment rates for states in the lowest 25 percentile of Craigslist use followed the exact same pattern as states in the top 25 percentile of Craigslist use indicating no effect on unemployment levels. Finally, they find that the vacancy rate of rental units decreased by approximately ten percent.

Seamans & Zhu (2013) focus more specifically on the effect of Craigslist on local newspapers by investigating the presence of Craigslist on those newspapers between 1997 and 2007. Their results show that their target newspapers had to reduce ad prices by approximately one fifth. Besides this newspapers differentiated themselves more extensively and their pricing structure shifted further away from ads but focused more on membership fees.

The most related study is by Zervas, Proserpio, & Byers (2014). They focus specifically on the state of Texas and investigate the presence of Airbnb on hotel revenues. By collecting a decade long panel data between 2003 and 2013 (keeping in mind that Airbnb only launched in 2008), covering almost 6000 hotels and 7361 Airbnb Listings. Their results show that a doubling of

Airbnb listings decreases hotel revenues by 2.1% on average, with the effect being greater for hotels targeting the budget segments relative to hotels serving higher segments. Keeping in mind that Airbnb is still relatively new and that listings are growth at very impressive rates, this ought to be quite an alarming figure for budget hotel owners.

There are also some developments which focus on the welfare effects of platforms. Notably that of Lewis & Wang (2013) who using their model show that efficient matching leads to the "social planner's solution" and so increases social welfare. A consequence to all consumers being well informed is that they favour one good over the other destroying the market for that second good.

Zhu & Lansiti (2012) take a different approach to welfare effects. They investigate the lock-in effects mentioned earlier and find that this may pose such a threat to consumers. They find that a tipping point does exist, where all users use a single platform, but that switching costs are very low. Already minor quality superiority or slightly higher subsidies can persuade all users to switch platforms. This theory would create a race to the bottom between platforms where eventually marginal revenues equal marginal costs.

Although the empiric work is at a very early stage, the papers above do show evidence that platforms have the capability of reshaping industries. This paper aims to build on the current field by using empiric evidence from 15 major cities in the world, a currently unprecedented investigation to this author's knowledge. In addition, this paper improves (Zervas, Proserpio, & Byers (2014) by controlling for state of the economy, and occupancy rates besides using a first difference model instead of trying to find city specific variables to prevent endogeneity.

3. Platforms

This section describes platforms in general. It starts off with a brief explanation of a platform. It then continues by discussing pricing mechanism of platforms, followed by a description of the characteristics typical to a current industry which could be taken over by a platform.

3.1 Definition of a platform

Not unlike the early stages of the product lifecycle, where producers are yet to converge to a single or at least dominant design, so too are theoretical economists still searching for a prevailing definition of a platform. In this subsection we will summarize some of the difficulties in giving a suitable definition of a platform and aim to improve the existing one.

3.1.A. Current definition(s)

(Caillaud & Jullien, 2003), were one of the initial authors to propose a definition, referring to platforms as intermediation service providers, they characterize a platform as an intermediary which thrives under the circumstances whereby the utility of one side of the platform is directly related to the size of the other side of the platform. In other words, a platform defines itself with high levels of network externalities.

(Rochet & Tirole, 2006) are the first to criticize this by stating that according to such a definition, a supermarket would also fall under a platform whilst clearly it is not. The more products a supermarket has the more customers it will attract (assuming that grocery shoppers are attracted to more products in a store). They continue to argue that platforms besides network externalities are characterized by their structure. A careful pricing structure whereby fixed and variable costs play a key role in securing user presence on the platform and generating transaction through the platform respectively to maximise overall transaction volume.

Interestingly, (Rysman, 2009) moves back to the first definition but from a different perspective. Rysman admits the definition is very broad, even that it could potentially include all markets. His focus point however, is the strength of the externality. He argues that platforms are those which act as a lubricant for interaction and operate on the basis of externalities.

At the same time, (Weyl, 2009) describes a platform as; providing distinct services to at least two sides of the market which are priced independently, enjoy network externalities and have bilateral market power. This could be seen as an intermediary which through network externalities obtains for itself a position of power in multiple markets, which it prices accordingly.

Finally, (Hagiu & Wright, Multi-Sided Platforms, 2015) are to my knowledge the latest authors to define platforms and once more maintain a very vague translation. They too characterize a platform by the presence of network externalities, but in addition to externalities, suggest two more determinants. First they stress that a platform simply enables the interaction between two distinct sides. Lastly they define platforms as an intermediary whereby both parties have an affiliation with the platform.

3.1.B. Deriving our own definition

In my opinion, all authors are right to some extent by emphasising the role of network externalities, but do not correctly define a platform in its entirety. Platforms in general consist of four main traits:

- The existence of strong network externalities
- The platform enables the transaction
- Although both/all sides have an affiliation with the platform, the platform has no part in any transaction it enables. The transaction is between end users.
- Sides are priced independently

Using the argumentation of Rochet & Tirole, the presence of network externalities alone as proposed by Callaud & Jullien is not enough as this would include a supermarket. Supermarkets have a direct influence on prices, charging a mark-up, independently promoting certain products etc. A platform merely enables the transaction and has no part in any negotiations between end users, thereby ruling out any intermediary which influences the transaction. To give an example, Xbox solely provides a medium for game developers and consumers to interact. Consumers transact with game developers and Xbox is no part in this transaction.

Rochet & Tirole's definition lacks as they emphasise the importance of pricing structures. Although platforms are unique in the way they price, all industries require a careful pricing strategy and so this definition lacks in defining platforms specifically.

Rysman's definition concerning the strength of the network externalities is important and true, but too vague. It does not provide a clear definition of a platform or what is does.

Weyl becomes more specific but includes bilateral market power as a key characteristic of a platform. Although generally, industries constituted of platforms have a very high market concentration, this does not necessarily mean they have market power. Zhu & Lansiti, (2012) showed that a minor technological or promotional superiority can already have consumers switch to that platform. The threat of entry is thus often very high giving a platform temporary market power at best.

Hagiu & Wright come very close to our definition but forget to stress the different relationship that each side of the platform has to the platform, another key aspect. Platforms must entice both sides and this requires independent pricing.

Unfortunately, this definition is still rather vague. It is however, very difficult to be more specific with a general definition when the role and effects of platforms differ extensively. Hence, in the following section, we improve our understanding and definition of platforms by highlighting some key differences and later introducing 3 distinct types of platforms.

3.2 Introducing different types of platforms

Above we have derived a general definition, this section starts by accentuating some key differences using distinct types of platforms, which help explain why a general definition must remain somewhat vague. Afterwards, we become more specific by redefining platforms to be creational, complementary or destructive.

Our first example, is that of Xbox and Visa. Both have careful fixed and variable pricing structures, making Rochet's & Tirole's definition of a platform appropriate. The purchasing price for Xbox or the fixed costs associated with Visa create a lock up effect which in turn can give temporary market power. Uber couldn't charge a purchasing price for downloading the app, consumers would immediately switch to Taxify, another platform providing the same service but is for now, less well known. In like manner, nobody would pay to use eBay when they can use Amazon, Craigslist or Marktplaats. So the market in which a platform operates is vital in describing common characteristics or definitions.

A second key difference is that for Xbox, the two ends up the platform can unambiguously be defined as consumers and video game designers. The prior purchasing the game which the latter creates. Now a designer can of course play a game, but designing and creating videogames is an incredibly skilled and complex process. One which the average consumer could not easily imitate or do. Likewise, visa is a three sided platforms enabling interaction between consumers, retailers and financial institutions. Each can easily be defined as a different user of the platform where obviously some overlapping is possible, but the average consumer could not operate a financial institution. When it comes to platforms such as Uber, Aibnb or Ebay, this is quite different. Consumer A could use Airbnb to book B's apartment for the summer (B being a supplier), yet at the same time rent out its own apartment to C for the time he is gone. This makes A, a supplier as well as a consumer. Likewise, individual X could spend a day working as a taxi in his own car using the Uber app and at night go for a drink and order a taxi home through Uber. Once more, individual X is a consumer and a supplier. Here the difference is the level of (human) capital at disposal to the person/firm and required to provide the service which creates very distinct platforms once more.

Although this characteristic may seem harmless at first, it is actually what fuel's the entire discussion. As workers felt threatened by the introduction of machines during the industrial revolution, so too may taxi drivers, hotels and house maids feel threatened by this electronic revolution, it could threaten their jobs. A further justification of this investigation, which targets these platforms specifically.

An interesting side note, is that the introduction of these platforms could change the nature of these industries. The hotel and taxi market can both be seen as industries characterized by Cournot competition. There is a fixed supply, which is predetermined and changes in supply can only be achieved in the long run. Cournot competition typically indicates positive profits and quantities below perfect competition to keep prices high. When consumers also become suppliers, the nature competition in such an industry changes. Supply is suddenly become almost infinite. This means industry equilibrium is now based on price setting, or Bertrand price competition. An equilibrium where prices equal marginal costs as competitors continuously undercut one another to steal market share. This line of argumentation also explains the resistance imposed by the current industry leaders.

As has become evident, it is very difficult to be specific with a general definition. Therefore, we redefine platforms according to the impact they have on their existing industries, defining them as creational, complimentary and destructive.

Creational platforms would include those as Xbox, which create an entire new market for both consumers and producers. Creational platforms are characterized by consumers and perhaps producers also, who pay a fixed fee to be present on the platform and a variable fee to transact on them. As the service is new, the service they provide is likely to be difficult to copy in the short run, giving them a (temporary) competitive advantage which enables them to maintain these fixed fees and lock in consumers. In addition, any potential entrants must either offer a superior product or at a lower price for them to be more valuable than the existing utilities derived from the established network.

Complimentary platforms would be those which compliment an existing market, for example Synkick. Synkick is a app which consumers link to their favourite music accounts (e.g. Spotify) and upon walking into a Synkick ready location, for example a bar or a shop, the music will automatically adapt according to the consumers music preferences. In doing so, the app complements the retail/hospitality industry as well as the music industry by creating a more enjoyable atmosphere for the consumer, increasing his utility and willingness to spend. Although they may be subject to more competition than creational platforms, they can exert some market power once they have established a large enough network. The network externalities for this app arise as consumers will value the app more as shop usage increases resulting in their music preferences being played more often. Shop owners will value the app more as the consumer base increases as this means being better able to adapt the music playing in their venue.

Destructive platforms, in the spirit of creative destruction, would include all those which threaten to replace an existing market. As mentioned in the literature review, the introduction of Craigslist significantly decrease advertising prices in local newspapers. As the markets already exist, they must deliver serious cost of efficiency gains for them to attract a large network and thus cannot charge the high fixed costs which creational platforms impose.

For some platforms, the effects remain somewhat ambiguous, especially with the lack of empirical evidence from the field. Platforms such as Airbnb and Uber could both compliment or be destructive towards their existing markets. By the end of this paper, I hope to have established evidence on the effects of these platforms to better define them and allow future research and legislation to build upon this.

3.3 Platform pricing mechanisms

Touched upon above, different platforms use specific pricing mechanisms. They do share some common traits however. Hence, platforms and legislators alike must understand the effects and consequences from opting certain strategies or policies.

The dominant reason for pricing mechanisms of decentralized intermediaries to differ with respect to their centralised counterparts is the existence of strong positive network externalities. Because platform value for users on one end is dependent upon the user base on the other side, the initial strategy is simple: attract as many users on one side. Platform often achieved this by slightly subsidizing participation on one side and allowing the superior user base to attract users from the opposite side. An easy example is that of a ladies night. The increased presence of females will increase the value for males who then opt to go to that particular club.

Visa, American Express and MasterCard work in a similar way. Each is a multi-sided payment platforms, which competes to attract consumers, retailers and financial institutions. The value for retailers, increases as the number of consumers increase and vice versa. Visa is currently subsidizing the consumer side by giving a free Samsung tablet and a minimum of 180 days of insurance on every purchase International Card Services (2015). In return, they pay a relatively small annual fee and charge retailers a certain percentage of their card-sale revenues, depending on their geographic region Collinson (2013). Assuming that consumers hold one card to avoid additional membership costs, if one of these platforms was able to attract all consumers, retailers would no longer be interested in the other platforms. Thus platforms use a “divide and conquer” pricing strategy which, as discussed next, may result in very fierce pricing competition.

Because platforms have an incentive to attain a monopoly position, they continuously compete to become the dominant platform through pricing mechanisms that reflect Bertrand pricing competition. Legislators must take into account when creating legal precedent that any government intervention, may disturb this current tough competition into more accommodating competition. These are also the conclusion of Armstrong (2006) and Caillaud & Jullien (2003) meaning that from a social welfare point of view, monopolies could in fact be socially optimal. Legislators must realize that in this instance, high market concentration such as a monopoly or oligopoly may be the preferred market structure from a consumer welfare perspective.

Platforms such as Uber, Airbnb and Helpling do not charge fixed costs to avoid what is known as the lock-in effect. The effects of charging a fixed entry fee is that users stick to a single platform (they are lock-in) to avoid additional costs. At a given point, the network may reach a tipping point, where it has become so large that the value of their network outweighs that of all others and all users exclusively use that platform. This has the effect that all platforms compete to reach this tipping point creating heavy price competition. Once all market share is attained, the platform cannot increase its prices, as consumers are quick to switch to a superior platform as shown by (Zhu & Lansiti, 2012).

By charging transaction costs instead of membership fees, consumers can multi-home, search through multiple platforms. The platform is still worth more as the number of user's increases but the lock-in effect is avoided, decreasing the overall level of competition.

These platforms also endorse a feedback mechanism whereby both parties are asked to rate the other party involved in the transaction. This is later made publicly available on the platform. This feedback mechanism creates a natural selection whereby high rating will ask higher prices. A unique and important feature to platforms which minimizes the market for lemons.

3.4 Characteristics of a platform industry

This section begins with a brief description and later makes a comparison between three platforms Uber, Helpling and Airbnb, all of which have seen incredible growth over the last decade and have become successful platforms and may have great effects in their respective markets.

3.4.A. Description

Uber is a platform which connects consumers with taxi drivers. In mere seconds one can order a taxi which arrives at the given location without the hassle of cash payments for this is automatically billed through your credit card (which is given when you sign up) Uber (2015).

Helpling provides a very similar service but instead does so for the cleaning industry. Once again, the consumer gives the address of where the help is needed. The platform then uses its algorithm to match this request with the best/closest registered provider. When matched, the consumer chooses a date and can pay online through ideal Helpling (2015).

Airbnb allows individuals/companies who have a spare apartment or room to rent these out to travellers. Travellers choose a city they wish to stay in and enter the date of arrival and departure. Airbnb then provides a list of all the possible accommodations with pictures, prices and a small statement of the owners with terms of use. If a traveller wishes to stay at a listed accommodation, he or she books and pays through Airbnb.

3.4.B. Shared character traits

The above mentioned platforms share some common traits. First of all, their pricing strategies. All of them follow the theoretical predictions and operate on a transaction basis allowing consumers the opportunity to multi-home and preventing the lock-in effect.

Another aspect, is that they operate in industries for which the service provided is relatively simple. Cleaning is a relatively simple service as is renting out spare rooms and although Uber (logically) requires a drivers' licence, this too is a relatively simple service. This simplicity is undoubtedly also part of the success. Everybody requires housing, cleaning and transportation and anybody can deliver these services (if they don't do it themselves). Thus these apps can quickly attract users from both ends of the platform rapidly increasing the value to other users. Coming back to the argumentation given earlier where consumers can also be suppliers, given the relative simplicity of the service and large potential supply base, industries currently serving these sectors may well feel threatened.

The third shared character trait is that these platforms drastically reduce transaction costs by allowing the consumer to select their preferences (car quality for Uber, geographic region for Airbnb and Number of hours for Helpling) thereby drastically increasing matching efficiency.

In addition the feedback strategy they apply almost guarantees a high level of service. Once the service is provided, they ask users, often at both ends of the platform, to give feedback. This information is than open to future users. High ranking increase the likelihood of future transactions thereby increasing the incentive to deliver better service. The incentive is lower for a common taxi driver, as no other potential clients will likely hear about the service he specifically provides. Uber and Helpling also require their providers to meet a certain threshold in positive replies. A strategy which may be more effective then qualifications as it imperfectly guarantees sustained quality.

A more ambiguous character traits is the allocation of risk. These platforms shield themselves from any risk by stating they are only a matching platform. Uber for example clearly states on their website that they are not a transportation provider (Uber, 2015). This shields them from any financial liability as a result of their match besides circumventing the legal obligation imposed on qualified taxi drivers to obtain all required documents. Unfortunately for them, not all governments agree with their argument that Uber is “a cousin of carpooling” and have (temporarily) banned it under unfair competition Teffer (2014). Airbnb and Helpling apply the same principle clearly stating that they are a matching platform and thereby hope to avoid any liability. Minister Henk Kamp of economic affairs in the Netherlands, has already stated that we must embrace these platforms for their efficiency gains and increased consumer choice, although he makes a distinction between services meeting all regulatory standards and those on the borderline AD.NL (2015).

Risk extends to other issues say regarding insurance for accidents, or stolen property. Platforms also realise this however, and Airbnb for example clearly shows which consumers have allowed Airbnb to check their ID, which would facilitate identification in case of any abuse.

Looking from another perspective, it could also reduce risk. Because the service is ordered and paid for online, the service provider has less incentive to increase his rent through false practices, e.g. not taking the shortest way to the destination.

4. Welfare effects of platforms

As mentioned earlier, platforms have great potential, either by creating new industries, complementing them or directly competing with currently existing industries. No country has yet adapted their laws to accommodate platforms, rightly so as their effects are still to be determined. This becomes problematic as soon as there are laws governing industries who currently service the industry in which the platform hopes to establish. As a consequence, frustrations have erupted from current market players who not only feel threatened, but also feel cheated by the system. The platforms themselves also feel irritated for they believe to be acting within the confines of the law. This section tries to highlight and discuss some of the welfare effects which are associated with platforms, starting from a consumers' point of view and subsequently moving on to that of the suppliers.

4.1 Welfare effect on consumers

The effect on consumers is relatively simple and tends to be positive overall. If the platform is creational, the consumer will enjoy an increase in welfare as he now has a larger choice. (Assuming consumer utility increases as variety increases). Complementary and destructive platforms will likely decrease prices, mainly due to a decrease in transaction costs, which will also increase consumer utility.

Price reductions are realistic, take for example Uber, who operates with qualified taxi drivers as well as UberPOP which as mentioned above requires no formal documents. This includes medallions sold by cities for the right to drive a cab, a document which can be extremely expensive (over one million dollars for New York City Brustein (2014)). These drivers can thus provide the same service at much lower costs whilst at the same time, leaving the choice to the consumer. In most US cities, UberPOP is priced at or below prevailing taxi rates Salmon (2013). Likewise, Uber rates for the Amsterdam are less than half the often charged maximum taxi fares in the Netherlands Uber (2015) Rijksoverheid (2015).

There is a risk involved, the transactions may be less personal and could create some issues. This issue however, also exists in older markets, taking second hand car industry as a classic example of the market for lemons. The feedback system of these platforms, may actually minimize this risk.

In addition, part of the business model is based on the collection and selling of big data. All transactions are stored on the internet data records where you are going, where you are staying, how much you are paying and whether you have your house cleaned or not. Those who value privacy could face a welfare loss. New laws regarding data storage and personal data are being established and perhaps platform will continue to find way to encourage and stimulate trust and ethical behaviour of their users. On the other hand, these consumers could also opt to not use the service.

Overall, consumer welfare is likely to increase as a result of increased product variety as well as price decreases. However, governments must try to minimize the welfare losses associated with risks or privacy losses.

4.2 Welfare effect for suppliers

On the supplier side, the effects are more ambiguous. The expected supplier utility can be expected to increase for creational platforms. Investors may even see a platforms as a compound option with high potential pay offs in the future. Although here also, suppliers from other industries could experience a welfare loss, take for example board game developers of shops.

Complementary platforms only facilitate transactions, increasing the number of transaction will increase the supplier surplus. There are likely to be no negative effects associated with them.

Again destructive platforms cause more concern. The first effect of these platforms will be an increase in supply, resulting in increased competition and lower prices, a welfare loss to supplier immediately but also in the long run.

Reducing the entry barriers however, may be a welfare gain in the short run as some investments are no longer required. If conversely, these investment actually have a net gain in the long run, this may be an additional welfare loss as a result of removing these entry barriers. Those who have already invested in the required documents and qualification, will face a welfare loss as these have become less valuable. Having said that, some of these documents, such as taxi medallions, are often owned by a company. Once these medallions are owned by a company, taxi drivers must “rent” these medallions are pay a fixed fee. Once these medallions are removed, a driver will have less expenses to cover which would also increase his utility. Reducing these entry barriers would then only improve what is otherwise an imperfect market.

A more straight forward welfare gain is that searching costs will also be reduced to suppliers using the app. Current taxi drivers can also enlist themselves with Uber, hostels can list their rooms on Airbnb and experienced house maids can also find new clientele through Helpling.

Another welfare gain on the supplier side, would be an increase in demand as prices are reduced. According to Uber’s own figures, following a price decrease in Boston, taxi hourly wages increased by a staggering 22% (Uber, 2013).

This line of argument extends to all industries. As the service is provided more cheaply, it appeals to a larger mass. As demand increases, so does employment in this sector. In the past some relatively easy jobs and services have ceased to exist simply because they have become too expensive. Think of the man who used to walk the streets sharpening knifes, fixing dolls or polishing shoes.

Whether the welfare gains will outweigh the deterioration of supplier welfare remains to be seen. What has become evident, is that on the supply side, it may be a lot brighter than one thinks at first

4.3 Aggregate welfare effects

If one restricts analysis to the short term, welfare effects appear to be positive. Although supplier welfare remains inconclusive, the demand side is likely to experience a welfare gain. In the long run, the effect will likely be positive. Consumers will enjoy a larger variety and price decreases. As to the supply side, the welfare gains remain uncertain. They can expect an increase in competition yet also enjoy higher levels of demand and a possible reduction in costs. Interestingly, we also find evidence that suppliers are already incorporating the idea of platforms into their own business models. For example Zoku loft, a hotel chain which provides hotel rooms designed to look like local houses (Zoku Loft, 2015). They have replaced traditional hotel staff with "locals" whose job also contains introducing guests to the local scene.

To summarize, the chance that immediate stakeholders experience a net gain in welfare is rather realistic. Before concluding this section however, we must also asses some of the externalities likely to arise as a result of platforms.

The first is directly related to the loss of privacy mentioned before as a consumer welfare loss. It is no secret that house maids are often paid in cash under the table, avoiding taxes in the process. Once these transaction are completed through the internet, monitoring is much easier and governments can improve general welfare by collecting taxes accordingly.

There may also be some negative externalities. If Airbnb for example has a negative effect on hotel prices. Hotels will have to differentiate or decrease their prices. A price cut, may result in a loss of jobs, which has a negative welfare effect.

Furthermore, even though I call them creational platforms, they may still have destructive effects on other industries. The introduction of the console has no doubt had its effect on the board game industry. Likewise, industries centred on these taxi medallions mentioned earlier may face large losses once these medallions become irrelevant. Evidence for now suggests otherwise as share value of the Medallion Financial Group, a financial institution specialised in financing cab medallions and other cab related assets has only increased after the introduction of Uber in the US (Yahoo Finance, 2015).

5. Airbnb

Airbnb is the main subject of this investigation, this section is dedicated to describing Airbnb in more detail. If not specified otherwise, the information in the following section has been gathered from Airbnb.com. The first part functions as a general description followed by

5.1 General Description

Airbnb is a two-way platform which connects hosts and guests. Launched in 2008, it has experienced exponential growth. Present day, Airbnb has over 35 million guests in over 190 countries. Considering there are roughly 195/196 countries, depending on the definition, it is safe to conclude that Airbnb is active in almost every country. Listed on their site are over 1.2 million listings, which includes, common rooms, single rooms, apartments, boats and roughly 600 castles.

Figure 1 in the appendix depicts a typical listings. At the top is a quick summary of the type of listing (single room, apartment, etc), the amount of guests it can hold, the amount of beds the accommodation provides and the average rating received by past guests. Just below is a more detailed description of the house, including the room itself. Information includes the type of bed, number of bathrooms, check-in times and any potential pets. This is succeeded by a list of the facilities present on location, including information regarding the presence of a television, internet, washing machines and what have you. Next are prices. Prices come in two styles. Sometimes the owner charges a fixed amount for an apartment regardless of the amount of guests. Other times there will be a fixed starting fee and an additional variable cost after a certain number of guests. Often, the owner will include prices a night, a week and on a monthly basis, where longer stays may be rented at a discount. After prices, the listing shows a more detailed written description of the apartment. This is usually general information regarding the room/house, its location and whether any of the facilities are shared with other residents but could also include a small description of the owners. Below the general description is a list of safety measures present at location. These could for example include a first aid kit or a fire extinguisher. Thereafter, are pictures of the accommodation in question followed by all the reviews posted by former guests. At the very bottom of the listing is a link to the profile of the owner or company providing the listing. At the listing itself, a quick summary is made such as the location of the owner, his year of enrolment to Airbnb and how many reviews he has received in total, including other locations. One can click on the link to the owners personal profile, which includes a more elaborate description of the owner and other listings under his/her care.

Those interested in renting out an accommodation can do so by creating a personal account after which they can post their listing. Those looking for a residency, can type in their desired destination and browse all listings free of charge. When a guests wants to book a listing however, he or she must create an account after which he or she can book any listing accordingly. When searching for a potential accommodation, Airbnb allows for users to work with various filters such as neighbourhoods, price filters, accommodation type, number of guests and or dates of arrival, making the matching as efficient as possible.

Upon finding a desired accommodation, three options follow. The first being that you can contact the owner through a communication service provided by Airbnb. Airbnb themselves recommend using this service throughout all communication in order for there to be written evidence caused by any misunderstandings or other occurrences. The second possibility is that the owner would like to get to know the guest a little better and asks them to contact them. After which the listing is reserved for 24 hours, which is also the response time deadline for the owner. If the owner does not reply within this time frame, the listing is once more made available. The last option is that the owner doesn't bother who rents the accommodation. At that point, there is a book immediately option, where a guest selects their desired date, book it on the spot and immediately receives a booking confirmation from Airbnb to their email.

In the latter two cases, the guest must submit its paying details to Airbnb. In the case where the owner would like some more information on the guest, no costs a deducted until the owner has agreed to host the guest. Once a booking is made, Airbnb asks the guest to send the owner a message to discuss terms such as key transmission. Users are free to download the Uber app which also allows for the possibility to update your arrival status, in the case of a delay for example.

After the stay, both parties are sent a request by Airbnb regarding feedback on the other side. These reviews will be made publicly available on the Airbnb website for future users to see. Naturally, Airbnb restricts the reviews to be objective, filled in truthfully and does not allow any discrimination, racism or other opinions unrelated to the accommodation. Airbnb maintains the right to partially or entirely remove content from their site and will do so accordingly if any malpractice regarding feedback is brought to their attention.

It is possible to cancel a booking as a host, although this is subject to a cancellation fee. There are circumstances under which the cancellation fee is dismissed. Examples being the passing of a close relative. For guest, the cancelation policy depends on that imposed by the host. There are 6 levels of "strictness". The least stringent rules apply when the host is flexible. This implies that a guest may cancel his booking ultimately 24 hours upon arrival and will be fully compensated. A cancellation within 24 hours of the first night will mean the guest is required to pay for the first night but will not be charged for the remainder of nights and if the guest decides to leave early he or she will be refunded for the nights not stayed 24 hours after departure. For any cancellation, Airbnb will still charge their service costs, so even if the guest cancels their reservation well before any deadline. The strictest rules apply when a host is "super strict 60 days" where a guest must cancel 60 days in advance to receive a 50percent refund and will not be compensated otherwise or for early departure. Generally, hosts tend to be either "flexible" "average" (5 day cancelation deadline, for full compensation, otherwise 50percent refund) or "strict" (7 day cancelation deadline for 50percent compensation, otherwise no refund).

If at any given time, the guest encounters a problem, Airbnb advises them to first of all contact the owner of the property. If the problem is reasonable, the owner is unconditionally required to solve the issue. If the owner cannot be reached, Airbnb provides a helpdesk of their own.

VAT is applicable in the EU, Switzerland, Norway and South Africa and as of 2014 is equal to the rate in the country where the accommodation is listed. These will automatically be added to the price of a stay by Airbnb who will then pay them accordingly. Business owners, or those paying through their employers, can have their VAT numbers registered at the EU after which they become responsible themselves for paying any VAT applicable.

On tax related issues, at times guests are required to impose a local tax. Airbnb advises them to make this information available in the listing of a hosts. The individuals themselves are still responsible for paying these taxes.

5.2 Business model Airbnb

There are two main profit streams for Airbnb. The first are revenues generated from fees. Airbnb charges “Guest fees” and “Host fees” to guests and hosts respectively and are based on a percentage of the “Accommodation fees”. The accommodation fees being the price charged by a host to its guests. The guest fees are flexible and operate on a declining scale as accommodation fees increase ranging between 6 and 12 percent. Host fees are a fixed percentage, pinned at 3percent.

Their second revenue stream concern the gathering and selling of data. Like most websites, Airbnb installs cookies on your electronic device to track the user. To book an accommodation or create a listing, one must also provide some personal data, such as name and email. By continuing, the user agrees to all terms and conditions, which include storing the user’s data and using it for maintenance and/or advertising by Airbnb or their business partners (discussed in more detail below). This data is for example very interesting for a restaurant chain, who now knowing the exact location of a guest, size of the group and indirectly their budget, can design and send an appropriate promotion. Hotel chains might find this information even more valuable, missing out on potential consumers.

Unfortunately, none of these upcoming platforms have yet gone public. As such, their income statements are not published on a yearly basis. What can be assumed is that these big data sales constitute a large part of the overall income platforms generate.

5.3 Privacy and Liability Policy

These policies may be the most controversial aspects of platforms in general. They tend to dispose of any potential liability in the terms and conditions. Airbnb does so likewise:

> “THE SITE, APPLICATION AND SERVICES COMPRISE AN ONLINE PLATFORM THROUGH WHICH HOSTS MAY CREATE LISTINGS FOR ACCOMMODATIONS AND GUESTS MAY LEARN ABOUT AND BOOK ACCOMMODATIONS DIRECTLY WITH THE HOSTS. YOU UNDERSTAND AND AGREE THAT AIRBNB IS NOT A PARTY TO ANY AGREEMENTS ENTERED INTO BETWEEN HOSTS AND GUESTS, NOR IS AIRBNB A REAL ESTATE BROKER,

AGENT OR INSURER. AIRBNB HAS NO CONTROL OVER THE CONDUCT OF HOSTS, GUESTS AND OTHER USERS OF THE SITE, APPLICATION AND SERVICES OR ANY ACCOMMODATIONS, AND DISCLAIMS ALL LIABILITY IN THIS REGARD TO THE MAXIMUM EXTENT PERMITTED BY LAW" (Airbnb, 2015).

In the quote above, the second and third sentences are most important. In the second sentence, Airbnb distances itself from the definition of an estate broker or other industries (hence a definition of themselves in the first sentence), thereby also distancing themselves from the laws applicable in those industries. The third sentence amplifies that they enable interactions, not create interaction and thus all responsibility and risk lies with the host and guest, again distancing themselves from any potential liability or risk involved.

This statement is repeated roughly twice in the first section of the terms and conditions alone. Further down they in a subsection dedicated to limited liability and Indemnification, Airbnb further elaborates on the risk allocation and denies any responsibility for them as a company, their employees or third party related to Airbnb.

It must be said that Airbnb upholds a host guarantee which is a type of insurance, although not called as such, for the host up to 800,000 euros which applies when the losses cannot be resolved with the host. This guarantee is not applicable everywhere. Currently it applies in 30 countries worldwide and is also subject to several limitations and conditions[2].

The privacy policy is very similar to other firms operating with big data. It indicates that data is not anonymous and may be used by Airbnb, Airbnb partners or third parties who have already installed cookies conditional on the user's acceptance. Any activity on Airbnb is stored including a guests search history, bookings, payments and any forms filled in on the website. In general, the purpose of this information is to improve the performance of the website but may also be used for advertising purposes by Airbnb and any of the above mentioned. Although they claim to continuously improve their security measures, they continue to state that no they cannot guarantee the complete safety of your personal information. Users can

[2] Austria, Australia, Belgium, Brazil, Canada, Cuba, Denmark, Finland, France, Germany, Greece, Iceland, Indonesia, Ireland, Israel, Italy, Japan, Malaysia, Netherlands, Norway, Puerto Rico, Singapore, Taiwan, Thailand, Turkey, South Korea, Sweden, Switzerland, US and the UK.

request their personal information when residing in the EU or Japan which Airbnb is then forced to provide within 40 working days.

6. Deriving the hypothesis

In this section we derive a testable hypothesis based on our theoretical findings. Discussed above, different types of platforms are likely to have different effects on the industries they serve. As such, these effects should be treated and investigated separately. This empirical analysis is limited to the effects of destructive platforms for two reasons. First of all, they arguably have the most interesting effects and are likely encounter most resistance. Secondly, gathering data to establish causal effect thought to be easiest for destructive platforms and secondly. As a reminder, the first part of this section will summarize the most important theoretical implication of destructive platforms. Based on this summary the hypothesis is developed in the second part.

6.1 Theoretical summary

Destructive platforms partially or entirely replace existing markets, therefore, they are foremost competitors to the existing industry. Where first there were consumers and supplier, these two can now be combined meaning a significant increase in supply. Shown by any supply-demand model, as supply increases, prices decrease. Hotels could try to diversify say by increasing their service thereby decreasing some of the competition. However, not all hotel will be able to do so, especially hotels targeting the budget sector.

Closely related to this competition aspects is that destructive platforms must provide a reasonable efficiency gain to penetrate the existing market in the first place. Under this assumption, hotels must generously respond, either through price decreases or diversification in order for them to remain competitive.

There is a cost benefit for many who supply through Airbnb as Airbnb is labelled a platform and not a particular industry participant. This enables those who supply through Airbnb to avoid many of the costs related to safety, health or insurance which registered suppliers cant. This in turn enables Airbnb to provide an almost equal service but at lower costs. This would once more indicate a price decrease.

The feedback is an effective tool to minimize risk and avoid the market for lemons. To maintain good ratings both end users must supply quality, at good prices and behave respectfully. This could put a downward pressure on prices.

There are also some psychological factors worth mentioning. Where the primary purpose of any hotel is to generate positive revenue streams, this need not be so with Airbnb. Some who post a listing may enjoy hosting guests or getting to know different cultures meaning revenue is not their necessarily their first concern. This would in turn lead them to price beneath market clearing level further increasing competition. This argument could also work to the opposite effect. Hotels maximise profits and thus be more effective at attracting their target segment.

Furthermore, there is still a risk factor. There is personal risk involved and although Airbnb provides a guarantee, this may not be applicable or may not cover all expenses. As such, people may not be willing to assume this risk for themselves and refrain from using this service. The feedback strategy Airbnb imposes is there to minimize this effect, but most likely fails in fully achieving this task

Finally, a hotel enjoys economies of scale. They are likely to be more efficient and cost effective when it comes to managing their reservations, laundry and customer complaints than Airbnb to name but a few examples.

6.2 Hypothesis

The goal of this paper is to establish evidence on the effects destructive platforms have upon entering a particular market. More specifically, this paper looks at the effect Airbnb has on the hotel industry, Airbnb being the destructive platform and the hotel industry the market it (partially) replaces. On the basis of the above, we expect to see a large increase in competition. This leads to our main hypothesis:

Hypothesis A: An increased usage of Airbnb for a particular city, has a negative effect on the hotel prices for that particular city.

Besides the main hypothesis to investigate the overall effect of Airbnb, it is also interesting to determine the type of competition present in the new environment. Whether competition is characterized by Bertrand pricing competition (upwards sloping response curves) or Cournot competition (downwards sloping response curves). Therefore, the second hypothesis is:

Hypothesis B: The new market is characterized by Bertrand competition. Upward sloping response curves indicating a positive relationship between hotel and Airbnb prices.

Proving or disproving these hypotheses will provide a better understanding of destructive platforms and their effects on their existing industries.

7. Data & Methodology

This section includes a description of the data set. Why countries were chosen, where the information was gathered and which adaptations are made. It starts with a general description, proceeded by a section dedicated to the derivation the main variables and concluded by a section on the remaining exogenous variables.

7.1 Data in general

The data set consists of 15 major cities in 10 European countries and 3 cities from the United States[3]. These cities were selected on the basis of most available data and covers the period 2008-2014. A relatively short period but as 2008 was the year Airbnb launched in San Francisco (Airbnb, 2015), and no data is yet available for 2015, the most that can be included. Figures 2 to 5 in the text and tables 1 to 3 in the appendix summarize much of the data. The average computed in the figures are including the year 2015. As data for 2015 only account for roughly half a years' worth, figures for average number of reviews may be biased down.

We see that on average, London is most expensive per apartment, leading the scale at 158.23 US dollars per night on average, followed by New York and San Francisco who charge roughly 20 US dollars less. Just shy of 60 US dollars a night makes Athens and Berlin the

Figure 2: Airbnb average accommodation price

[3] Amsterdam, Athens, Barcelona, Berlin, Copenhagen, Dublin, London, Madrid, Paris, Rome, Venice, Vienna, New York, San Francisco and Las Vegas.

cheapest cities to rent an apartment soon followed by Berlin at 63 US dollars. The sample average was 97 US dollars a night.

When looking at per person per night (PPPN) the sample average was 37 US dollars a night. San Francisco leads the scale at 66 US dollars followed by New York and London at 60 and 58 US dollars respectively. Again Athens has the lowest fares, on average charging 19 US dollars a night, on average. The maximum price charged in Athens was actually below that average of San Francisco coming in at 60 US dollars with a corresponding minimum of 9 US dollars a night.

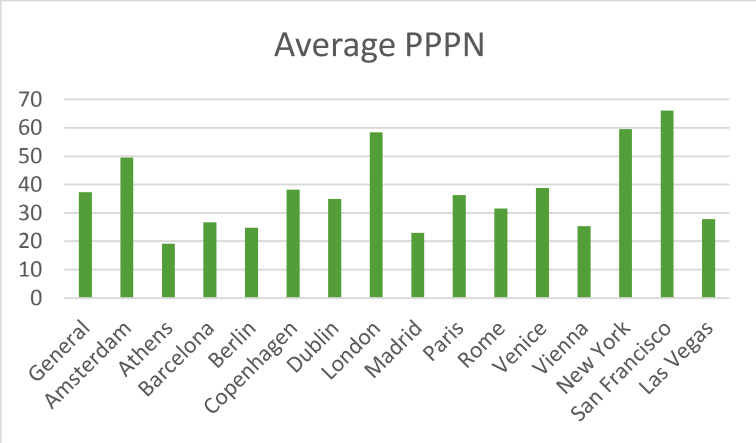


Figure 3: Airbnb average PPPN

The average number of individuals welcome in an Airbnb listing is 2.85. All cities come reasonably close to this average apart from Las Vegas, who on average holds 4.46. An explanation may be that Las Vegas is a city centred on entertainment where visitors are more likely to come in larger groups.

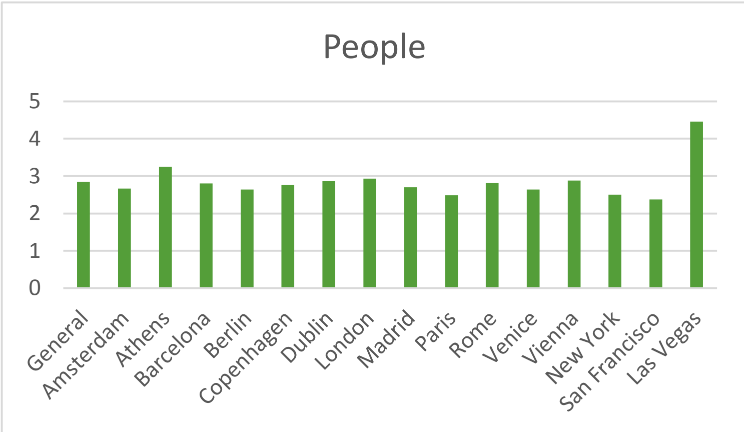


Figure 4: Airbnb average number guests welcome

The amount of visitors Airbnb has is proxied by the number of reviews an apartment has. Venice far outperforms all other cities with 85 reviews on average leaving Vienna and Amsterdam in second and third place with 51 and 50 reviews respectively. Berlin has fewest with

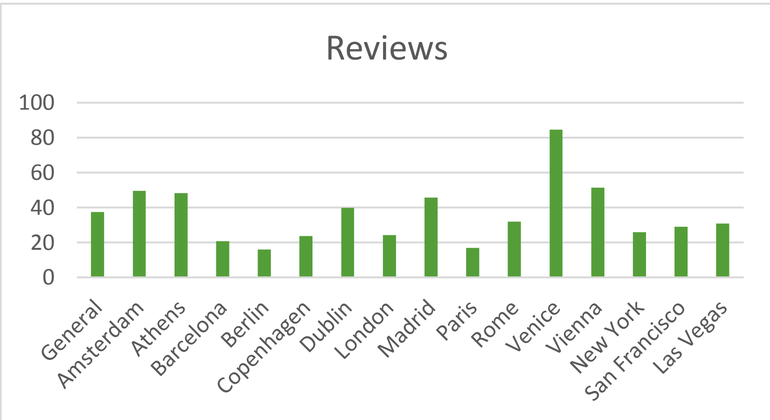


Figure 5: Airbnb average number of reviews

just 16 where the average number of reviews is 37.

Tables 1 and 2 in the appendix summarize hotel prices and Airbnb prices. One of the most striking features is that New York hotel prices are without exception, the cheapest every year whilst Airbnb listings are the second most expensive. If we compare this to the number of reviews New York listings have on average, we see that they are below average, indicating a lower use of Airbnb, which would then support a correlation between the two. Venice and Paris are consistently the most expensive charging rates over 300 US dollars a night. Airbnb listings in both cities however, show apartment prices slightly below average. As mentioned, Venice has by far the most reviews which would indicate travellers prefer booking a night stay through Airbnb than a hotel room. Paris on the other hand, contradicts this theory for they have the lowest reviews of all. Both hotel data and Airbnb listings were restricted to Manhattan in New York and city centre for Paris and Venice, so differences are unlikely to be a result of geographic differences.

Another striking feature is that the years 2010, 2011 and 2013 showed a price drop for hotels. The years 2011 and 2013 saw a striking increase in the number of reviews for some cities. Notably Athens, Rome, Venice and Vienna, which could indicate an association. These were also years of hard recession, especially for Italy and Greece indicating a correlation there also.

7.2 Hotel Data

The data on average hotel rates, occupancy and the number of hotel rooms was provided by the Share Centre powered by STR and STR global. STR global is a listed company which specializes in collecting supply and demand data for the hotel industry STR Global (2015). The data consisted of monthly averages for each of the fifteen cities with the exception of hotel prices for Athens, which was regrettably missing covering the years 2009-2015. This data was then converted into yearly averages. Unfortunately, this approach wastes a lot of data points and seasonal differences. However, as Airbnb data is only collectable on an annual basis, it was decided to go for this approach.

The average hotel rates will be used to analysis the impact on hotel prices. Zervas, Proserpio, & Byers (2014) use hotel revenues. As this is requires more estimations and computations, it was opted to use hotel prices.

7.3 Data related to Airbnb

Each of the 15 cities included featured over 1000 potential accommodations. To collect and process all these offers would have been too time consuming. As such, for every city 80 observations are gathered resulting in a total of 1200 observations. These listings were restricted to the areas which enjoyed the highest concentration of hotels under the assumption that hotels also gather in the most attractive locations. Furthermore, this is also to avoid bias created by prices differences for different geographical locations. For every observation the price, number of potential visitors, owners' year of enrolment to Airbnb and number of reviews was noted down. The number of reviews being the proxy for how many times an individual has rented out that apartment. This figure differs substantially. At times, members have been enrolled for several years and have only limited reviews. Other times, the member is relatively new and has over a hundred reviews. This finding indicates that Airbnb is also used by individuals and firms specialised at renting out apartments using Airbnb as a very effective matching system. Furthermore, it may cause bias in the data when a new apartment is listed through renting agency who has been active on Airbnb for several years, indicating the residence has been online much longer. Moreover the exact percentage of users providing feedback is unknown and may differ across cities.

The gathered information has been used to construct cumulative average price. So average price for all listings in that particular city for each year as well as price per person. Moreover, it allows us to include a variable of new listings, which proxies the supply side of Airbnb listings as well as cumulative reviews. The total number of reviews being used as a proxy for Airbnb demand.

7.4 Other Control Variables

As mentioned above, STR Global provided data on occupancy and number of hotel rooms in a given city. Hotel rooms will be used to control for existing competition in a city. As the number of hotels increase, competition is likely to increase and prices reduced. Furthermore, with a larger supply, hotels are likely to become price takers, which would result in a larger effect if Airbnb would enter the market. Evidence also suggests this, Balaguer & Pernias (2013) provide evidence for Madrid. After controlling for hotel characteristics they find that as hotel density increases, hotel prices and the standard deviation of hotel prices decrease.

Occupancy is included as a proxy for city popularity. This will correct for any endogeneity associated with increasing hotel prices whilst Airbnb listings increase simply because a city is very popular.

In addition to popularity of a given town, different income levels per country may also have an effect on hotel prices, especially when the ration of domestic to foreign tourism is very high. Germany has the highest ratio in Europe, where on average 83% of all tourists are Germans Deutscher Tourismusverband e.V. (2013). In the US, this is even more extreme at 91% New York Times (2015). As a result, domestic income is likely to have a large impact on hotel prices. Data on GDP per capita was collected through the World Bank for the years 2008 to 2014, all the years in the data set.

Also, we include the presence of very large events such as Olympics and World/Euro Championships. The reason for only adding these major events is that they last over an extended period of time, attract huge crowds, and they are limited in their occurrence and are specific to a city or country. There are only two such events in this data set. The first is the 2008 Euro cup in football, which took place in Austria and Switzerland with the majority of the games taking place in Vienna. The second being the 2012 Olympics which took place in London. As an example, the Olympics attracted 500,000 viewers on a daily basis and lasted for 17 days, STM events (2015), as such, we can expect this to have an impact on annual hotel prices for the city of London.

Finally, a crisis variable is include which equals one when for that particular year, that country saw a contraction in GDP per capita. David Romer, goes into a lot of detail on the topic and shows that through increased income uncertainty (which is higher during a crisis), precautionary savings increase, which reduce consumption and increases savings Romer (2012). As such, this variable is again particularly important when the ration of domestic tourism to foreign is high.

7.5 Methodology

For this investigation, a panel data set has been selected. Panel data sets have several benefits over cross-section or time series data sets, the two central advantages to panel data in this research is its ability to follow observations whose status changes over time and its strength against omitted variable bias. The prior, refers to decomposing the before and after effect

Hsiao (2003). Time series models often fail to capture the dynamics as they suffer from multi-collinearity which panel data reduces by exploiting the inter-individual differences in exogenous variables Hsiao (2003).

The latter allows one to isolate the effect of omitted variables, given the assumption that they either do not change over time but are unique to all cities, or that they do change over time, but are shared by all cities. This character trait enables us to use first differences to take out the effect all together, in doing so leaving the exogenous variables in a vacuum which in turn allows for a consistent interpretation of the causal effect (for an example, see below) Hsiao (2003).

In the general sense, panel data has the advantage that one has more observations, this advantage is hardly applicable here as observations were limited to 80 observations per city.

There main draw backs to panel data are its sensitivity to heterogeneity and selection bias. Heterogeneity bias comes as result that the behaviour of a particular city is dependent on an infinite amount of factors unique to certain time periods. Taking all these factors into account would be terribly time consuming if not impossible. As a result, the model may suffer from a certain level of omitted variable bias not accounted for using first differences.

Furthermore, many panel data models suffer from a level of selection bias Hausman & Wise (1979). Although the data gathered here were the first 80 observations expressed by Airbnb. Airbnb automatically shows listings with hiring review ratings higher up the list. If this has an effect on the results, this may bias the results.

7.5.A. Fixed or random effects model?

As mentioned earlier, panel data can correct for some omitted variable bias by taking first differences. In order to do so, we must first assess whether these omitted factors are unique within cities and stay constant over time or whether cities share traits which change over time resulting in a fixed or random effects model respectively. Examples of these effects are cultural or legislative differences. Generally, the United States tends to be more entrepreneurial, which could have an effect on the rate of adoption or trust in Airbnb which in turn is likely to have an effect on average hotel rates. Likewise, legislation is likely to differ among countries, and in the United States even with states. These unique city traits are very difficult to proxy but as they tend to stay relatively constant over time, using the first difference, fixed effects approach, summarized by Hsiao (2003) Torres-Reyna (2007) should correct for such issues.

As an example of the first difference approach assume the unbiased model to be:

$$Y_{it} = \beta_0 + \beta' x_{it} + \gamma z_{it} + \varepsilon_{it}$$

Under conventional OLS regression, the results of β_0, β_{it} and γ_{it} are unbiased and consistent. However, imagine z captures some cultural trait for which no proxy is available. If z is correlated to β_{it}, which is likely true, the error term will assign some of the effect of $z_{it}$to β_{it}. This endogeneity issue will cause bias estimators and test results. As the effect ought to constant across time periods, using the first difference approach the effect will be 0;

$$Y_{it} - Y_{it-1} = \beta'(x_{it} - x_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1})$$ Where i = 1 to i and t = 1 to t.

So theoretically, the fixed effects model is preferred. Usually, one can formally test which model is better suited using the Hausman test. A test which compares estimator β_1' which is known to be efficient and consistent, with β_2' which is only efficient under the assumption being tested Stata.com (n.a.). The H_0 hypothesis is that the effect is not systematic (the random effects model being appropriate). The results, presented as table 4 in the appendix, show that the estimated variance estimator *vce* does not meet the required asymptotic properties, a recognised issue of the Hausman test Stata.com (n.a.,b). Stata continues to recommend the seemingly unrelated estimation (Suest) test, however, this does can't be performed when using the fixed effects approach. It is possible to force the Hausman test to be positive, thereby deriving a result. These are summarized as table 5 in the appendix. We obtain a Chi-squared probability of 0.0759, which would indicated a random effects model at the 5 percent level, yet fixed effects model at the 10 percent level. There is thus some ambiguity, considering the theoretical explanation above, a fixed effects model is chosen as the appropriate model.

Now that we know which model is best suited to our data, we run the necessary test so as to make sure the model satisfies the Gauss-Markov assumptions. The first test run is that for heteroskedasticity. Heteroskedasticity inflates the stander errors making test results bias. Here the modified Wald test is used under the H_0hypothesis of no heteroskedasticity. As shown in table 6 in the appendix, we can soundly reject the null hypothesis with a Chi squared probability of 0.000. To prevent biased testing we use robust standard errors.

The next test is that of autocorrelation. Autocorrelation is the correlation between $\beta_{it}$and β_{it-x} which prevents the derivation of the maximum likelihood estimators. However, using the test Wooldridge test for autocorrelation test proposed by Wooldridge (2002) and encoded by Drukker, (2003 3 N. 2), with a H_0 hypothesis of no first order correlation, we obtain a F-statistic of 0.2255, well above the 0.05 level and so we cannot reject the null hypothesis, indicating no autocorrelation (see table 7 in appendix for full test results).

Our final test is that for a random walk. A random walk indicates a relationship between two otherwise unpredictable variables who just happen to move close together. As we have a strongly balanced data set, we can apply the Levin-Lin-Chu test for unit root, using a 1 period lag on average rate with the H_0 hypothesis being presence of unit root. We obtain an adjusted p-value of 0.0059, well below the 0.05 threshold meaning we reject the null hypothesis and have no unit root (full table in appendix, table 8).

Taking the above into consideration, our final model is a fixed effects model with robust standard errors to correct for heteroskedasticity.

8. Results and Discussion

In this section we show the regression results and thereafter start with by interpreting the statistical significance and whether we can interpret the model. It then continues in more detail about the actual effects of the variable we can interpret. We then compare the results to our hypothesis and conclude this chapter by summarizing the effects on the hotel industry.

Dependent variable: Average Hotel Rate	**R^2= 0.6997**	**Rho=0.994**	**Prob > F= 0.0005**
	Coefficient	Standerd Error	P-value
New Airbnb Listings	0,145	0,315	0,653
Average per person price Airbnb	0,496**	0,150	0,006
# Hotel rooms	-0,002**	0,001	0,005
Big event	9,216**	2,753	0,005
GDP per capita host country	0,004**	0,001	0,008
Hotel occupancy rate	172,838	107,457	0,132
Crisis year	-2,055	4,179	0,631
Cumulative number of reviews Airbnb	0,006*	0,003	0,041
Constant	-3,231	79,727	0,968

** = significant at 1 percent level, * = significant at 5 percent level

8.1 About the model

Our regression shows an R-squared of 0.6997, indicating that our explanatory describe the variance in our data quite adequate. As it is a fixed effects model, this figure is based on the within R-squared. The constant is included in the table for completeness but has no further implications. Five out of eight exogenous variables are significant, four of them at the one percent level. The F-test, shown in the appendix as table 9, shows a p-value of 0.0005, indicating that all variables are jointly significant. We have a rho of 0.994, which means that 99% of the variance in the error term is due to ε_i, or city specific effects. This high value could indicate some omitted variable bias. The overall correlation between the regressors and the residual is -0.7878, quite a high correlation. When we run a full correlation we find that all correlation are fine except for two.

	Uhat	New Listings	Average PPP Airbnb	# hotel rooms	Big event	GDP per capita	Occupancy % hotels	Crisis Years	Cumulative reviews Airbnb
Uhat	1								
New Listings	0.083	1							
Average PPP Airbnb	0.154	-0.054	1						
# hotel rooms	-0.913	0.020	0.047	1					
Big event	-0.154	-0.030	0.064	0.158	1				
GDP per capita	0.283	0.012	0.352	0.097	-0.057	1			
Occupancy % Hotels	-0.233	0.305	0.052	0.444	0.091	0.237	1		
Crisis year	0.210	0.360	-0.092	-0.358	-0.083	-0.198	-0.364	1	
Cumulative Reviews Airbnb	0.233	0.611	-0.118	-0.195	-0.077	-0.122	-0.015	-0.151	1

The number of hotel rooms with which has a 0.444 correlation with the hotel occupancy percentage. This is would be expected however and should not be considered problematic. What is more worrisome is a correlation of -0.913 between the residual and the number of hotel rooms. This also most likely the cause of such a high rho. It indicates that cities have specific variables which we have omitted in the regression and which the fixed effects model has not accounted for. Perhaps the popularity of towns has not properly been addressed which would then be correlated with the number of hotel rooms leading to its high association with the residual. It could be a consequence of our yearly average instead of monthly averages which has removed seasonality from our regression. I leave this to future research to investigate. We will leave the number of hotel rooms in our equation as it does correct for competition from the hotel industry and is thus an important control variable for prices.

8.2 What are the effects

We see that average Airbnb prices, number of hotel rooms, big event, GDP per capita of the host country and the cumulative number of reviews on Airbnb are statistically significant and can thus be interpreted as having an effect.

The average per person per night price on Airbnb has an effect of 0.496, which means that when the average price increase by 1 dollar, the average price of hotels increases almost 50 cents. This is interesting as it indicates an upward sloping response curve and thus Bertrand competition.

An increase in the number of hotel rooms has a negative effect on price. To be specific as the number of rooms increases by 1, the price decreases by 0.002 dollars. This figure may seem irrelevant at first, but considering the fact that Las Vegas had 14,600 new rooms in the planning phase in 2013, prices could decrease by 29.2 dollars over the upcoming years (Garrido, 2013). A revenue drop of over 10 percent from 2013 hotel prices.

Big event is defined as an uncommonly large and relatively lengthy event and has an effect on the average rate charged in cities, increasing it by 9.216 dollars. This price increase could be expected thanks to the great additional influx of demand for that period.

GDP per capita also has a positive effect increasing. A 1 dollar increase in GDP per capita increases hotel rates by 0.004. The sign once more is as expected, it also relates to the theory. Mentioned above, domestic tourism is potentially a large part of tourism, hence a GDP increase is also likely to have an effect on the consumer's willingness to spend, including hotel expenditures.

As expected the cumulative number of reviews also helps explain hotel prices. What wasn't expected however, was the sign. Every additional review adds 0.006 dollars to hotel prices, a price which could rapidly increase considering the growth of Airbnb. Future research should create a log variable of cumulative reviews. This would allow the effect to be shows as a percentage. We would a price decrease as the cumulative number of reviews increases as this would indicate that Airbnb was getting more popular. The fact that there is a positive relationship is odd. Perhaps it indicates that hotels are adapting their strategies and are diversifying as Airbnb grows. Potentially moving into higher segments of the market to avoid fiercer competition. Otherwise, it may be as a result of the growing tourism industry. Holidays are becoming increasingly affordable for a larger range of income groups. Airbnb growth and price rises could be correlated to this growth leading to such a result. Undoubtedly an interesting topic for future research.

New listings of Airbnb was not significant. This indicates that the growth of Airbnb has no influence on hotel prices. This finding is against are expectations and after finding a positive relationship with cumulative number of reviews calls for a careful inspection of our third hypothesis.

Occupancy was also insignificant. A strange finding which could potentially be explained by the fact we removed seasonality from our model. This has result in off-season months being combined with in-season months which will differ across cities and thus have different effects. Once monthly data on Airbnb can be collected, this could hopefully be corrected for.

Lastly, the presence of a crisis in a country had no significant effect on hotel prices. A potential reason for this is that families who go on holiday are often wealthier, thereby being less effected by the crisis. Another potential reasons is that a lot of these cities are the nation’s capital. A lot of room stays may be business related which would occur regardless of the state of the economy.

If we analyse the effects from a welfare perspective, consumer welfare can be expected to increase, although this is conditional on the average price per person in Airbnb. Assuming that Airbnb continues to grow as it has since its introduction, a large supply associated with an efficient feedback system is sure to keep Airbnb prices competitive either through price or quality. We may even see Airbnb accommodations diversifying over the years to come to attract more consumers and more positive reviews.

8.3 Concerning our hypotheses

There were two hypothesis, our main hypothesis and a sub-hypothesis:

> *Hypothesis A: An increased usage of Airbnb for a particular city, has a negative effect on the hotel prices for that particular city.*
>
> *Hypothesis B: The new market is characterized by Bertrand competition. Upward sloping response curves indicating a positive relationship between hotel and Airbnb prices.*

The first was related to the overall effect of Airbnb presence on the hotel markets. Whether a large platform could really alter an existing market. The results suggest this is not so meaning we have to reject our main hypothesis. Growth of Airbnb listings was insignificant and the cumulative listings though significant, actually had a positive effect on hotel prices. This indicates that hotels do not see a potential threat in the size of a Airbnb platform. A potential explanation is the growth in the global tourism industry as mentioned earlier. This indication shows that when estimating the effects of destructive platforms, one risks seriously over-estimating the results of these platforms when using growth.

Our second hypothesis looked at the particular style of competition present in the accommodation industry. We see that there is a positive relationship between Airbnb prices and hotel prices. This indicates upward sloping response functions, meaning Bertrand price competition and a confirmation of *Hypothesis B*. As the average price of Airbnb decreases, hotels will respond by also decreasing their prices. This could also be an explanation, as to why the quantity supply in the industry has no effect on hotel prices, this would be more typical to Cournot quantity competition.

To summarize, there appear to be effects as a cause of Airbnb, but not from all the expected channels. Size of Airbnb does not matter for the price of hotels. A very large Airbnb platform actually increased hotel prices. The average price per person on Airbnb however, does have a significant negative effect on prices.

8.4 Implication for destructive platforms and their original industries

The above evidence provides new insights as to the effects of destructive platforms and the existing industries they enter. The results clearly indicate that not all variables move in the same direction. Platform growth has a surprising insignificant effect showing that existing markets to do fear to be replaced. At least hotels, do not respond aggressively to the existence of Airbnb, which will likely be similar for other industries. As the total use of the platform increases, prices are actually increased. A potential explanation being the increase in service by the existing market in an attempt to diversify for the relatively simple service the platform provides.

Average price per person is important. The present industry and the entering platform do appear to be substitutes with a relatively high price elasticity. Those who target the budget segment in the existing market may find it more difficult after the introduction of a destructive platform.

9. Conclusion

The aim of this paper is to look at how existing markets are effected as platforms enter. We first derive an improved definition of a platform in general specifying 4 key characteristics. The first is network externalities. The value of a platform to one side of the intermediary is directly dependent on the size of the other side. Our next two condition are that they enable interaction, but that they in no way are part of the transaction. This remains exclusively with both ends of the platform. Finally we specify a platform as independently pricing both sides of the platform. Realizing this general definition was inadequate, platforms were divided into creational, complementary and destructive, each having its own market characteristic, pricing strategies and welfare effects.

Having established a theoretical background on platforms, an empirical analysis was set up to analysis the effects of destructive effects in particular. The reason for studying destructive platforms is that their effects seem to be most significant. They enter existing markets and through increased efficiency, could restructure the market completely. Individuals are now both supplier and consumer and this poses a threat to the existing market whose services are threatened to be replaced. As a result, these platforms have received considerable opposition although some leaders such as Henk Kamp have also acknowledged the benefits.

Using evidence on Airbnb and the hotel industry, we predict the corresponding effect using a fixed effects model. We find that platform growth is insignificant to hotel prices, but that cumulative reviews, had a positive effect on hotel prices. This indicates that the existing industry feels no threat by the overall size of a platform. Besides platform size, we find evidence that the average price per person significantly explains hotel prices. As the average price per person on Airbnb decreases by one dollar, average hotel prices in that city decrease by 0.496 dollars. This implies that current markets should consider the platforms as threatening and should consider either price decreases themselves or attempt diversification.

References

AD.NL (2015) Minister Kamp: Uber hoort erbij en is niet te negeren. *Retrieved from:* http://www.ad.nl/ad/nl/1012/Nederland/article/detail/3920672/2015/03/22/Minister-Kamp-Uber-hoort-erbij-en-is-niet-te-negeren.dhtml

Airbnb. (2015). *Hoe Verwerkt Airbnb Betalingen?* Retrieved from Airbnb: https://www.airbnb.nl/support/article/51

Airbnb. (2015). *Over Ons*. Retrieved from Aribnb: https://www.airbnb.nl/about/about-us

Armstrong, M. (2006). Competition in two-sided Markets. *Journal of Economics Vol. 37, N. 3*, 668-691.

Ascolli, A., Scamoni, C., de Lezo, A., de Lezo, S., Lefebre, F., Mckenna, C., . . . Heimz, R.-R. (2007). *CMS Guide to Principle Hotel-Specific Laws in Europe.*

Balaguer, J., & Pernias, J. C. (2013). Relationship Between Spatial Agglomeration and Hotel Prices. Evidence from Business and Tourism Consumers. *Tourism Management. Vol 36*, 391-400.

Brustein, J. (2014). *Uber's Fare War on New York Taxi Puts Million-Dollar Medallions at Risk*. Retrieved from Bloomberg Business: http://www.bloomberg.com/bw/articles/2014-07-07/ubers-fare-war-on-new-york-taxis-puts-million-dollar-medallions-at-risk

Caillaud, B., & Jullien, B. (2003). Chicken and Egg: competition among intermediation service providers. *Journal of Economics. Vol 34, N.2*, 309-328.

Collinson, P. (2013). *Retailers vs Mastercard and Visa in battle of the fees*. Retrieved from theguardian: http://www.theguardian.com/money/blog/2013/may/25/retailers-mastercard-visa-fees

Deutscher Tourismusverband e.V. (2013). *2012*. Retrieved from Zahlen-Daten-Fakten: http://www.deutschertourismusverband.de/fileadmin/Mediendatenbank/PDFs/Zahlen_Daten_Fakten_2012_aktuell.pdf

Drukker, D. M. (2003). Testing for serial correlation in inear panel-data models. *The Stata Journal*, 3 N.2 p168-177.

Fremstad, A. (2014). Gains From Sharing: Sticky Norms, Endogenous Preferences and the Economics of Shareable Goods. *Working Paper, University of Massachusetts Amherst*.

Garrido, R. (2013). *Top Ten U.S. Cities by Hotel Rooms.* Retrieved from Loyalty Traveler: http://loyaltytraveler.boardingarea.com/2013/10/09/top-ten-u-s-cities-by-hotel-rooms/

Hagiu, A. (2006). Proprietary vs Open and Two-sided Platform and Sociol Efficiency.

Hagiu, A., & Wright, J. (2015). Multi-Sided Platforms. *International Journal of Industrial Organization*.

Hausman, J. A., & Wise, D. A. (1979). Stratification on Endogenous Variables and Estimation: The Gary Income Maintenance Experiment. *Econometrics. Vol. 47, No 2*, 455-474.

Helpling. (2015). *Boek Gemakkelijk een Schoonmaakhulp uit uw buurt*. Retrieved from Helpling: https://www.helpling.nl/zo-werkt-helpling

Hsiao, C. (2003). Analysis of Panel Data. In H. Cheng, *Analysis of Panel Data* (p. 12). Cambridge: CAMBRIDGE UNIVERSITY PRESS.

International Card Services (ICS). (2015). *Overzicht Producten*. Retrieved from International Card Services: https://www.icscards.nl/ics/producten/overzicht-cards#

Kroft, K., & Pope, K. G. (2012). Does Online Search Crowd Out Traditional Search and Improve Matching Efficiency? Evidence from Craigslist.

Lewis, G., & Wang, A. (2013). Who benefits from improved search in platform markets?

Lynch, J. G., & Ariely, D. (2000). Wine Online: Search Costs Effect Competition on Price, Quality and Distribution. *Marketing Science. Vol. 19. N. 1*, 83-103.

New York Times. (2015). Where Americans Will be Heading in 2015. *New York Times*, p. TR2.

Rijksoverheid. (2015). *Wat zijn de tarieven voor een taxi*. Retrieved from Rijksoverheid: http://www.rijksoverheid.nl/onderwerpen/taxi/vraag-en-antwoord/wat-zijn-de-kosten-voor-een-taxi.html

Rochet, J.-C., & Tirole, J. (2006). Two Sided Markets: Where we Stand. *Rand Journal of Economics: Vol. 37, N.3*, 645-666.

Rochet, J.-C., & Tirole, J. (2006). Two-sided Markets: Where we stand. *Journal of Economics, Vol. 37, Issue 3*, 645-667.

Romer, D. (2012). *Advanced Macroeconomics, fourth edition.* New York: McGraw-Hill.

Rysman, M. (2009). The Economics of Two-Sided Markets. *Journal of Economic Perspectives. Vol. 23. N. 3*, 125-143.

Salmon, F. (2013). *Why Cab Drivers Should Love Uber*. Retrieved from Reuters: http://blogs.reuters.com/felix-salmon/2013/12/11/why-cab-drivers-should-love-uber/

Seamans, R., & Zhu, F. (2013). Responses to Entry in Multi-Sided Markets: The Impact of Craigslist on Local Newspapers.

stata.com. (n.a.). hausman specification test. Retrieved from http://www.stata.com/manuals13/rhausman.pdf

stata.com. (n.a.,b). SUEST - seemingly unrelated estimation. Retrieved from http://www.stata.com/manuals13/rsuest.pdf

Stigler, G. J. (1961). The economics of Information. *The Journal of Political Economy. Vol 69 Issue 3*, 213-225.

STM events. (2015). *Olympics 2012 in London*. Retrieved from STM events: http://www.stmevents.com/london_olympics_2012.html

STR Global. (2015). *About*. Retrieved from STR Global: https://www.strglobal.com/about

Teffer, P. (2014). *Bad Week in Europe for Uber*. Retrieved from euobserver: https://euobserver.com/regions/126900

Torres-Reyna, O. (2007). Panel Data Analysis Fixed and Random Effects Using Stata. Princeton, United States. Retrieved from http://www.princeton.edu/~otorres/Panel101.pdf

Transport for London. (2015). *Apply for a Taxi Driver Liscence*. Retrieved from Transport for London: https://www.tfl.gov.uk/info-for/taxis-and-private-hire/become-a-taxi-licensee/apply-for-a-taxi-driver-licence

Uber. (2013). *UPDATED: UberX Price Cut And Its Impact On Drivers*. Retrieved from Uber: http://newsroom.uber.com/boston/2013/10/uberx-price-cut-increases-rider-demand-and-driver-earnings/

Uber. (2015). *Amsterdam, Uberpop*. Retrieved from Uber: https://www.uber.com/cities/amsterdam

Uber. (2015). *De Kleine Lettertjes*. Retrieved from Uber: https://www.uber.com/cities/new-york

Uber. (2015). *Hoe boek je een rit*. Retrieved from Uber: https://www.uber.com/nl/features

Weyl, G. E. (2009). A Price Theory of Multi-Sided Platforms. *The American Economic Review*.

Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data.* Cambridge, Massachusetts: The MIT Press.

Yahoo Finance. (2015). *Medallion Financial Corp (TAXI)*. Retrieved from Yahoo Finance: http://finance.yahoo.com/echarts?s=TAXI+Interactive#{"customRangeStart":1104534000,"customRangeEnd":1420066800,"range":"custom"}

Yannis, B. (1998). The Emerging Role of Electronic Market Places on the Internet. *Communications of the ACM, Vol. 41, N. 8*.

Zervas, G., Proserpio, D., & Byers, J. W. (2014). The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry.

Zhu, F., & Lansiti, M. (2012). Entry Into Platform Based Markets. *Strategic Management Journal, 33*, 88-106.

Zoku Loft. (2015, June 10). *Services, We Aim to Please*. Retrieved from Zoku Loft: http://livezoku.com/zoku-loft/

Appendix

Figure 1, Typical Airbnb listing

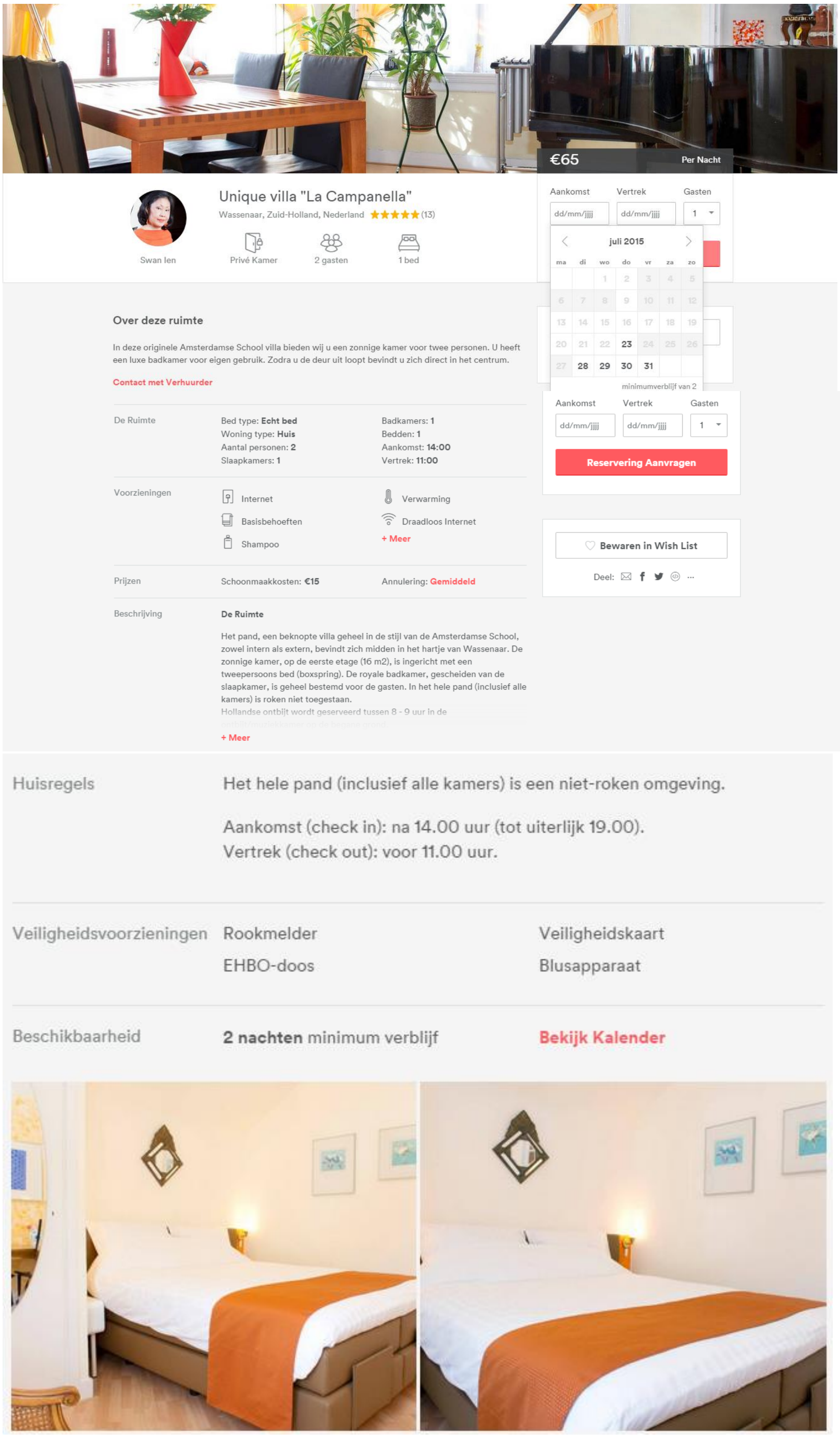
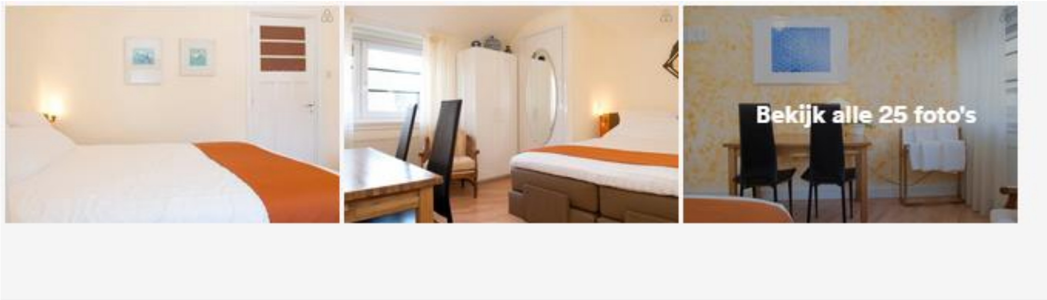


figure 1 continued.



13 Recensies ★★★★★

Samenvatting

Nauwkeurigheid	★★★★½	Locatie	★★★★★
Communicatie	★★★★★	Check-in	★★★★★
Schoon?	★★★★★	Waarde	★★★★½

Jolinde

Ons bezoek aan La Campanella was de eerste keer dat wij via Airbnb ergens verbleven. Swan Ien was heel vriendelijk en hielp ons bijvoorbeeld ook op weg v.w.b. parkeergelegenheden en voorzieningen in Wassenaar. De kamer en badkamer waren heel schoon en fris. En het ontbijt was heerlijk! Absoluut een aanrader.

Table 1, Hotel prices.

City/Year	2015	2014	2013	2012	2011	2010	2009
Amsterdam	206,58	196,11	185,64	201,82	176,70	177,68	224,43
Athens	.	.	.	.	.	.	.
Barcelona	167,65	167,51	157,22	169,15	156,32	161,44	208,37
Berlin	126,30	125,48	122,86	128,93	125,68	124,65	142,29
Copenhagen	187,49	160,61	135,99	140,66	128,23	157,90	175,81
Dublin	145,39	134,96	123,40	127,12	116,92	135,44	177,13
London	207,78	186,96	189,98	189,58	171,88	161,44	202,89
Madrid	127,36	121,87	125,61	142,09	134,09	144,61	188,75
Paris	394,38	396,37	373,81	388,27	326,46	331,19	395,54
Rome	229,32	226,29	213,82	222,01	204,83	225,86	263,39
Venice	382,30	389,62	337,30	364,63	304,07	334,01	405,19
Vienna	142,85	141,59	141,17	145,16	129,25	141,61	168,02
New York	115,92	108,75	106,78	103,17	98,17	99,12	134,64
San Francisco	230,22	207,46	189,28	172,15	148,89	145,40	172,08
Las Vegas	289,15	283,50	274,72	267,58	253,95	234,92	305,48
Average	210,91	203,36	191,26	197,31	176,82	183,95	226,00

Table 2, Average Airbnb per person prices

City/Year	2015	2014	2013	2012	2011	2010	2009	2008
Amsterdam	49,50	48,05	48,88	50,66	60,60	52,75	77,50	.
Athens	18,60	18,49	19,01	19,69	17,59	13,20	.	.
Barcelona	26,78	27,13	22,18	23,36	25,22	22,50	.	.
Berline	25,07	25,38	31,86	18,23	17,71	5,00	.	.
Copenhagen	37,26	37,58	34,65	34,44	37,01	33,66	.	.
Dublin	35,18	35,14	34,93	34,30	29,32	33,33	35,83	.
London	56,87	57,31	56,28	48,70	45,25	23,25	.	.
Madrid	22,07	21,85	22,31	22,09	16,44	.	.	.
Paris	40,06	41,65	45,91	50,74	80,20	43,00	25,00	.
Rome	30,22	30,52	30,42	30,58	20,87	.	.	.
Venice	39,94	40,28	36,78	37,27	38,35	36,13	50,00	.
Vienna	24,81	25,11	26,56	26,30	22,73	15,94	.	.
New York	59,68	59,52	62,79	67,55	59,88	65,38	56,25	.
San Francisco	66,42	67,80	75,25	79,37	84,20	52,99	.	.
Las Vegas	27,35	26,63	24,17	22,92	27,36	23,25	.	.

Table 3, Average number of reviews

City/Year	2015	2014	2013	2012	2011	2010	2009	2008
Amsterdam	13	26	14	17	6	3	1	0
Athens	21	17	8	10	20	4	0	0
Barcelona	17	23	12	20	6	2	0	0
Berlin	18	15	27	13	6	1	0	0
Copenhagen	22	29	16	7	2	4	0	0
Dublin	14	32	17	7	7	1	2	0
London	26	22	15	10	6	1	0	0
Madrid	10	31	20	14	5	0	0	0
Paris	20	32	18	6	2	1	1	0
Rome	22	25	9	14	10	0	0	0
Venice	10	14	23	18	13	1	1	0
Vienna	14	21	12	7	24	2	0	0
New York	18	22	11	14	8	3	4	0
San Francisco	8	27	25	11	4	5	0	0
Las Vegas	13	17	13	17	6	14	0	0

Table 4 Hausman test, invalid results

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	Coefficients			
newlistings	.14512	.1294435	.0156765	.
aver~pairbnb	.4958728	.5043214	-.0084485	.
hotelrooms	-.0023203	-.000816	-.0015043	.0004782
olympicseu~p	9.215553	7.273894	1.941659	.
gdppercapi~t	.0038645	.0020419	.0018226	.0004
occupancy	172.8376	183.4191	-10.58152	.
crisisyears	-2.05533	-4.633231	2.577901	.
cumulative~s	.0062368	.0049876	.0012493	.

```
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =     -6.00    chi2<0 ==> model fitted on these
                                         data fails to meet the asymptotic
                                         assumptions of the Hausman test;
                                         see suest for a generalized test
```

Table 5, Hausman test, results forced to be positive

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	Coefficients			
newlistings	.14512	.1294435	.0156765	.0320619
aver~pairbnb	.4958728	.5043214	-.0084485	.0286509
hotelrooms	-.0023203	-.000816	-.0015043	.0005418
olympicseu~p	9.215553	7.273894	1.941659	.7240065
gdppercapi~t	.0038645	.0020419	.0018226	.000586
occupancy	172.8376	183.4191	-10.58152	10.60056
crisisyears	-2.05533	-4.633231	2.577901	.9093805
cumulative~s	.0062368	.0049876	.0012493	.0004764

```
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        9.98
                Prob>chi2 =      0.0759
```

Table 6, Testing for heteroskedasticity

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (14)  =      923.06
Prob>chi2 =      0.0000
```

Table 7, Wooldridge test for autocorrelation in panel data

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      13) =      1.619
           Prob > F =      0.2255
```

Table 8. Testing for unit root

```
Levin-Lin-Chu unit-root test for averagerate
--------------------------------------------
Ho: Panels contain unit roots              Number of panels  =     14
Ha: Panels are stationary                  Number of periods =      7

AR parameter: Common                       Asymptotics: N/T -> 0
Panel means:  Included
Time trend:   Not included

ADF regressions: 1 lag
LR variance:     Bartlett kernel, 6.00 lags average (chosen by LLC)
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 Unadjusted t        -5.5910
 Adjusted t*         -2.5193        0.0059
------------------------------------------------------------------------------
```

Table 9, F-test

```
. test $xlist

 ( 1)  newlistings = 0
 ( 2)  averagecumulativepriceppairbnb = 0
 ( 3)  hotelrooms = 0
 ( 4)  olympicseuropacup = 0
 ( 5)  gdppercapitahost = 0
 ( 6)  occupancy = 0
 ( 7)  crisisyears = 0
 ( 8)  cumulativereviews = 0
       Constraint 5 dropped

       F(  7,    13) =    8.80
            Prob > F =    0.0005
```