An agent-based modelling approach to housing market regulations and Airbnb-induced tourism

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ABSTRACT

Airbnb has shown constant growth and it provides income and taxes to tourist destinations. However, the prevalence of a substantial number of Airbnb providers in tourist destinations may lead to bottlenecks in rental housing markets. Regional planners and policy-makers across the world are therefore imposing restrictions to regulate this hitherto unregulated business model. The present paper sheds light on the link between housing-market regulation and the growth of Airbnb, based upon Norwegian Airbnb listings and agent-based modelling. The simulation results suggest that Airbnb's current growth will not simply flatten out when the supply matches the demand, but will be followed by a series of sudden crises and subsequent quick recoveries. These instabilities will put stress on local rental markets and threaten both the local tourism industry and rental housing markets. Moderate taxation may contribute to a more even distribution of Airbnb listings in Norway, notably across the urban space.

1. Introduction

Online peer-to-peer accommodation services have grown impressively in the past few years, and the emergence of the web-based platform Airbnb is the main reason for this growth. Founded in 2007/2008 as an initiative by former graduate students to offer a low-cost alternative to conference hotels in the U.S. city of San Francisco, Airbnb has by now developed into the strongest rival for the global lodging industry (Guttentag, 2015; Oskam & Boswijk, 2016). The success story of the company's business model, which has inspired other business start-ups in the sharing economy (for example, the French *Nightswapping* or the Spanish *Badi*), can partially be traced back to a void in terms of a lack of regulation which facilitates a seemingly unlimited growth of the Airbnb-induced informal lodging sector (Dogru, Mody, & Suess, 2019; Guttentag, 2015).

In fact, Airbnb's business model has important consequences for the local housing markets and the local economy on several levels: first, the presence of Airbnb letters or leasers alters the provision of informal and short-term accommodation in a given municipality or city, but it also affects the long-term development of local housing markets, as the example of Los Angeles highlights (Lee, 2016). Second, and following from this, the rise of Airbnb with the growth of short-term housing

providers using this platform represents a double-edged sword for cities and municipalities: on the one hand, tourists, as the main consumers of these services, bring additional income to the municipalities, through taxes and consumption expenditures, as well as to individual home-owners, through rental payments, which is a positive partial effect. In particular, the extra income generated by letting housing space to Airbnb customers alleviates high housing prices by increasing the income of residents and making them able to stay in their houses longer (Kaplan & Nadler, 2015). On the other hand, as a negative effect, the examples of Berlin and Barcelona show that the number of properties rented out on a peer-to-peer base via Airbnb can grow so considerably that the public authorities are forced to impose restrictions in order to stabilise rental housing markets in the municipalities and safeguard affordable rental opportunities for permanent residents. Notably, large tourist destinations are experiencing the phenomenon that Airbnb renting is also spreading from the city centre, *i.e.*, the core of the tourist destination, to neighbouring residential areas, thereby crowding out the demand of regular long-term rental homes (Gurran & Phibbs, 2017). Given these negative effects, the inherent instability that an unregulated Airbnb-based tourism market generates may threaten not only the traditional tourist providers in a municipality or city, but also the local real estate and rental markets.

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Motivated by a gap on the issues of the regulation of Airbnb and the housing market effects in the existing literature, this paper focuses on the impact of the regulation of Airbnb on local housing markets. Although case-based evidence stresses the need for regulation (Lee, 2016; Wegmann & Jiao, 2017), there is a lack of empirical literature addressing the various types of governmental and municipal restrictions and their respective impact on tourist destinations regarding Airbnb. In practice, the policy measures implemented to date to regulate Airbnb seem to represent more of a trial-and-error approach than a structured political strategy. This is because the business models associated with sharing economic activities do not all fit into the existing public regulation schemes and policies (Interian, 2016). Moreover, while peer-to-peer accommodation platforms continue to grow without interruption all over the world, virtually nothing is known about when or why this growth will flatten out. In particular, there is a lack of cases that give evidence about when Airbnb's growth is expected to flatten out in the long run. Thus, investigating different regulatory measures and their specific impact on Airbnb's growth over time can contribute to a more informed policy approach.

In the light of the above-stated lack of literature and consistency in policies, the present paper uses an agent-based computer-simulated approach to predict the future development of Airbnb as an online peer-to-peer platform. It addresses the following research question: *How can the growth dynamics of Airbnb be predicted with or without policy interventions (e.g., taxes raised by municipalities or temporal restrictions on renting)?* Based upon a historical data series on Airbnb listings in Norwegian municipalities, agent-based modelling (ABM) simulations are conducted, which include both time-based restrictions and taxation. Hence, the results are grounded in a close match between real-world data and model outputs which will be validated against real data. We focus on the supply of Airbnb units in the models in this paper and treat the demand as exogenous.

The simulation results suggest that, while moderate taxation may have a stabilising effect on the market of peer-to-peer accommodation, time-based restrictions have a potential to render crises in the local tourism and housing market even more disruptive. As opposed to an unregulated market scenario and time-based restrictions, taxation may potentially contribute to a more even distribution of Airbnb listings over time, notably across the urban space.

The paper contributes to the existing literature in the following ways: first, it amends the empirical literature on online peer-to-peer accommodation and its effects on local housing markets (Barron, Kung, & Proserpio, 2018; Guttentag, 2015; Oskam & Boswijk, 2016). It does so by offering a theoretically-grounded explanation of the policy interventions which are being discussed and implemented in the unregulated market segment of the tourism sector (Edelman & Geradin, 2015; Gurran & Phibbs, 2017) and a model for the short- and long-term rental market. The paper therefore responds to the fact that research on Airbnb's business model and its sustainability is not adequately developed to date (see, for example, Leung, Xue, & Wen, 2019). Second, it uses ABM as a technically- and conceptually-rich technique to simulate future developments for tourism. Hence, we take up the agenda evoked by Nicholls, Amelung, and Student (2017, p. 4) "*to introduce ABM to a wider tourism audience*". Altogether, the present paper extends the recent debates on cities which are discussing policy measures to regulate Airbnb, such as Los Angeles (CBS Los Angeles, 2018; Lee, 2016), or have recently introduced them, like Berlin (Ksienrzyk, 2018).

The paper is organised as follows. Section 2 introduces Airbnb's business model and its regulation, which will be followed by Section 3, which presents the theoretical model. Afterwards, the ABM simulation and its empirical results will be presented in Section 4. The subsequent section 5 first discusses these results and then gives a conclusion. Finally, Section 6 presents an outlook on future research, the limitations of the paper, as well as some implications for policy-makers and other stakeholders.

2. Regulation of Airbnb – background and experiences

2.1. Airbnb and its business model

According to Botsman and Rogers (2010, pp. 159–160), the sharing economy is broadly defined as "*traditional sharing, bartering, lending, trading, renting, gifting, and swapping, redefined through technology and peer communities*". The sharing economy involves providers and consumers of goods and services, as well as platforms. Platforms are defined as websites and apps that "*enable, facilitate and mediate exchanges and sharing between peers to create alternate and stable marketplaces*" (De Rivera, Gordo, Cassidy, & Apesteguia, 2017, p. 12).

Airbnb's business model consists of the provision of an online peer-to-peer marketplace which can be accessed by a website. It connects travellers and hosts with physical space(s) (for example, and most commonly, rooms, apartments, and houses) to let out. The hosts can set up the conditions and rules for letting their property (such as the duration of a rental contract) and take the decisions on rental contracts after the travellers have made their bookings. They can also determine the price that they want but can obtain recommendations and help from Airbnb hosts upon request. Experienced and distinguished hosts are showcased by Airbnb as "superhosts". Airbnb earns money based upon two different types of commission: a flat commission paid by the hosts for the usage of Airbnb's platform for their letting of their space, and a commission on every payment made by travellers booking with Airbnb. With this business model, which allows private households to offer accommodation to tourists, the company has grown into a serious competitor for the local lodging industry (Oskam & Boswijk, 2016). Importantly, most housing offered via Airbnb is space that has not been rented out before (see Guttentag, 2015).

2.2. Regulation of Airbnb

Writing about the challenges of regulating businesses in the sharing economy, Interian (2016, p. 131) states that "*the sharing concept erodes disinterested public regulation by either substituting it for private regulation or leaving a void of no regulatory oversight*". Indeed, the emergence of Airbnb was accompanied by an initial period of non-regulation, called a "*honeymoon*" by Codagnone and Martens (2016). However, individual cities such as Amsterdam started to impose regulation quite early on (Rachordas, 2015). The regulatory measures and initiatives imposed on Airbnb differ widely, ranging from taxation (*e.g.*, London), to licences or permission issued by the city or regional parliaments (*e.g.*, Barcelona and Berlin), to fines for non-registered Airbnb listings, to limitations on the rental days for listings (*e.g.*, Amsterdam), and even to classifying listings as illegal (Tun, 2018). To impose such measures, housing lettings are classified according to their primary use, for example, in main or principal *versus* accessory or secondary residences (Gurran, Searle, & Phibbs, 2018). A popular measure is that of establishing a limitation to the letting duration allowed, which, for example, the city administration of Los Angeles, U.S., has just approved (Daniels, 2018) and which European cities, such as Amsterdam, had introduced earlier (Tun, 2018). Generally, the regulatory initiatives taken to date are softer compared, for example, to those taken for the Uber car-sharing service, which faces bans in some cities or countries.

The economic logic behind the regulation of the sharing economy is that different groups of stakeholders in the markets and their interests should be shielded in order to maintain market efficiency, protect consumer and labour rights, and ensure fair competition in the marketplace (Gurran et al., 2018; Koopman, Mitchell, & Thierer, 2015; Lee, 2016). Edelman and Geradin (2015) plead for a general regulation of businesses such as Airbnb because a regulatory framework would safeguard consumer rights while simultaneously opening up the opportunities to reap the efficiencies of such business models. They put forward changes in the neighbourhood and the risk of "gentrification through Airbnb" (Wachsmuth & Weisler, 2018) as the short-term risks of an unregulated