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Rethinking the platform-mediated short-term rental market:

a study of Airbnb activity across London neighbourhoods

BPLN0008 Dissertation in City Planning

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Being a dissertation submitted to the faculty of The Built Environment as part of the requirements for the award of the MPlan City Planning at University College London: I declare that this dissertation is entirely my own work and that ideas, data and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

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Table of Contents

LIST of FIGURES

LIST of TABLES

ABSTRACT

Airbnb as a virtual platform has added onto the urban environment a digital layer, where individuals exert impacts on the private rental market through exchanging both the digital image and physical properties of a place. This network of trade heavily relies on interactions between digital and physical dimensions. Moreover, these digitally-mediated exchanges have affected the functions of residential properties and the functioning of planning sectors.

This study thus suggests the importance of a multi-scalar consideration, which can unpack the interactions between digital and physical dimensions of the Airbnb market. By contextualising the issues of Airbnb-mediated STR within the London context, it explores how Airbnb integrates both dimensions to the private rental market and how individuals use such innovative technology to make a profit.

The explanatory sequential mix-methods design is applied to develop the qualitative research building upon the findings from the quantitative investigation. The qualitative findings reveal that when hit by a global pandemic, Airbnb activity in different urban neighbourhoods exhibit divergent behaviours in the pattern of change in the revenue and number of listings. The decision was made to conduct field research in three of areas where activities remain persistent relative to the larger trend, and interview the local conventional letting agents, as they would be the first to notice the impacts on the long-term conventional rental market.

Seen through an inter-connected multi-scalar lens, this study displays an interpretative framework for Airbnb-mediated market interactions in London. It demonstrates that the city-wide spatial unevenness only presents a physical arrangement of digitally-mediated activity, but the underlying dynamic is the digitally reshaped/reproduced urban environment. As for the planning sector, this implies a new field of regulatory interest where local urban space is not only influenced by conventional, physical development but also the more subtle, digital 're-imaging' of existing properties.

1. INTRODUCTION

The global growth of a platform-mediated use of urban residential space is changing the ways in which the private housing market has been planned for accommodating local needs (Ferreri and Sanyal, 2018). Airbnb as the most prevalent platform for Short-term rental (STR) opens up space where residential units are exchangeable in a short period of time. It not only mediates the exchange of housing resources on the digital space but also functions as an instrument for "entrepreneurial landlords and speculative investors" to profit from the STR market (Grisdale, 2019: 21). As such, exchanges that take place in a virtual marketplace created by Airbnb are restructuring a new pattern centred on the commercialisation of urban accommodation (Artioli, 2018).

As one of the most popular Airbnb markets around the globe, London is undoubtedly being affected by the expansion of the STR submarket. A recent study in London suggests that more than two per cent of private housing stock in London has been converted into STR use on the Airbnb platform, and in some areas, this percentage can be up to seven per cent (Shabrina, Arcaute and Batty, 2021). More importantly, there is a positive correlation between multi-family buildings and Airbnb listings, and a range of possible outcomes on the local housing market, including an eight per cent rise in the private rental price per week (ibid).

Barcelona and New York city present similar cases to London. In Barcelona, the rental prices of urban areas popular with Airbnb visitors are rising up to seven per cent (Garcia-López et al., 2019). Sheppard and Udell (2016) report that the Airbnb market also has an influence on property value in New York, which has increased by about six per cent over their research period. Unlike most other cities, which have not had regulation on STR, London and New York have been regulating the use of residential properties even before the rise of digital platforms (Crommelin et al., 2018; Ferreri and Sanyal, 2018). New York has a land-use policy with a clear legal definition for what type of dwellings can be adapted for STR use (Crommelin et al., 2018). And until 2016, STR use of residential properties was fully banned in London. (Ferreri and Sanyal, 2018)

In 2016 the UK government lifted the ban through the Deregulation Act 2016 as a response to the proliferation of platform-mediated STR activity in London in order to boost the new market (Ferreri and Sanyal, 2018). This

market-oriented regulation simply encourages individuals to use their under-utilised properties for STR (Stabrowski, 2017), instead of assessing the implications of platform-mediated activity on multiple policy sectors (i.e., housing and tourism) (Aguilera, Artioli and Colomb, 2019). One limitation has been put in place: residential properties (C3 use class) in London may only be used as STR units for a maximum of 90 nights in any one calendar year (Simcock and Smith, 2016). Planning permission is required if a property owner permanently changes the use to accommodate non-local visitors as a serviced apartment or hotel (C1 use class) (ibid).

Although the deregulation still protects long-term rental residents through the 90-day restriction, doubts have been cast on its effectiveness (Ferreri and Sanyal, 2018; Holman, Mossa and Pani, 2018; Shabrina, Arcaute and Batty, 2021). For London planning authorities, the investigation to track down a breach of the 90-days rule normally involves data scraping and door-to-door survey, an unnecessarily labour-intensive and time-consuming exercise (Ferreri and Sanyal, 2018). This manual work is needed owing to the operations of private corporates on a digital layer, which limits public access to information and adds complexity to city governance. (ibid).

1.1. Digital platform and city planning

The development of advanced digital platforms such as Airbnb has redefined the boundaries for what is deemed formal use of residential properties (Kim *et al.*, 2019). It encourages the previously informal activity like STR through the digital space and opens new virtual networks for people to explore the STR market (ibid). With the increasing complexity of digital infrastructure, conventional city planning approaches experience growing difficulty with monitoring digitally-mediated activities (Ferreri and Sanyal, 2018; Aguilera, Artioli and Colomb, 2019). In London, studies have shown that Airbnb exerts an influence on the rental price for long-term residents, and is taking over parts of urban accommodation (Shabrina, Arcaute and Batty, 2021).

The relaxation of STR regulation unlocks this new revenue stream by means of stimulating more economic activity at an individual level (ibid). Deregulation causes the rapid expansion of the Airbnb market and results in shrinking access to residential units (Ferreri and Sanyal, 2018; Holman, Mossa and Pani, 2018). The London housing market meanwhile faces substantial challenges such as the constraint posed by land supply (Holman, Fernandez-arrigoitia and Whitehead, 2015). The planning difficulty of managing the STR is due to the fact that

most Airbnb listings belong to both the conventional housing sector and the digital-mediated sharing sector (Artioli, 2018). This can be seen as an individual-level adaptation optimizing their benefits by embracing the new market (ibid).

The planning sector in England relies on its discretionary plan-led system, which adds flexibility to the planning process that intends to balance the local economic development and public interest (Holman, Mossa and Pani, 2018; Kim *et al.*, 2019). In a deregulated environment, the planning sector is now being gradually deprived of the agency in preventing market exploitation of residential units (Friedman, 2009). On a practical level, authorities with shrinking funding and human resources have difficulties enforcing the loosened regulation for STR activity (Ferreri and Sanyal, 2018). The lack of a systematic framework compounds this problem where methods of different planning authorities vary from each other without clear criteria (Ferreri and Sanyal, 2018).

Therefore, some proponents of platform economy suggest that city government can move toward a "light-touch framework" that relies on data mining to provide information (Stephany, 2015: p. 178). On the surface, data access to the individual level could enhance the monitoring and evaluation of STR activity (Ferreri and Sanyal, 2018; Holman, Mossa and Pani, 2018; Kim *et al.*, 2019). However, the UK government and planning authorities "without advanced computing infrastructure or access to the original algorithms" are more likely to depend on the service and data provided by private digital corporates (Morozov and Bria, 2018, p.23). Particularly as fiscal austerity ensues, an insufficient amount of resources may lead to a desire of using digital companies' proposals for dealing with urban matters (Ferreri and Sanyal, 2018).

As the digital platform like Airbnb has attached "citizen" to "consumer" and "city planning" to "corporate solution", there is a need to rethink the application of the urban digital infrastructure provided by "for-profit platform economy giants" (Kim *et al.*, 2019: p.281). More importantly, reaching a deeper understanding of the implications of Airbnb-mediated STR market requires a broader consideration of its activity on both digital and physical dimensions (Artioli, 2018). As Airbnb provides the virtual space for individuals to participate in the marketplace, in which local housing resources become exchangeable assets, Airbnb-mediated activities and its own action on the digital layer have brought many impacts upon physical development and planning (ibid). Therefore, for the planning sector, it is important to address the methodological challenge inherent in the

combination of digital and physical networks. This complexity has been reflected in the ways researchers discuss Airbnb-induced impacts on different scales: city-level, specific area and individual involvement.
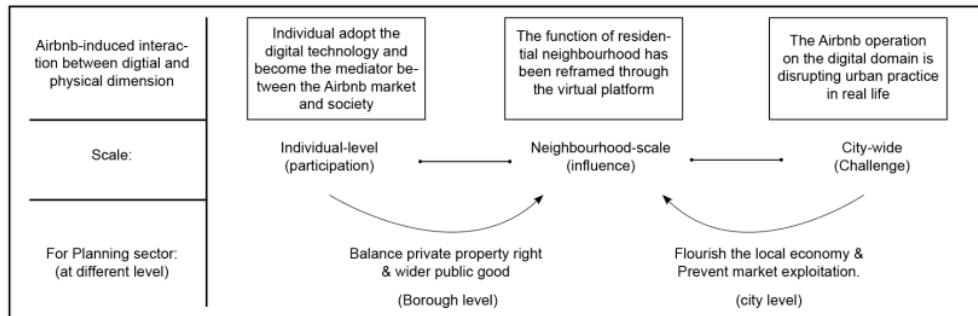
Figure 1. Dynamics of Airbnb-induced impacts and implications for planning sector. (Diagram by author)

1.2. City-scale challenge

The prevalence of platform technologies has led to a growing influence of corporate power over urban practice, such as regulation design and enforcement (Ferreri and Sanyal, 2018; Morozov and Bria, 2018). Many city governments have started governing this type of STR activity with more experimental regulatory approaches (Aguilera, Artioli and Colomb, 2019). The city-specific regulation in London intends to unlock a new market for citizens so that they can earn additional incomes from STR, however, it also introduces a more profitable market for investors and speculators (Shabrina, Arcaute and Batty, 2021).

By underlining the transformative potential of digital platforms, city-wide researches have examined the implications of platform-mediated STR, mainly from two perspectives: the impacts brought about by these processes (Coyle and Yu-Cheong Yeung, 2016; Schor, 2017; Stephens, 2017; Artioli, 2018; Cocola-Gant, 2018); and the spatial distribution of such impacts (Quattrone *et al.*, 2016; Coles *et al.*, 2018; Wachsmuth and Weisler, 2018; Picascia, Romano and Teobaldi, 2019). The studies at the city scale reveal not only the uneven spatial pattern at a specific point in time, but also the changing distribution of Airbnb activity over time (Wachsmuth and Weisler, 2018; Cocola-Gant and Gago, 2019; Grisdale, 2019). The complexity brought by the operations on the digital domain is disrupting the practice in real life (Artioli, 2018).

1.3. Neighbourhood level Airbnb development practice

While large scale spatial investigations provide insight into the dynamics of STR activity from a given city context, the differences between urban neighbourhoods are equally important (Cocola-Gant and Gago, 2019). Wachsmuth and Weisler's (2018) developed a revenue model to assess the activity level of short-term rental on a neighbourhood scale based on Neil Smith's rent gap theory. Their results from analysing New York neighbourhoods demonstrate that revenue varies across the city. Instead of counting listings, their approach measures Airbnb activity level by the percentage of rental income diverted into Airbnb from the conventional rental market.

As urban neighbourhoods in many cities have been affected by profit-oriented Airbnb activity differently, researchers began to consider their activity in relation to a specific type of neighbourhood (i.e., historical town centre; post-industrial residential neighbourhood) (Füller and Michel, 2014; Ioannides, Röslmaier and Van Der Zee, 2019; Cocola-Gant and Gago, 2019; Yrigoy, 2019). Perceived as an economic phenomenon and technological instrument, Airbnb has raised ground rent of residential units with the prospect for a higher return (Cocola-Gant, 2018). The Airbnb expansion, therefore, reflects an increasing number of properties that have extended their function from only residential to a digitally-mediated commercial dimension, through the support of virtual platforms (ibid).

1.4. Airbnb-related digital entrepreneurialism

"For Airbnb, the market in short-term rentals is a landscape infused with the spirit of entrepreneurialism— not just any form of entrepreneurialism, but one in which opportunities for individual profit are tethered to notions of community, sustainability, self-regulation and (ultimately) self-help." --- (Stabrowski, 2017: p. 342)

The Airbnb platform encourages individuals to become businesses and to grow in this new market digitally and collectively (Stabrowski, 2017). For people participating in the process of Airbnb expansion and professionalisation, current studies primarily emphasise investigating the relationship between guests and hosts (Sigala, 2019). However, there is a rising number of digital entrepreneurs who are interested in the operation of digital exchanges (ibid). These entrepreneurs as the third party or secondary market can reframe the perception

11

of a place with the support of digital technologies (Stors and Baltes, 2018). On one hand, they act as professional property managers to facilitate the commercialisation of residential units (Sigala, 2019). On the other hand, given that the innovation of digital tools allows people to access information and explore distant physical places in the virtual space, digital entrepreneurs who are proficient at utilising online platforms wield great power in reshaping the image of a residential neighbourhood (Stors and Baltes, 2018).

The modern digital platform also disrupts the role of local government as the primary agent for market-oriented change (Stabrowski, 2017). As digital entrepreneurs have taken a portion of housing resources from the conventional market sector, responses from standard letting agents to the market changes might explain the neighbourhood variation in the level of activity. More importantly, Individuals as the mediator between the new market and society, could quickly adopt the digital technology and is blurring the boundaries of space planned for residents and visitors (ibid).

1.5. Research Aims and objectives

These Airbnb-mediated digital-physical interactions span across multiple scales – city, neighbourhood and individual. These three layers form the basis for understanding the relationship between the city-wide expansion of Airbnb and specific neighbourhood contexts; between the digitally-mediated and conventional sectors. At the city level, its uneven spread has drawn attention from urban researchers since its presence tends to be associated with an unequal distribution of resources and a lack of appropriate policy response (Schor, 2017; Stephens, 2017; Artioli, 2018; Cocola-Gant, 2018). With the support of digital technologies, more individuals – with or without properties – can participate in the process of commercialising the residential area (Stabrowski, 2017). Thus, the investigation on Airbnb-related digital entrepreneurial activity is expanding, due to their role as a facilitator of the development of the Airbnb market (Stabrowski, 2017; Sigala, 2019). Regarding Airbnb activity in urban neighbourhoods, it is worth noting that the extent of expansion and resulting professionalisation following the STR commercial activity varies from place to place in a city (Wachsmuth and Weisler, 2018; Grisdale, 2019).

It is clear that the discussion about the Individual's active participation in the activity intermediated by the Airbnb digital network cannot be separated from the larger neighbourhood and city level argument. Through utilising innovative digital technologies to develop both virtual and physical network, Airbnb platform and Airbnb-related entrepreneurial activity has led to the inconsistent practices observed at different neighbourhood and the uneven development pattern across the city (Grisdale, 2019).

Therefore, the aim of this research is **to unpack the interactions between the digital and physical dimensions of the Airbnb-mediated STR market in London.** By considering the physical-digital interactions that span multiple scales, this study intends to contribute to a more holistic framework interpreting the dynamic between digitally-mediated and conventional sector – one that can support both policy-maker and local planner to design specific strategies that might assist in optimising their practice. The overarching research question is: **How and to what extent might a multi-scalar consideration of Airbnb's proliferation in London promote an interpretative framework taking into account the digital – physical interaction of the STR market?**

In pursuit of understanding the interconnectedness of Airbnb market's physical and digital dimensions, all objectives were linked to the overall goal of exploring the dynamic interaction of digitally-mediated activity and the surrounding environment.

Research objectives:

1. Investigate the city-wide Airbnb activity regarding its activity level and proportion of rental revenue that flows into Airbnb share of the short-term rental market;

2. Spatially display the city-scale distribution of Airbnb activity in all London neighbourhoods;

3. Explore the spatial relationship between the distribution of Airbnb listings and revenue at a neighbourhood level, and identify case study residential neighbourhoods with persistent and/or high Airbnb activity;

4. Discuss the differential local market behaviours as a dynamic process between the City-wide expansion of Airbnb and specific neighbourhood context, through longitudinal analysis of case study areas.

5. Evaluate the dynamics between the digitally-mediated and conventional rental sectors, through analysing interviews with local letting agents;

6. Summarise the digital-physical interactions across multiple scales into a more comprehensive framework on Airbnb-mediated short-term rental market.

2. LITERATURE REVIEW

This chapter introduces literature in three parts: initially by reviewing the underlying mechanism and the 'ideals' of a digital marketplace propagated by platforms like Airbnb; followed by a discussion of the tension between the advanced platform technology and city planning, particularly focusing on the planning practice in London; ending with a rethinking of physical-digital interaction of Airbnb-mediated STR market based on the previous studies characterised in three scales (city, neighbourhood, and individual).

2.1. The digital marketplace & informal use of residential properties

2.1.1. The ideal of digital platforms

Digital platforms can mediate the exchange of resources among individuals. The relations mediated by digital platforms increasingly engage in different types of economic activities, in which not only goods and services, but also capital and labour are exchangeable (Artioli, 2018). Urban space became the main site for the expansion of digitally mediated exchange activity owing to "the digital skin of cities" (Rabari and Storper, 2015: p.27). The notion of sharing economy propagates the ideal where access to resources is seen as more desirable than ownership (Killick, 2015). Along with the same rhetoric, the claim of promoting more collective and efficient use of assets is beginning to affect certain sectors of the urban economy, such as housing and transportation (Ferreri and Sanyal, 2018).

Exchanges that take place in a virtual marketplace created by digital platforms (i.e., Airbnb and Uber) are materially restructuring a new pattern centred on the commercialisation of assets (Artioli, 2018). Every user of the platform is able to choose either to be a producer who can commercialise their tangible assets for new revenue, or be a consumer on the platform (ibid). Ideally, within the online marketplace, platform users can bring previously under-utilised resources to trade with other individuals without going through an intermediary. However, it allows property-owner or property manager to shift the use of resources, so as to maximise their profit (Cocola-Gant and Gago, 2019).

2.1.2. The underlying mechanism of digital platforms

The rise of digital platforms led to an ever-denser social network and an expanding practice of digital space (Stabrowski, 2017). The "transformative nature" of digital platforms enables a new pattern of "integration between economy and society" (Artioli, 2018: p.7). The growth of Airbnb market has triggered the transformation process of residential properties. Airbnb, as the earliest and most popular digitally-mediated STR platform, has initiated the exchange of properties on an individual basis (Yrigoy, 2019). Although this informal use is a pre-existing phenomenon, the "app-based sharing" platforms have implications on the material practice of sharing. (Kim *et al.*, 2019: p.262). The collective use of urban space is now entangled with for-profit sharing activity (Stabrowski, 2017). For the asset-owner, living space can be commercialised; for the tourist, the residential neighbourhood is becoming a playground for city exploration (ibid).

The practice of Airbnb in urban space can be at once the medium and the outcome (ibid). Via the digital platform like Airbnb, rental properties on the private market can be removed from the conventional sector into the informal shared accommodation sector (Artioli, 2018). Ultimately, platform development led to a change in overall resources allocation, which is often uneven and unequal (ibid).

2.2. The digital marketplace & city planning

In most cities, STR as an informal use of properties has been in an unregulated form (Kim *et al.*, 2019). Therefore, many city governments have started handling the proliferation of STR activity, and their responses are diverse, in part because the structure of local economy and housing system is different (Artioli, 2018); in part because it is continuously being reframed by a range of actors "with clashing interests" (Aguilera, Artioli and Colomb, 2019: p.2). Across European countries, due to different types of actors being involved in policy-making processes, this transnational activity has been governed differently (ibid). However, it is clear that people make the connection through digital platforms, but the exchanges happen in real space (Artioli, 2018). The combination of digital and physical dimensions has increased the complexity of urban governance and strategic planning (ibid).

Data sharing agreement between city government and corporate platforms has been initiated in Barcelona, a "restrictive approach" based on data shared by Airbnb seems to be an effective way to trace the shift of use (Kim *et al.*, 2019: p.272). within the debate of the design and enforcement of regulation, scholars have discussed whether gathering or even buying data from for-profit cooperates is the most effective solution (Ferreri and Sanyal, 2018; Gurran, 2018; Kim *et al.*, 2019). Airbnb as an extractive practice intends to derive its business value from amassing platform users' resources (i.e. properties) and services (i.e. city trip) (Gurran, 2018). It is "merely extracting and redistributing wealth rather than generating sufficiently new values for a host or community to thrive, be socially fair and sustainable" (Dredge *et al.*, 2016: p.3). Similarly, for the planning sector, it is difficult to act upon the limited as well as imperfect data extracted by digital firms (Ferreri and Sanyal, 2018), and to deliver a socially and economically sustainable outcome (Holman, Mossa and Pani, 2018).

2.2.1. Regulation feasibility in London

Regarding the STR regulation in London, the discourse is centred around its feasibility (Ferreri and Sanyal, 2018; Holman, Mossa and Pani, 2018). STR activity as an informal type of use of residential properties is fully banned in the past (Simcock and Smith, 2016). However, the deregulation act in 2016 has loosened the restriction on STR, which allows property-owners to carry out STR for a maximum of 90 nights in a calendar year (ibid).

The deregulation of short-term letting in London as a policy response to the rise of home-sharing platforms has caused not only a rise in rental price, but also a conversion of the long-term rental into short-term rental (Shabrina, Arcaute and Batty, 2021). While Insufficient information has been shared by the digital platforms and its users, local planners need to manually collect data so as to monitor breaches (Ferreri and Sanyal, 2018). Furthermore, evaluating the influences on local residents requires the planner to gather more information through on-site observation and door-to-door survey (ibid). Therefore, the effectiveness of enforcement is under doubt due to the time-consuming investigation process (Ferreri and Sanyal, 2018) and lack of systematic and standard measures of data quality, such as consistency and completeness (Holman, Mossa and Pani, 2018).

The idea of a more generative use of advanced platform technology has emerged to facilitate a reciprocal and not-for-profit arrangement (Gurran, 2018; Kim *et al.*, 2019). This cooperative-like plan requires a "proactive

planning policy and investment funds", thus it seems "overly ambitious" (Kim *et al.*, 2019: p.273). Particularly for cities like London under fiscal austerity, it is difficult to provide an investment climate for cooperative platforms against for-profit platforms. The ambiguity of what defines a 'generative practice' has also led to its appropriation by the digital platforms. As Airbnb is becoming more influential, it creates a website – Airbnbcitizen – to advocate for their social value and positive contribution to the local community; to advertise their active engagement with local governments. In doing so, the concept of the generative platform is incorporated into their "marketing strategy"(ibid: p.281).

Nonetheless, if a city governance over-relies on data provided by private corporates, on one hand, this could cause planning practice "becoming more reliant on processes of corporatisation"; on the other hand, this would be a matter for planners to sustainably balance the social and market gain, when the digital corporate "has embedded themselves into urban societies and their governance" (Ferreri and Sanyal, 2018: p. 3365). As noted by Aalbers (2019), the issue of deregulation is not only about benefiting specific groups, but also about reinforcing their interest and emphasising their dominance by promoting digitisation of urban governance and planning.

2.3. Rethink the physical-digital interactions of Airbnb-mediated STR market

The preceding literature build toward a larger argument on the digital character of Airbnb-mediated STR activity. It is important to consider the interaction between digitally-connected users and activity that took place in real space (Artioli, 2018); to rethink the basis of new policy goal that avoids the perilous trend toward over-relies on corporatised digital infrastructure (Ferreri and Sanyal, 2018; Kim *et al.*, 2019); or to reflect a more positive use of the platform (Gurran, 2018) – which, however, might be re-appropriated as marketing slogans.

There are a series of urban issues raised by digital platform economies (Kim *et al.*, 2019). In order to reach an integral understanding of urban issues triggered by Airbnb, it is vital to not only interpret the overall trend in terms of statistics and but also unpack its place-specific, material impacts (Schwanen, van Kempen and Cocola-Gant, 2019). The present discourse on this topic is varied in scope and method but can be characterised in three

scales: City-wide expansion (Coyle and Yu-Cheong Yeung, 2010; Cocola-Gant, 2018; Wachsmuth and Weisler, 2018; Cocola-Gant and Gago, 2019; Grisdale, 2019; Picascia, Romano and Teobaldi, 2019; Amore, de Bernardi and Arvanitis, 2020; Shabrina, Arcaute and Batty, 2021); Its effects at the urban neighbourhood (Füller and Michel, 2014; Gurran, 2018; Stors and Baltes, 2018; Ioannides, Röslmaier and van der Zee, 2019; Yrigoy, 2019); and the influence of Airbnb-related digital entrepreneur (Stabrowski, 2017; Sigala, 2019).

2.3.1. City-wide uneven expansion

In many cities, the meteoric rise of digital platforms has disrupted the local economic activity. Academics interested in Airbnb effects have undertaken social-economic investigation (Schor, 2017; Picascia, Romano and Teobaldi, 2019) or spatial study through an economic lens (Wachsmuth and Weisler, 2018; Cocola-Gant and Gago, 2019; Grisdale, 2019; Yrigoy, 2019) or spatial-temporal study to trace the expansion process (Quattrone *et al.*, 2016; Coles *et al.,* 2018).

One spatial approach focuses on the extent of activity, which is mapped based on its supply of properties and impacts of the activity, according to the number of residential units and the amount of rental revenue that has been shifted (Wachsmuth and Weisler, 2018; Cocola-Gant and Gago, 2019; Grisdale, 2019; Yrigoy, 2019). As for a city-level expansion, Airbnb listings are mainly concentrated around attractions and city centres (ibid). However, the clusters of activity can be found not only in the conventional tourism areas but in several residential neighbourhoods with "strong cultural cachet, good public transit, and leisure amenities – i.e., gentrifying or recently gentrified areas, which have not historically hosted tourists in large number" (Wachsmuth and Weisler, 2018: p.1155). Airbnb activity may act differently, as each neighbourhood has its own dynamic and pre-existing problems (i.e., gentrification), (Stors and Kagermeier, 2017).

As for a spatial-temporal study, the change of Airbnb spatial pattern can provide a detailed picture of the dynamic of Airbnb market. The spatial-temporal research (2010-2015) on London shows the supply of Airbnb listing is not limited to the centre and has diversity in its location (Quattrone *et al.*, 2016). While its activity penetrates neighbourhoods proximate to the central area at the early stage, it spreads unevenly to other areas,

which are "attractive and accessible by public transport", and have "residents who are young, employed, and born outside the UK" (ibid: p. 1389). Moreover, they found that the locations of entire home/apartment are more likely to locate in an affluent area, and private/shared rooms tend to be more available in "low-income yet highly educated part of town (likely student) with a predominant non-UK born population" (ibid: p. 1392). Another spatial-temporal study (2011-2016), using New York as a case study area, similarly finds that the spatial distribution of Airbnb has become decentralised over time (Coles *et al.,* 2018).

The non-spatial research at the city-level discusses the uneven economic opportunities to access the digital platforms across all citizens. Picascia, Romano and Teobaldi (2019) analyse Airbnb revenue distribution within its users based on the Gini Coefficient. Their study compares the national-level Gini Coefficient for income distribution (0.36) with the Airbnb income distribution (from 0.51 to 0.70) in 13 Italian cities. The result indicates that a limited number of users have obtained a substantial amount of revenue from this new income stream (ibid). Schor (2017:p. 34) also has a discussion about the impacts of the technological innovation of digital platforms on city-wide income distribution, and emphasise the way in which "a relatively more privileged middle class" has applied the digital platforms as their investment opportunity.

2.3.2. Airbnb effects at urban neighbourhood

By underlining the spatial character of Airbnb exchanges and the unequal access to Airbnb, scholars place their attention on two types of the neighbourhood: (1). The tourist hotspot, such as historical or more central neighbourhoods (Cocola-Gant and Gago, 2019; Yrigoy, 2019); (2). Urban residential neighbourhoods on the periphery of the previous type (Füller and Michel, 2014; Stors and Baltes, 2018; Ioannides, Röslmaier and van der Zee, 2019). As for the "traditionally touristic core", the tourism activity has already led to more "consumption-oriented" activities, which are further exacerbated by the shift of residential units into recreational uses, resulting from the expansion of Airbnb activity (Yrigoy, 2019: p. 2711). Therefore, new ground rent opened by Airbnb is directly linked to the existing tourism destination and flow, which is assisting Airbnb to attract more guests and hosts (ibid).

For the urban neighbourhood that is not considered as a hotspot for tourism, the rapid growth of Airbnb activity has been treated as an over-spill of tourism bubble (Ioannides, Röslmaier and van der Zee, 2019). As seen from the view of new urban tourism, Füller and Michel (2014: p.1306) argue that Airbnb invites more tourists by providing the opportunity to explore and experience an "ordinary and authentic" residential neighbourhood in different urban space. Yet, there is another argument developed around the functioning of Airbnb. Its digital character makes the "urban tourism space" no longer "a fixed, spatial entity" (Stors and Baltes, 2018: p.166). It allows the speculative investors to proactively construct the urban tourism space that now can be "(re-)produced digitally and collaboratively" (ibid: p.166). Therefore, individuals supported by digital technologies might have a greater impact on urban practice and contribute to the reproduction of urban space (ibid).

2.3.3. Airbnb-related entreprenurial activity

Considering urban citizens as a part of the Airbnb platform ecosystem, research has focused on two types of actors, who are proficient at using these innovative digital technologies: (1), Entrepreneurial Airbnb hosts, who tend to maximise their revenue by renting properties on the STR platforms (Rubino and Coscia 2018; Grisdale, 2019) (2). Digital entrepreneurs, who develop a new form of business relations and network for platform-mediated STR. (Stabrowski, 2017; Sigala, 2019) The latter could support the platform users to become the former, through providing services, such as property management and training (Sigala, 2019).

Regarding the specific actions taken by the professional hosts, Rubino and Coscia (2018) analyse the Airbnb revenue generation pattern in Turin, Italy. They explain that hosts are beginning to adopt different strategies to obtain greater revenue from multi-bedroom house/apartment, for instance, advertising the property as various types of listing (e.g. private room, entire home/apartment) to attract different guest groups (ibid). Because of the increasing competition between Airbnb listings, Sigala (2019) found that there is an increasing number of entrepreneurs – who help property-owner maximise their economic benefits and improve their competitiveness

in the Airbnb market. These entrepreneurs provide professional services, such as property management and marketing, and they give guidance on professionalisation (ibid).

Airbnb offers a technology-driven environment to digital entrepreneurs, fuelled by platform innovations (De Maeyer and Bonne, 2016). The three key factors for the development of Airbnb-related digital entrepreneurship are: "market opportunityrecognition, business model development and technology commercialisation" (Standing and Mattsson, 2018: p.396). Sigala (2015; 2019) argues that digital entrepreneurs driven by the market can drive the market. In other words, it responds to the market, but also reshapes the market. Three abilities are required for an Airbnb-related entrepreneur: (1). Able to structure network with other market actors "with the purpose to exchange resourcesand co-create value"; (2). Able to produce "exchange, normalised and representational practices" with other actors to frame the interactions; (3). Able to create the market picture, reflecting their knowledge of the new market (Sigala, 2019: 164). It is imporant to realise that these entrepreneurs play a significant role in the Airbnb ecosystem, and their actions on the market can be further explored (ibid).

2.4. Conclusion

For England, scholars (Ferreri and Sanyal, 2018; Holman, Mossa and Pani, 2018) consider the influence of deregulation and the role of the planning sector, particularly when the LPAs have been passively driven by the relaxation of regulation on STR. In London, the fields of planning led by LPA and policy-making led by Local government seem to be 'mutually exclusive entities' (Holman, Mossa and Pani, 2018: 610). Ferreri and Sanyal (2018) meanwhile observe the intensive communication between Airbnb and the UK government on the re-inscribing practice of STR, either through direct lobbying or through indirect mastering of data.

Within this context, the influence of the digital space permeated every side of urban practice, including governance matters (Artioli, 2018). This chapter reviews various issues arising from previous studies based on three scales: city, neighbourhood, and individual, and reflects the way in which the digital dimension coupled with the activity happens in real space. By considering the physical-digital interactions of Airbnb-mediated STR

market that span multiple scales, the next chapter provides a methodology rationale to explore the dynamic interaction of digitally-mediated activity and the surrounding environment.

3. METHODOLOGY

3.1. Introduction

This study integrates both quantitative and qualitative methods to engage with the overarching research question: **How and to what extent might a multi-scalar consideration of Airbnb's proliferation in London promote an interpretative framework taking into account the digital – physical interaction of the STR market?** As noted by Johnson, et al (2007: p. 123) that mixed methods "combine elements of qualitative and quantitative approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purpose of breadth and depth of understanding and corroboration". According to Creswell (2003), the underlying paradigm for mixed methods research is pragmatism where the focus has revolved more around the research question rather than the research method. This pragmatism embraces mixed approaches to view the research problem and gather inspiration for interpretation and condensing data from a range of methods (Cherryholmes, 1992).

This study applies explanatory sequential mixed methods. The approach requires first a quantitative research phase, and then the qualitative study builds on the findings from the quantitative investigation (Berta, Bottero and Ferretti, 2018). As such the research is designed into two main stages:

1. The quantitative analysis: to articulate the city-wide variance of Airbnb activity level, (through mapping the spatial pattern of Airbnb listings and the spatial variation of Airbnb *proportional contribution* – which shows that the proportion of rental market profit contributed by Airbnb market varies from neighbourhood to neighbourhood).

2. The qualitative study: to investigate the development process of Airbnb market in different residential neighbourhoods, through analysing the expansion process along the longitudinal axis and gaining insight into the local rental property market condition and the city-level planning environment.
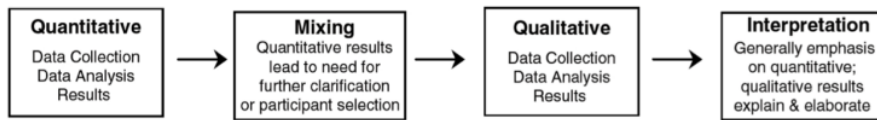
Figure 2. Mix methods designs - explanatory sequential mixed methods design (Plano Clark et al., 2008).

The selection of case study areas in stage 2 is based on the initial findings from stage 1, which highlights residential neighbourhoods with high and persistent Airbnb activity. This method circumvents the usual approach to case study selection, where research value may be preferentially given to a certain geographical category: 'inner city', 'periphery', 'rural' etc. By following the statistical pattern this selection criterion has the merit of reducing bias in selecting case study regions. The in-depth investigation of cases could provide a systematic way to connect specific, neighbourhood scale observations with quantitative analysis at the city scale. The following sections detail the research approach following the 2-stage structure.

Table 1. The methodology of the study. (Table by author)

Methodoloy:	Mixed methods (sequential design)		
Strategy:	GIS (Geographic Information System)	Case Study approach	
Data collection:	Secondary data	Secondary data	Semi-structure Interview
Data analysis:	Spatial analysis	cross-case analysis	Content analysis

3.2. Stage 1 - Quantitative Analysis

Aim and output

The first part of the study aims to statistically explore and represent the disruptive spread of STR activity across London. it uses the quantitative data of Airbnb listings in 2019 and 2020 to investigate Airbnb's proportional contribution to the private rental market in all London LSOAs (Lower Layer Super Output Areas). Unlike borough/ward, population vary greatly, the LSOAs keep a consistently sized statistical unit. The stage-1 output is two interactive maps* representing and to a certain extent forecasting the expansion of Airbnb

* the interactive map links - 2019 (file:///Users/zixuanxiong/Desktop/JAN%20R/guide_links/v2_link2019.html) ; 2020 (file:///Users/zixuanxiong/Desktop/JAN%20R/guide_links/v2_link2020.html).

activity in London, colour-coded to statistically correspond with the percentage of rental income divided from the conventional rental market into the Airbnb in each neighbourhood. The processed data used to produce this map will be attached in appendix A as a spreadsheet. The two maps are then used to inform the selection of case study areas in stage 2.

Data Analysis Scope

The statistical calculation limits its scope to only 'full-time' listings. The reason is twofold: 1) to reduce variation in data input so comparisons across different areas are more straightforward; 2) Full-time listings are far more likely commercialised properties geared toward non-local tourists in contrary to 'normal' Airbnb, which is let out by the owner-occupants only in parts of a year. As such the limited data pool sharpens the research results in diagnosing the impact of STR as a commercialised practice that is leading to more for-profit activity for the non-locals. As Wachsmuth and Weisler (2018) defined, a full-time Airbnb listing is occupied for at least 120 days (4 months) a year. Accordingly, Grisdale further investigates the commercial listings in Toronto and detailed the description of full-time listings, which has excluded two types of units (private room and shared room) and primarily focus on the listings tagged as entire apartment/house. This study adds another condition – a professional listing should be booked instantly on the platform, which means that it is always available and the host is often ready to host guest(s). Therefore, in this study, a full-time listing needs to satisfy three conditions: (1). the listing is occupied for at least 120 days a year; (2) The unit type is tagged as an entire apartment/house; (3). The listing can be booked instantly.
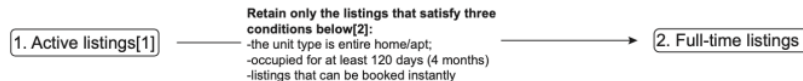
[1]: Inactive listing shows availability of zero, which happens when the listing is either fully booked out or inactive. Also, listings have the price of 0 £ per night, which happens when the listing is unavailable to rent at that date. Moreover, the listings have not been reviewed in the past half year are labelled as inactive.

The second step to determine the disruptive influence of the STR activity on urban accommodation is to explore its revenue model of short-term rental platform, via the framework proposed by Wachsmuth and Weisler (2018). In their framework, Airbnb proportional contribution – the percentage of rental income divided from the conventional rental market into Airbnb – displays the market activity level in the present private rental market. Their model applies an economic explanation for the displacement impact of Airbnb market growth. As such, this study builds on this approach to estimate the intensity of activity at all London neighbourhoods. The equation of the percentage of capital flowing into the Airbnb market is as follow:

$$percentage\ of\ rental\ revenuer\ flowing\ in\ STR\ Market = \frac{A}{A + B} \qquad (Equation\ 1)$$

A: $total\ airbnb\ revenue =$

$Estimated\ average\ Airbnb\ Revenue\ at\ a\ LSOA\ \times dwelling\ stocks\ at\ corresponding\ LSOA;$

B: $total\ rent\ paid\ to\ private\ rental\ market =$

$Average\ Rental\ Revenue\ of\ Long\ term\ Rental\ Housing\ at\ a\ LOSA\ \times dwelling\ stocks\ at\ corresponding\ LSOA;$

Choice of LSOA instead of borough as basic unit of calculation

(1). LSOA is a smaller unit and allows the result to be more neighbourhood-specific.

(2). Each LSOA is defined as an area containing 1500 people, disregarding geographical size. By conducting the analysis by the unit of LSOAs the mapping produced will not only indicate how different London areas fare in terms of STR expansion but can also give an indication of the intensity of this activity in relation to population distribution.

The Pandemic

The analysis time frame is set to compare the changing trends from 2019 to 2020. The reason is twofold: (1). the most recent development reflects the most updated market tendencies of STR (2021 data was not available at the time of analysis); (2). due to the COVID-19 pandemic tourism has seen a sharp decline with international travel practically impossible. This would help uncover imperceptible / unconventional Airbnb activities that in a 'normal' year would have been drowned in data resulting from seasonal fluctuations in the tourism industry.

3.3. Stage 2 – Qualitative Study

Aim and output

Unravelling the implications of large trends at a neighbourhood scale is critical for developing a coherent narrative, in which inferences made from neighbourhood scale and larger trend analysis support one another. Ioannides, Röslmaier and van der Zee (2019) stress the importance of case studies in the context of Utrecht. They discuss the growth of STR accommodation can cause the expansion of tourist bubble by analysing the Lombok neighbourhood. Another study on Berlin analyses the how the digital platforms like Airbnb reframe the tourism space that is previously fixed, using two neighbourhoods as case studies (Stors and Baltes, 2018). Wachsmuth and Weisler (2018) suggest a need for more qualitative research for making inferences on a neighourhood-scale activity. The research output for this stage comprised of the longitudinal analysis tracing the development process of Airbnb listings in three case study neighbourhoods and 6 semi-structured interviews conducted with local real-estate agents and academic experts. These transcripts form an in-depth understanding of the Airbnb digital marketplace in different London neighbourhoods.

Case Study Selection

Case study areas were selected based on their deviation to the general trend exhibited by all LSOAs, measured by change in

(a). the proportional contribution from Airbnb to total rental revenue

(b). total number of listings.

Longitudinal Trend Analysis

The longitudinal study of Airbnb market is used as a starting point of qualitative investigation to trace the market change from 2016 to 2020. The price trend of Airbnb market is important when tracking the level of digitally-mediated STR activity. There are seven aspects to Airbnb market: (1). The number of Airbnb listings; (2). percentage of active listings; (3). Area's total revenue growth year over year (%); (4). Average revenue (per listing) growth year over year (%); (5), The contrast of median and average Airbnb listing price; (6). The number of Active Airbnb listings; (7). The total revenue of Airbnb listing, and one aspect to local housing stock – the housing stock

growth (%) at borough level. In pursuit to understand the influences of Airbnb under specific neighbourhood context, the longitudinal changes in each aspect are compared across different urban neighbourhoods.

Semi-structured Interviews

The semi-structure interviews were conducted with local real estate professionals and academic researchers, so as to understand the private rental market and the planning practice in London. Only the agents from the case study areas were invited to the study. Their reflection on the development of Airbnb market adds additional depth and rigor to the study, either by pointing other possible situations that has been omitted or by highlighting complexity and interconnection between Airbnb model and market trend (or other factors that may affect the Airbnb activity). The background of two academic experts were: One researcher has worked on the regulatory responses to STRs in Europe, and another researcher has focused on the London's planning system, and the role of planning actors in the system, including the planning practice on managing platform-mediated STR activity.

Table 2. The list of research participants - semi-structured interview

Participant	Background	Date of interview
Agent A (from South Tottenham)	Association of Residential Lettings agent	20/02/2021
Agent B (from Kilburn)	Letting negotiator	20/02/2021
Agent C (from Nine Elms)	Letting manager	04/03/2021
Agent D (from Kilburn)	property manager & accredited landlord in London Landlord Accreditation Scheme	05/03/2021
Researcher A	Researcher has focus on the London's planning system, and the role of planning actors in the system.	03/02/2021
Researcher B	Researcher has worked on the regulatory responses to short-term rentals in Europe.	10/03/2021

A content analysis approach is applied to analyse the qualitative interview data. It is acknowledged as a flexible method of analysis which enables the construction of a systematic vision of rich data (Punch, 1998). The open-ended responses are abstracted and organised into themes with careful attention paid to divergent views. The process of a inductive content analysis can be broken into few key stages: 1. preparing phase – develop a sense of the whole of the interview as a context; 2. Open coding – divide up the content into pieces (i.e., sentences, phrases, and words that depict a particular phenomenon within the specific context); 3. Organising themes –

identify coherent as well as distinctive themes, which consist of core themes and their sub-themes (Elo and Kyngäs, 2008). Since the sample size is relatively small, the themes are manually coded in this study. After the condensed themes are reviewed and assigned to overarching themes, it can be linked to the topics extracted from current academic literatures.

3.4. Ethical consideration

Interviews were conducted with local real estate agents on a one-to-one basis. To the interviewee this can sometimes feel as if they are put in a compromised position and scrutinised by the 'academic researcher' coming from a self-proclaimed higher position. To ensure the comfort and confidence of the interviewees time and effort was taken by the researcher to prepare succinct descriptions of the research both in written and verbal forms to fully brief the interviewee of the scope and anonymity of the interviews. The questions and conversation style were carefully crafted so as to respect the interviewees' positions and personal values. The interviews were conducted during a lockdown period and extra care was taken to ensure sanitation standards were met throughout the process. On top of that no indoor conversation would proceed, online / phone conversations were offered as the preferred interview method and in-person communication to only take place at the insistence of the interviewee. (The sample of information sheet and consent form can be found in appendix B, and the example of interview question can be found in appendix C)

Another consideration is the data resource derived from Inside Airbnb, which is a non-commercial, independent organization that provide data scraped from Airbnb website. The shared data at this website has been widely used in many academic studies over the past few years. In addition, the data applied in this study are also publicly accessible: price, location, type of room, number of listing. The information about hosts is excluded from this study (i.e., user id, username).

4. QUANTITATIVE FINDINGS

This section begins with the city-wide spatial study of Airbnb activity over two continuous years – 2019 & 2020, followed by neighbourhood-level investigations on the growth of Airbnb activity in three urban neighbourhoods, selected based on the criteria of 'persistent activity' outlined in Methodology. On the neighbourhood scale, longitudinal investigation on the process of Airbnb development coupled with the analysis of interviews with local letting agents offer insight into the specific factors affecting the property market and planning environment.

4.1. City-wide analysis – differential level of activity across London

Statistics were gathered to grasp the general trend of Airbnb development (table 1). In order to display the shifting market dynamic during the pandemic, data from 2020 is compared with 2019 as a 'pre-pandemic' baseline. Approximately 52.76 per cent of listings were active on the Airbnb market in October 2019. In October 2020, this number dropped to 33.65 per cent. This substantial change is understandable considering the pandemic on a global scale has led to travel restriction and lowered demand for Airbnb.

Airbnb listings show greater annual revenues than the average revenue of a conventional long-term rental. Table 2 shows estimations of the average monthly revenue of an Airbnb listing vs. a conventional rental property. On average, a host can earn more from short-term than long-term rental if the property is hired for longer than 183 days in a year. Within all Airbnb properties, the number of full-time listings (available for hire 365 days a year) is about 6,176, or 23 per cent.

Table 3. The number of listing and the percentage of active listing at 2019 and 2020. (Table by author)

Year	Number of listings	Active listings
Oct 2019	83888	44261 (52.76%)
Oct 2020	76620	25775 (33.65%)

Table 4. The average monthly revenue of an Airbnb rental and of a conventional long-term rental (Highlighted blue background shows how many nights an active listing in London would need to rent out in order to achieve similar revenue that generated from rents of long-term rental.) (Table by author)

Price benchmark	Average rent in private rental market (£55 per night)	Average price of active Airbnb listing (£110 per night)			
Rental period per annum (nights)	365	60	90	182	255
Revenue per month	1644	550	814	1645	2305
Revenue per annum	19728	6600	9764	19745	27666

However, the non-spatial statistical evaluation conducted above is unable to present the variation of activity level across the city and cannot address the mechanism by which Airbnb's invasive presence affects local housing markets. To answer these questions, the following spatial analysis reveals the location and pattern of how rental revenues are redistributed to the Airbnb market across London neighbourhood. (Figure 3)

4.1.1. The spatial pattern of Airbnb market activity

As the two maps show, Airbnb activity is most intense at city centres, particularly around tourist-popular areas. The darker the colour, the greater the proportion of total rental market profit contributed by Airbnb market. Urban neighbourhoods in entertainment districts, such as Soho and Mayfair, have received the most rental revenue from Airbnb. Outside of entertainment districts, it is important to note that a substantial amount of Airbnb activity is present in many residential neighbourhoods, which are vulnerable to rental price fluctuations.
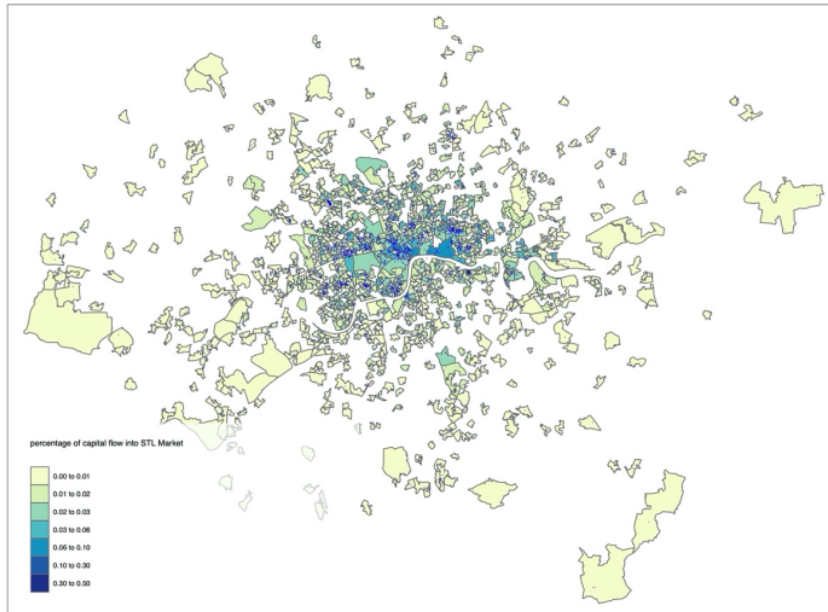
(a).2020
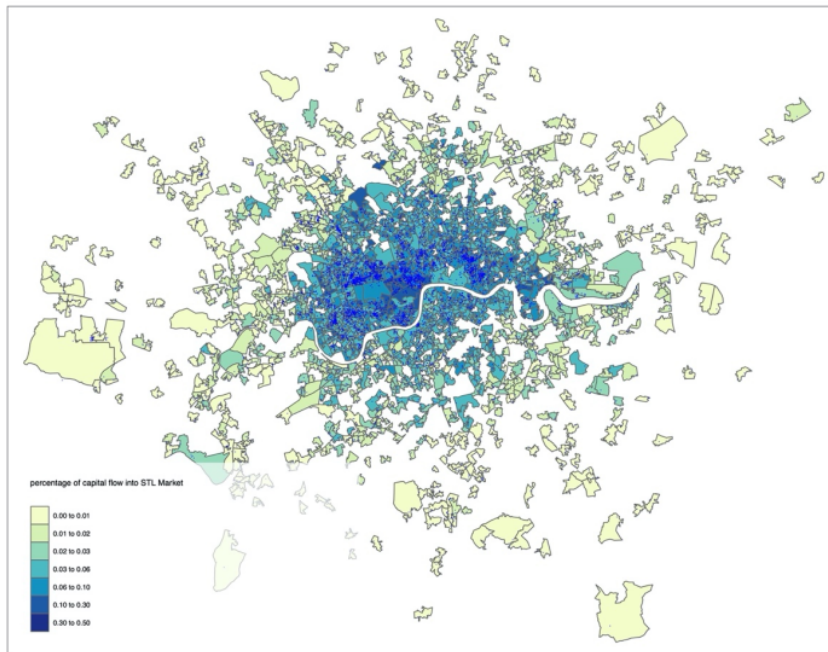
(b).2019

Figure 3. The percentage of capital flow contributed by Airbnb into the local market in (a) 2020 and (b) 2019. (A darker colour suggests a higher percentage of total revenue flow into Airbnb, for example, the lightest colour represent the percentage range of 0.0 to 0.01 (0% to 1%); Each dot represents one full-time Airbnb listing). (Diagram by author)

In some places with low overall rental revenue from Airbnb, the contribution is made by very few Airbnb listings many long-term rentals. For example, in LSOA-E1004737, Westminster, one Airbnb listing contributes 6% of total rent in that area among around 200 rented dwellings. The average annual income of an Airbnb listing is nearly double of an average private rental dwelling, even when the Airbnb is occupied for less than half of the year. Within this context, Cocola-Gant and Gago (2019) suggest that Airbnb now acts as a mediator or a technical tool that can make rental housing investment more palatable and profitable.

As mentioned above, activity level is measured in two indicators: 1) number of active listings and 2) proportion of rental market profit contributed by Airbnb market. The results from 2020 are summarized into four types:

Table 5. The four different circumstances of the Airbnb activity in urban neighbourhood, and the possible location for the condition to occur (analysed based on 2020 data from inside Airbnb). (Diagram by author)

Total number of listings (Number of dots)	Proportional contribution (Colour of the area)	The condition is often been observed at			Example
		Tourist-popular area or CBD[2]	In-between area [3]	Peripheral area	
High	High	✔			A
Low	High		✔		B
Low	Low			✔	C
High	Low	✔	✔	✔	D

Type A (with high number of listings and a large amount of revenue flowed into Airbnb market) has been discussed at length by existing literatures. Popular attractions bring an area, along with its surroundings, to overflow capacity with tourist accommodations (Schäfer and Braun, 2016). Soho is one such example, with an average Airbnb price of £ 210 per night and nine per cent of total rental revenue coming from the Airbnb market.

[2]: A central business district (CBD) is the commercial and business centre of a city. In London, the city centre is usually regarded as encompassing City of London and City of Westminster. While the two respective CBDs are the City of London and the transformed dockland - Canary Wharf.

[3]: The in-between area is neither the area in urban centre where the businesses and tourist attractions are located, nor the outer London area as defined by ONS (Office for National Statistics)

Type B areas have fewer listings than Type A, but the Airbnb market still generates a substantial rental revenue. This condition can often be observed at neighbourhoods adjacent to the core area of the city. These neighbourhoods often have some unique 'selling points', such as having historical architecture or Airbnb offering the experience of living on a boat (see figure 3). Their proportional contribution by Airbnb market can be much greater than peripheral residential areas. At the same time, due to their uniqueness, such listings are rare and unlikely to be replicated.

Type C represents mostly neighbourhoods far from the city centre, usually with a smaller number of listings and less revenue from Airbnb market. The average listing price is relatively low compared with most other neighbourhoods, but still exceeds / levels with the average annual rental revenue for long-term rental. It is worth noting that listings in these areas appear to group around access to public transport. Cheam, located in the London borough of Sutton, has four active listings all near the train station with average nightly price of £64.

Type D presents a peculiar combination: high number of listings with low rental revenue. This situation is often observed at residential neighbourhood near the city centre. For example, two residential neighbourhoods (Nine Elms, Lambeth & South Tottenham, Haringey), whilst geographically distanced, exhibit a similarly low proportion of rental revenue diverted into Airbnb market (about 3.3 per cent and 2.9 per cent respectively).

(A)

(B)

Beautiful boat located in St Katharine Docks
★ 4.81 (31) · Greater London, England, United Kingdom

Historic 1920s House moments from the Thames
★ 4.66 (59) · London, United Kingdom

(C)

● Airbnb listing location

★ Train Station/ Underground

(D-1)

(D-2)
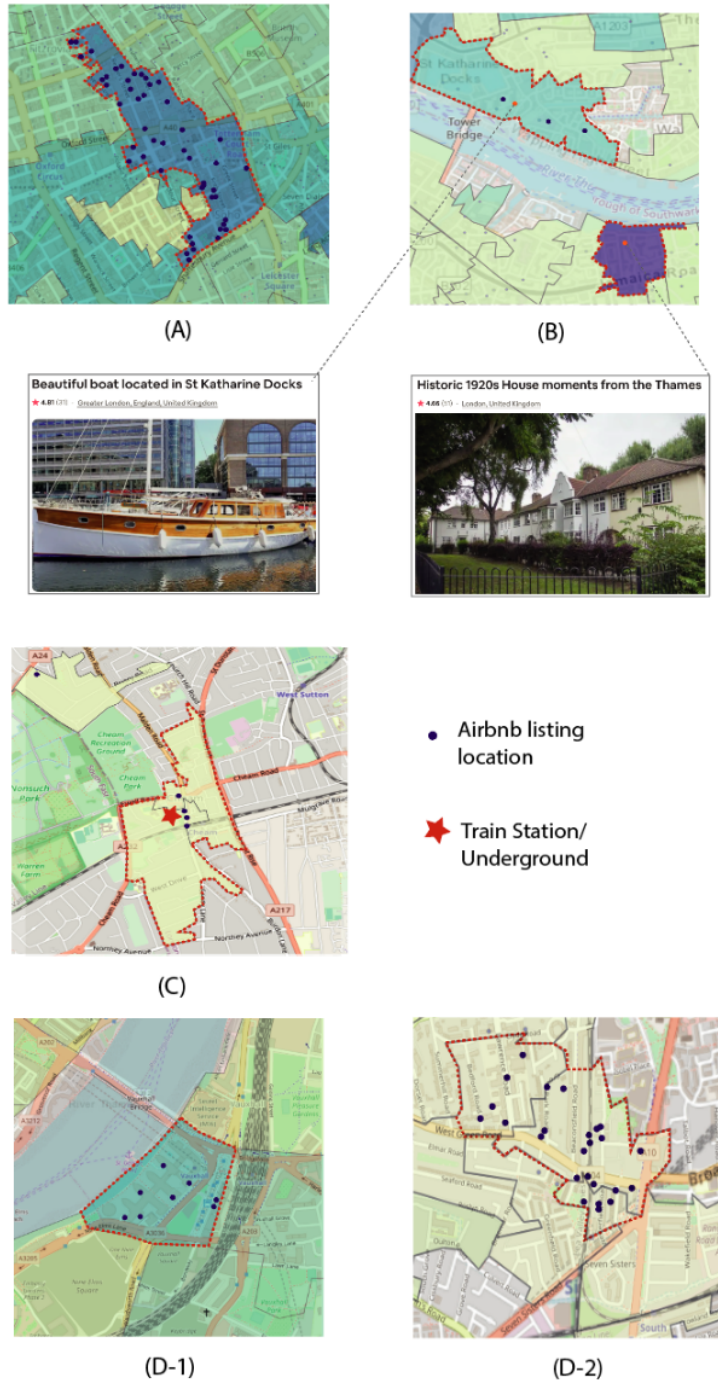
Figure 4. The London neighbourhood examples for the four different circumstances observed from the spatial study of Airbnb market activity at 2020.

In the past, tourism would have been relatively inactive in residential neighbourhoods where hotels were scarce. The advance of Airbnb-like STR platforms has extended the capacity of tourist to access the residential area with the purpose of staying at a cheaper accommodation, or experiencing a 'neighbourhood culture' (Füller and Michel, 2014; Stors and Baltes, 2018).

4.1.2. The comparison – a variety of trends across the metropolitan area of London

The preceding analysis demonstrates a general trend, where both the number of Airbnb listings and their proportional contribution to the private rental market have declined throughout the pandemic. However, some areas stand out as outliers against this general trend, three such cases are selected for further case studies, outlined in the table below.

Table 6. The general trend of Airbnb activity during the pandemic period, and the three unconventional trends: (1). While market remain active, the number of listings is dropping; (2). Less active, but the number of listings is persisted at the same level; (3). Less active, with a rise in the number of listings. (Table by author)

case 1: proportional contribution of Airbnb to the private rental market of case area remains high in relation to surrounding areas.

case 2: persistently high number of Airbnb listings despite general decline of proportional contribution.

case 3: growing number of Airbnb listings despite general decline of proportional contribution.

2019 → 2020
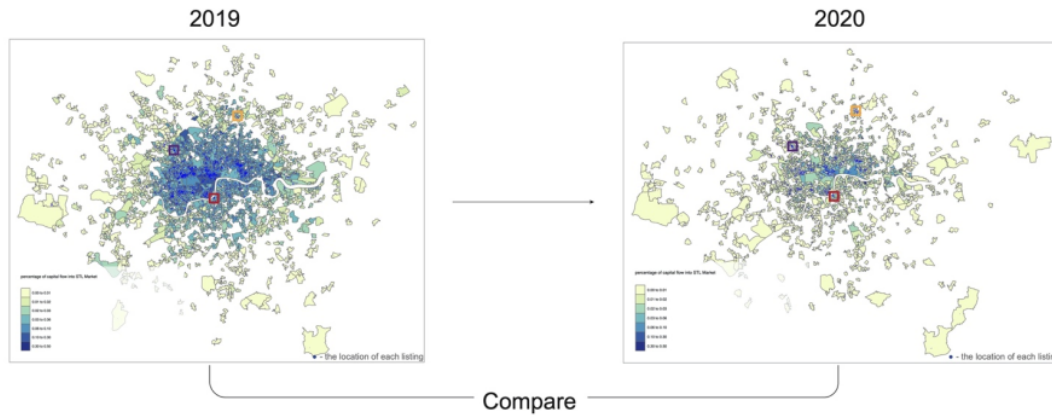
Compare

(Please find the enlarged version in Appendix A)

Case 1   Case 2   Case 3

2019

2020

Nine Elms   Kilburn   South
                                                    Tottenham

case 1: Nine Elms, Lambeth   case 2: Kilburn,   case 3: South Tottenham,
                              straddle across Camden and Brent   Haringey
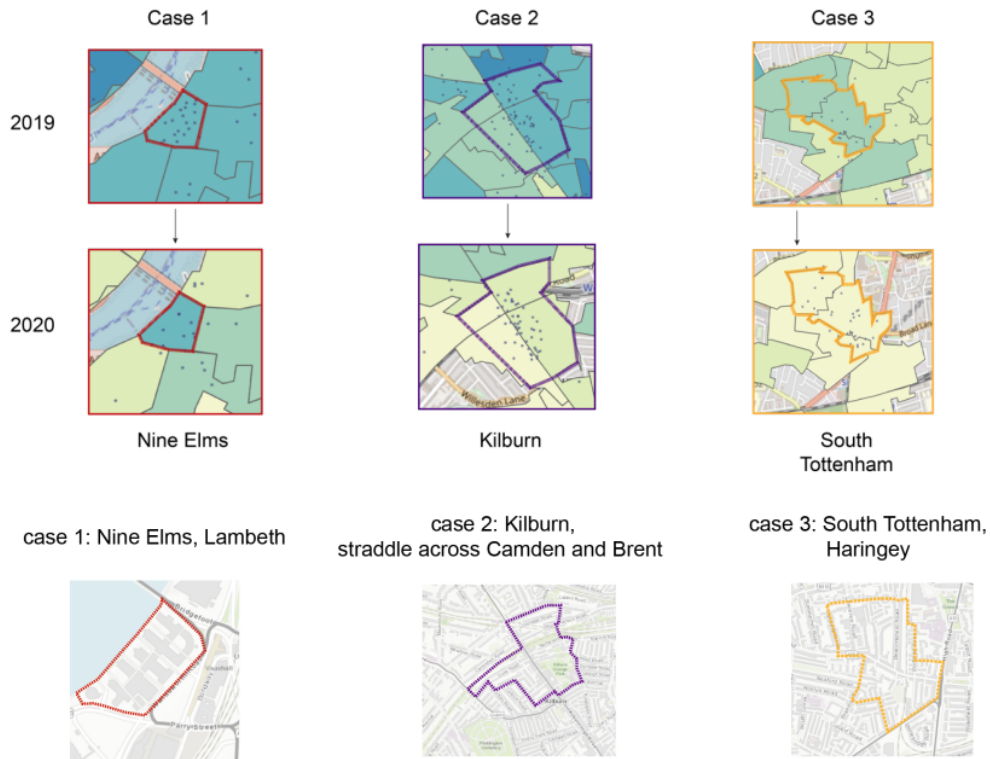
Figure 5. The comparison of spatial pattern of Airbnb activity at 2020 and 2019, and the locations of three selected case study areas. (Diagram by author)

Table 7. The number of active listings and the growth rate at the case study neighbourhoods. (Table by author)

The residential neighbourhood	The number of active listings		Growth rate of number of active listing (%)
	2019	2020	
Nine Elms	185	142	-23.2%
Kilburn	91	87	-4.4%
South Tottenham	51	69	+35.3%

A dramatic drop over the pandemic in total revenue at all three areas, often coupled with a decrease in the total number of listings. Regarding the proportional contribution by Airbnb, it has fallen from 5 per cent to only 3.3 per cent at Nine Elms; from 3.9 per cent to 1.5 per cent at Kilburn; and from 2.4 per cent to 0.3 per cent at South Tottenham. Amongst the three, Nine Elms shows the greatest decline in number. The activity level remains still at Kilburn. In contrast, South Tottenham has a sharp rise in number with a growth rate of 35.3 per cent.

4.1.3. Summary

The primary outputs of spatial analysis are: (1). Airbnb activity is spread across different types of residential neighbourhoods; (2). Even though the city centre is the most popular location, Airbnb clusters can be observed in residential neighbourhoods that are geographically located far away from the hotspots in the city centre; (3). The pandemic has resulted in a universal drop-in Airbnb activity. Three unconventional cases diverge from this city-wide trend and share the commonality of persistency in Airbnb activity over the study period.

4.2. Case Study – Neighbourhoods with Persistently High Activity

4.2.1. longitudinal change of neighbourhood-level Airbnb activity from 2016 to 2020

This section presents the comparative analysis of Airbnb-mediated STRs in three case study neighbourhoods identified in the last section. Figure 5 (a) plots the number of total listings (active + inactive) of all three neighbourhoods against time and shows consistent growth over the past five years. The level of actual Airbnb activity is more erratic, however, represented by plotting active listings separately as a percentage of total listings (figure 5. (b)). Active listings universally dropped from 2016 to 2017, closely following the introduction of the 90-days rule at the end of 2016. Thereafter, the trends begin to diverge. For Nine Elms, the figure rose to 66.9 per cent from 31.6 per cent over two years, then fell due to the pandemic-induced loss of tourism. For Kilburn, even though the total listings have been growing, the percentage of active listings gradually decreased. Unlike Kilburn, South Tottenham has a lower percentage in 2018 and a higher percentage in 2020.

(a)   *(b)*
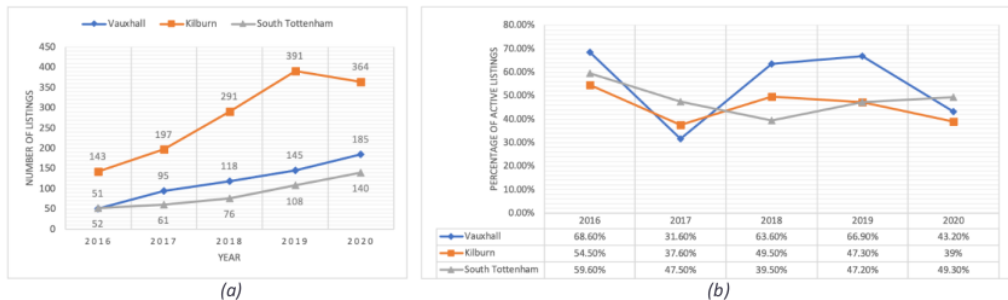
Figure 6. (a) The total number of both active and inactive listings in three London neighbourhoods; (b)The percentage of yearly active listing in three London neighbourhoods. (Diagram by author)

The change of revenue level in each case study area is assessed from three analytical perspectives: (1). Total revenue growth rate, which reflects the overall change of revenue inflow in a year; (2). Average revenue growth rate, representing revenue change for the average host; (3). and median revenue representing a real, common revenue point at each case study area.

See Figure 6: the total revenue growth rates for Kilburn and Nine Elms remained flat after the Deregulation Act 2016 and rose to a peak in 2018. These areas have continually generated more revenue for the Airbnb market until the onset of the pandemic. However, South Tottenham shows the opposite behaviour. Revenue from the

Airbnb market decreased as it increased for other areas. The growth rate then surged to the peak level, and at 2020 it is steadily attracting more capital when other areas have been struggling to maintain profit.

	2016	2017	2018	2019	2020
Vauxhall	0	0%	153%	5%	-44%
Kilburn	0	-2%	152%	104%	-67%
South Tottenham	0	-61%	-33%	347%	42%

	2016	2017	2018	2019	2020
Vauxhall	0	16%	1%	-19%	-33%
Kilburn	0	4%	30%	58%	-57%
South Tottenham	0	-59%	-35%	163%	5%
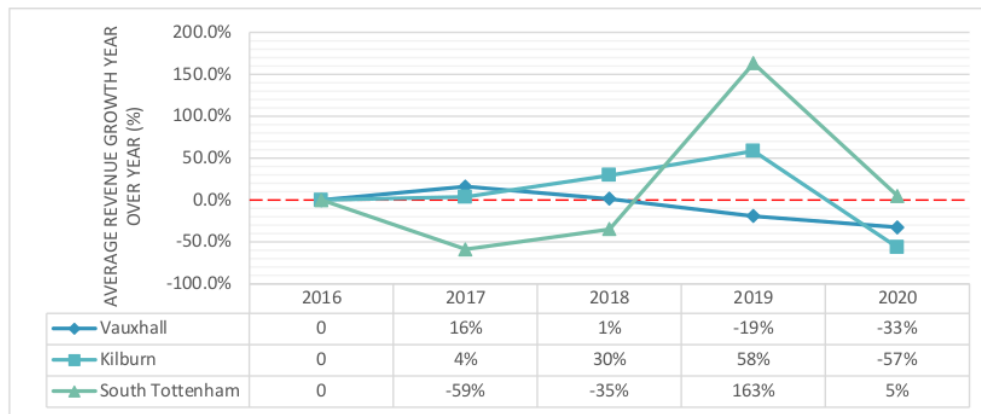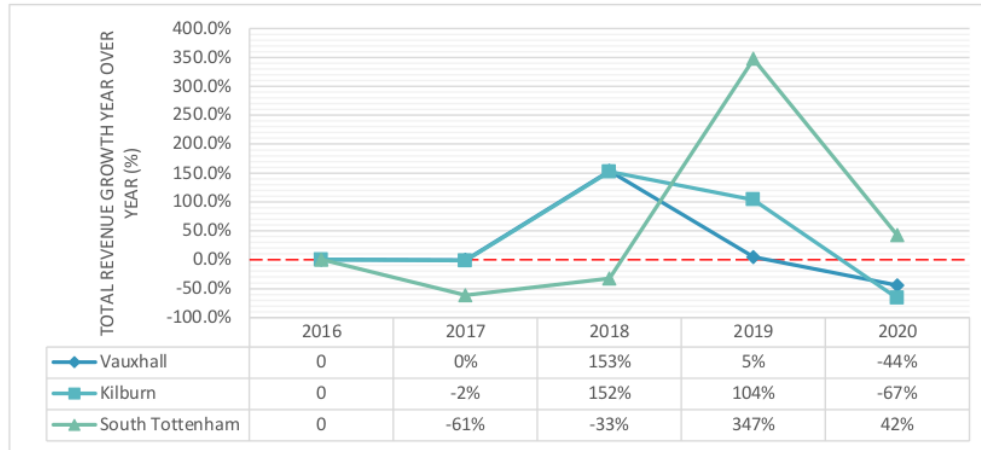
Figure 7. The longitudinal analysis of Airbnb market at three London neighbourhood in terms of (a) Growth rate of total revenue flow generated from Airbnb market; (b). growth rate of average revenue (per listing). Curve above red line (0.0%) indicates growing revenue and below red line indicates shrinking revenue. (Diagram by author)

Comparison between the trends of total revenue rate and of average revenue rate shows that a rise in total revenue does not necessarily lead to a rise in average revenue. Taking the Nine Elms area as an example, while its average revenue per listing dropped by 19 per cent between 2018 and 2019, the total amount of revenue generated by Airbnb activity has increased by 5 per cent. This implies a significant profit gap among individual

41

listings. To further investigate this gap the median and average listing price are compared in figure 6. As expected, the average price is consistently higher than the median, portraying the general existence of higher-priced listings 'pulling' up the local average price. What's interesting is that the degree of such an effect, indicated by the difference between the median price curve and the average price curve, varies greatly across the three case study areas (Figure 7). South Tottenham has the smallest gap, implying that its listings have similar prices among them.

The trajectory of average & median listing price for South Tottenham also stands out as an anomaly. In the other two cases during the pandemic period: even though both average and median prices decreased the former did so at a much steeper rate causing the two curves to converge at a lower point than before. This shows a significant number of higher-priced listings have exited the market / priced down, whilst lower price listings remained relatively stable. This is not the case for South Tottenham. Its average price continued to grow despite decreasing median price. This implies two possible scenarios: either new higher price listings have successfully entered the market, or, lower price listings have priced up and remained marketable – both against the behaviour expected of Airbnb market during the pandemic.
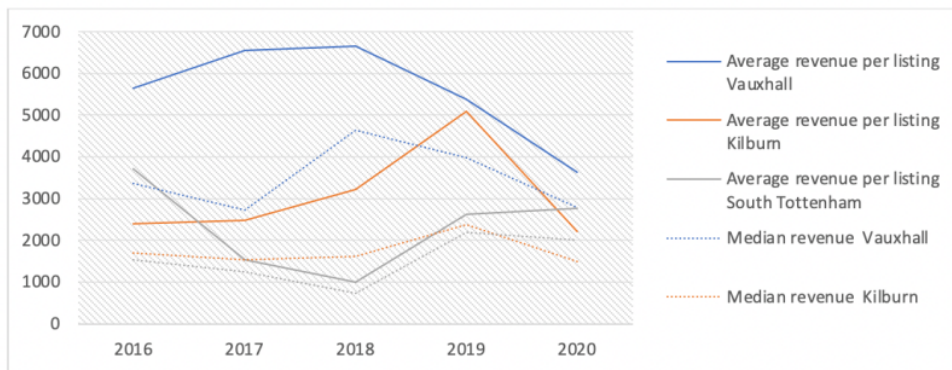
Figure 8. The contrast of median (dash line) and average (solid line) listing price at three London neighbourhoods (Nine Elms – bule colour; Kilburn – orange colour; and South Tottenham – grey colour) from 2016 to 2020. (Diagram by author)

Even though the total listings have been increasing at stable rates across the board, there was a sudden surge in revenue growth rate for South Tottenham in 2018 (figure 8). Unlike Kilburn and Nine Elms, who experienced a significant downturn during the covid periods in both real listings and revenue, South Tottenham, continued growth in both indicators.
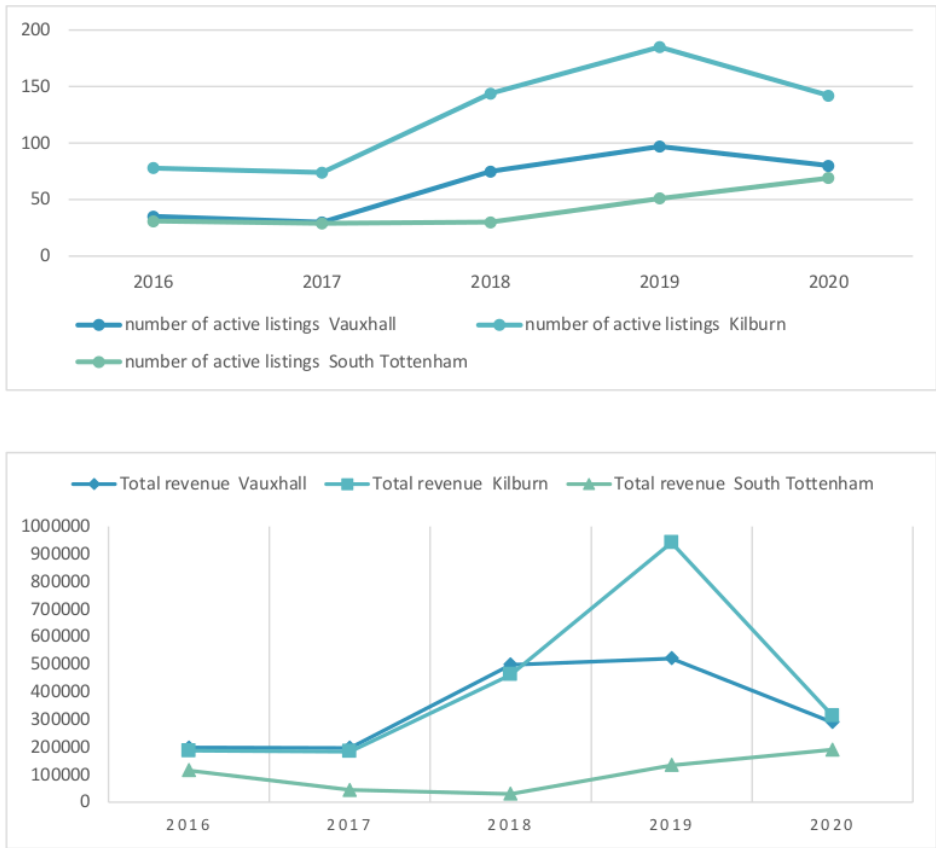
Figure 9. (a). The number of Airbnb listings and (b) the total revenue of Airbnb activity at three London neighbourhood. (Diagram by author)
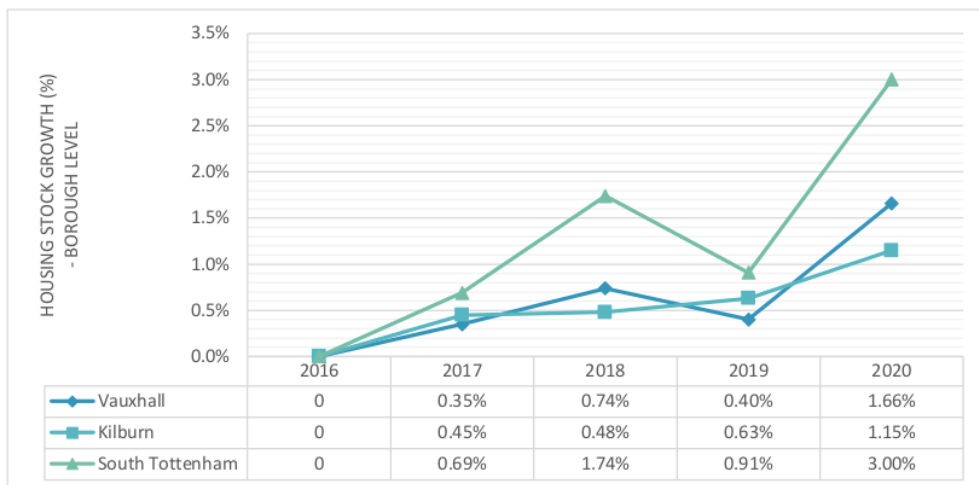
Figure 10. The longitudinal analysis of housing stock change at three London neighbourhood (Diagram by author)

The persistent growth of STR revenue in South Tottenham during the pandemic (2019-2020) coincided with a surge in the housing stock (fig. 9). Detailed investigations on possible conversions from new builds to STR properties may reveal more correlations – but would be beyond the scope of this study. Instead of pursuing data scraping to the level of individual households, this study argues for seeing STR activity as local differences interconnected – mediated – as a digital whole. To this purpose, it is sufficient to observe that South Tottenham, out of the three case study areas, presents a considerable potential for STR expansion despite of its apparent low revenue rate.

4.2.2. Summary

The primary outputs of <u>longitudinal analysis</u> are: (1). The development process of Airbnb market, in terms of its revenue level and a number of active listings, vary from place to place, but all case study areas have an active market activity over the past five years; (2). The average price is consistently higher than the median, portraying the universal existence of higher-priced listings 'pulling' up the local average price; (3) South Tottenham has the smallest gap, meaning it has the most balanced price pool amongst the three; (4). For South Tottenham, its average price continued to grow despite decreasing median price. This implies two possible scenarios: either new higher price listings have successfully entered the market, or, lower price listings have priced up and remained marketable – both against the behaviour expected of Airbnb market in the pandemic.

5. QUALITATIVE FINDINGS

This section presents a content analysis based on semi-structured interviews to discover the interaction between the digitally mediated STR and the conventional rental sector. It starts by explaining how real estate agents perceive the Airbnb market and the features of case study areas. As a new digital dimension enters the management of local housing resources, digital entrepreneurialism and new technologies are altering the connection between property owners and conventional real estate. Two interrelated themes emerge from the content analysis: (1). The emergence of the specialised STR management company; (2). Cooperation between sectors under the common-hold tenancy agreement.

5.1. How do real estate agents perceive the Airbnb market and the neighbourhood?

While major tourist attractions remain in city centres, housing developments are increasingly making space for Airbnb activity to enter residential neighbourhoods. Digital platforms and online services, such as Airbnb and Booking.com, encourage property owners to use their properties for STR activity (Agent A). In all three areas, agents explain that the Airbnb market does not affect their rental business, and they feel their share of the private rental market 'has not been threatened; by Airbnb market (Agent A; Agent B; Agent C; Agent D). They also perceive different degrees of rising in Airbnb activity: One sees a fair rise at South Tottenham (Agent A); a modest rise at Kilburn (Agent B; Agent C); and barely any rise at Nine Elms (Agent D).

Although the growth of Airbnb allows self-management without appointing a professional real estate agent, it is operated within a limited demand from property owners, and "It is sort of work in its own environment, its own market" (Agent B). As for the conventional rental sector, there are always large numbers of tenants who are looking for long-term rental tenancy. For agents from Kilburn and South Tottenham, they have a good supply of standard agreements offering tenancies of a year or more (Agent A; Agent B; Agent C). The Assured Shorthold Tenancy (AST) in England and Wales allows "tenants (to) get a certificate to prove (that) they have been protected under the government scheme" (Agent C).

In comparison to self-management, the AST provides security and stability for both property-owner and renter. "Some landlords after experimenting with Airbnb, if they look at long term, they just go down to an agent or

46

somehow try to get residual income in a more comfortable way, with a more constant flow of income, as opposed to Airbnb route" (Agent A). Moreover, the regulation in London has added complexity to the management practice, "Airbnb is not flexible for landlords to invest" (Agent B).

Airbnb has seasonal patterns. As the market is "definitely lucrative for landlords", over the course of a year, some of them will switch into offering a STR between the periods of standard tenancies (Agent B). For example, a landlord may choose to offer property for STR during tourist season, and switch back to standard tenancy in the rest of the year; some may try to fill the gap between standard tenancy periods by offering STR.
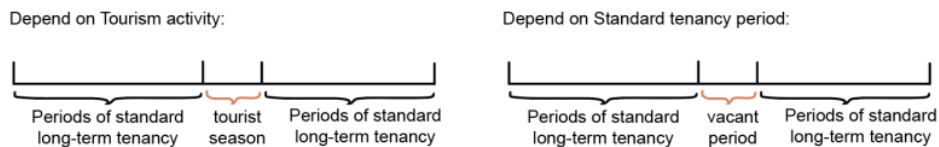
Figure 11. The two possible conditions for a combination of long-term and short-term rental use. (Diagram by author)

As there is no pre-existing community from 20, 30 years ago, Nine Elms is "all-new" and "developers don't want (that) this area is becoming a very come and go area" (Agent D). The "hotel-style living" in Nine Elms can be popular with Airbnb or STR, with a wide range of facilities including cinema, gym and sky pool for residents(ibid). Because the residential areas are "next to the US embassy, (residents may feel) so secure with the armed guards walking around all the time" (ibid). Nine Elms "become a great place to come", and "hotel-style (flat) is really attracting visitors who only stay at London for a week or a month" (ibid). Nevertheless, the agent did not observe an obvious rise in Airbnb activity, he explained that "developers are actively trying to stop the STR market from coming here", in part because of their strategy of "building a community" (Agent D).

Nine Elms agent describe the area as an "international" place with many overseas landlords, who may prefer not to invest Airbnb market, because it is not the easiest market to rent and manage (ibid). "There are a lot more works involved, but, renting long term the workload for a property owner is less" (ibid). In comparison, local landlords have more flexibility in managing their finances, and "perhaps aware that their unit would be more profitable as a STR" (ibid). Also, as Agent from Kilburn noted, local landlords who "are based in London" or "only

47

own one to two properties" more likely would opt for self-managing their properties to save cost and maximise gain (Agent B).

As for South Tottenham, where numerous redevelopment projects (i.e., Seven Sister Ward Corner, Tottenham Hotspur Football Club Stadium) are approved and finished, many local, as well as overseas investors have been investing properties (Agent A). In 2019, 65% of Agent A's applicants were coming from "more affluent areas (in London), such as Hackney, Shoreditch, Hampstead, and Islington" (ibid). The agent explained that this is a really large number, as they "register at least 100 to 500 applicants a week" (ibid). Over the past 20 years, this area has changed: "local schools have improved; there are (more) open spaces for entertainment; there are more facilities, such as art centre, theatre and leisure centre; and there are lots of taverns" (ibid). This area is still "affordable" and becomes more "vibrant" – "there is something for everyone" (ibid). Airbnb as a brand and business can "improve this area even more, once the consumer learns more about this option of Airbnb" (ibid). The agent then explained that "the Airbnb market could work very well in South Tottenham, given its good transport connections" (ibid). Taking Stratford Express as an example, it shortens the time needed for visitors to travel from Stratford Airport to the area. It is also conveniently located close to transport links the city centre, for instance, Seven Sisters (station) is on the Victoria line.

Nine Elms

Nearby Station

River view

High density
residential building

High density
residential building

Kilburn

High street

High Street & theatre

Mixed-use building on high street

Residential area

South
Tottenham

Mixed-use building on high street

Mixed-use building on high street

Newly-built mid-rise residential area

Newly-built mid-rise residential area

Figure 12. The site photos of the three neighbourhoods. (Photo by author)

Similarly, Kilburn has a good transport infrastructure and network, "it is more accessible than the other areas in west-east London (i.e., West Hampstead)" (Agent B). Moreover, the well-developed transport is convenient for tourists. People can "access the overground (train), underground jubilee line, and buses within a walking distance" (Agent C). Both agents from Kilburn reflect that this area now is culturally diverse. "A very long time ago, Kilburn used to have Irish Community which is very lively back in the day, but I am talking about 20 years ago" says Agent C, who maintained a business in Kilburn for 35 years (ibid). Agent C adds: "Now it is completely different, Kilburn is multi-cultural now, which is also good" (ibid). Agent B expresses a similar idea: "It is a very diverse area. You find people (with) all nationalities, … a lot of like Italians, French people come in, they are primarily so far, the two largest renting groups" (Agent B). The presence of non-local long-term tenants has also been observed at Nine elms, in which nearly 70% of properties are rented to students (Agent A). Therefore, diverse tenant groups with greater mobility and varied market sectors in the housing market reveal a gradual change in all aspects from people's everyday life to housing market operations in the urban area.

Table 8. The brief summary of standard letting agents' perception of local Airbnb market (Table by author)

Agents	Did you perceive a rise of Airbnb activity	What do conventional real estate agent think about the neighbourhood?	How conventional real estate agent think about Airbnb Market?
A	It is fairly picked up	Improvement over the past 20 years; Good transportation connection; More entertainment options.	**a great market & business model**. It may work very well in South Tottenham given its good transport connections.;
B	See a rise in the area	Multi-cultural; Good transportation network;	Each other are filling the gaps. It's **growing harmoniously**.
C	There is a little bit around	Multi-cultural; Good transportation network;	Letting properties to Airbnb entrepreneurs, at least we got guaranteed rent and rental income for the landlord. So that **basis is good**.
D	Not many at all	Hotel-style living; All new and well-conditioned; Very secure; Overseas landlord.	it's only going to **get bigger and being better**. I can see eventually that hotel moved towards the kind of Airbnb style, rather than, just hotel rooms.

5.2. The emergence of specialised short-term rental management company

Agents from Kilburn and South Tottenham have been approached by a new type of entrepreneur proficient at utilising digital technologies and online platforms. "There are small companies out there that provide specialist service exclusively for Airbnb, and I was approached by a company, I think about 3, 4 months ago" Agent A from South Tottenham states. Agent C from Kilburn describes how these entrepreneurs approach the conventional sector: "When they see an advert online or on the paper, they will ring up a real estate agent to make arrangement for viewing". These companies checked "the properties that is being advertised (for long-term rental), and want to rent property from there" (ibid). Agent B from Kilburn had a similar experience of receiving calls from those entrepreneurs, they asked "whether we have any properties that would be available for like a STR, and at that time no one weren't really interested (in these properties)" (Agent B).

These entrepreneurs as a sub-economy of the Airbnb market deliver management services and enable more property owners and real estate agents to access to Airbnb network. Most conventional real estate companies will provide management service and have an "in-house management team", which is responsible for maintaining the rental properties (Agent B; Agent C). However, to the conventional agent, STR is difficult to manage, requiring greater attention to communication with guests, higher operational and maintenance costs (ibid).

For "companies that are specialized solely on like Airbnb holiday lets/short term rentals", they are unravelling "a gap in the (property) market" (Agent B). The gap is explained through a case: In 2019, a landlord has a flat nearby Queens Park conversation area in Kilburn, priced at 2,800 £ a month. Due to the high price, "no one wanted to pay the amount", whilst the landlord did not budget the price (ibid). As the property turned into the STR market, it made "a lot of people interested" (ibid). For Agent B from Kilburn, the STR market might help the conventional sector "filling the gap, when a long-term rental market doesn't somewhat meet the requirement of the landlord who may have a financial situation, such as mortgages and loans" (ibid). Based on this sort of thinking, two sectors seem willing to strengthen collaboration with each other and are "growing harmoniously" (ibid). Agent C from Kilburn is in line with Agent B's view, "filling the gap" can work in two ways – conventional sector sometimes is "struggling to let properties, particularly four-beds or a five-beds property", whilst Airbnb

entrepreneurs seek to "rent a property and run STR activity" (Agent C). Through engaging with the conventional sector, Airbnb entrepreneurs expand their share of managed properties and accelerate the alignment between the conventional real estate sector and the new shared accommodation sector.

5.3. A co-operation between sectors under the common-hold tenancy agreement

The conventional agent has been gradually driven into the Airbnb ecosystem. They can act as a conduit for turning long-term rentals into short-term rentals. Through the "commonhold" tenancy agreement a property may be leased to a company (Agent C). The real estate companies give other companies authority to manage their properties, and this "commonhold tenancy is like a business let" (ibid).

Within the commonhold tenancy, unlike the AST, the real estate agent usually "cannot put clauses in the deal" that would prevent other companies from operating STR activity, while tenants "can be asked to leave if they do not pay the rent in two weeks" (ibid). The length of commonhold tenancy can "start of a minimum of a year, and go up to two or even five years" (ibid). Agent C has had experience working with commonhold tenancies with both Airbnb entrepreneurs as well as the local council, but contract length with the council is often longer than that with Airbnb entrepreneurs.
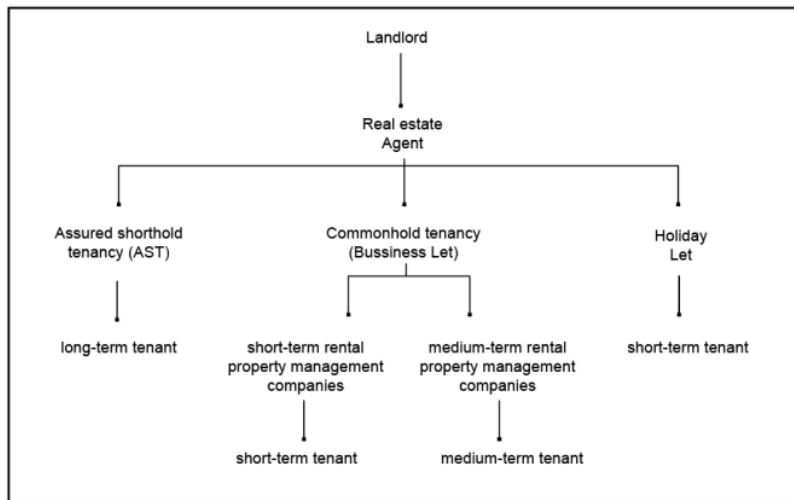
Figure 13. The three types of tenancy agreements mentioned in the interview. (Diagram by author)

These management companies are usually "formed by some individuals", and "they generally try to find landlords that are open to company/business let" via real estate agents, rather than social media (Agent B). If conventional agents have properties, they commonly will put landlords in touch with small management companies (ibid). Agent B considers the growth of management companies from a different angle – the diverse needs of different tenant groups. Now for "both people coming from abroad and people are in the country", they are looking for different rental periods (ibid). Apart from tourism, some companies focus on the medium-term rental [4] business for students and professionals who rent to live and work (ibid).

Dissimilar to the perception from Kilburn agents, where Airbnb entrepreneurs look for a pricey or multi-bedroom property that is available for STR, Agent from South Tottenham observes a different case. Airbnb entrepreneur this time try to persuade the agent to convert a studio flat, which is priced at "£ 1,000 a month, and not the biggest studio flat with about 29 square meters" (Agent A). The entrepreneur contacted the agent and said: "we do Airbnb, and we can potentially give you 1,100 £ a month, which is greater than the market price" (ibid). This is the first-time Agent has been approached by Airbnb entrepreneur and refused their proposal, given the high demand of flat for long-term tenancy and current pandemic circumstance. Also, the agent made an inference that these "Airbnb (management) companies might have opened up Airbnb market in South Tottenham" (ibid). Even though Agent chose not to cooperate with Airbnb entrepreneurs, their team has started looking into this new market. Furthermore, Agent has elucidated the reason why they reject the plan: "Definitely this market interests me, I'm not going to get into a share, maybe it's an area that we will get into because there's certainly grown in the area" (ibid).

[4]. The tenancy length of a medium-term rental is greater than one month and less than a year. The interviews with four real estate agents also note that they often will not deal with this type of tenancy compared with long-term residential lease.

5.4. Summary

This part of content analysis has presented the key themes derived from the synthesis of the four semi-structured interviews, which were conducted to gain an understanding of individual's knowledge of the Airbnb market and the neighbourhood they work in. The primary topic that emerged around real estate agents' experience is about the rise of Airbnb entrepreneurs, that have approached agents at Kilburn and South Tottenham. As specialised property management companies, their business model heavily depends on their ability to amass resources through digital platforms like Airbnb to exploit the informal use of residential properties.

Furthermore, digital entrepreneurs have built their own networks on both digital and physical dimensions. In the real space, their co-operation with local agents expands their market opportunities, by delivering a solution that responds to the concerns of the conventional sector. On the digital platforms, they make the connection with their customers. Even though the interview sample in this study was small, these individual interviewees provide key information based on their in-depth knowledge of the neighbourhood and local property market. it points to a merging of digital and physical markets, slowly shifting the urban resource/actors from conventional use/sector into informal use/sector that treats residential properties as investment assets, rather than homes.

Stors and Baltes (2018) argue that on digital platforms such as Airbnb, hosts can be seen to almost entering a 'performance' to re-image their neighbourhood to the taste of a homogenous audience, namely the generic tourist, an image that in turn substitutes how the real place is perceived. Considering the preceding case studies within this context, digital entrepreneurialism can be seen as aiding the next step toward re-imaging 'place' into 'asset', its value wholly determined by the projected margins above the market price.

6. Discussion

This chapter discusses the ways in which the Airbnb integrates digital and physical dimensions of STR market. Two major points are raised based on cross-examining preceding findings and existing literatures.

First, the city-wide uneven spatial development as a representation of Airbnb's digital, homogenising function. Stors and Baltes (2018) contend that advances in information technologies contributed toward the expansion of tourism from 'central tourist zones' out / into 'residential neighbourhoods' in the past decades. The perception of place is no longer fixed to its physical locale but its image on the interconnected web. The quantitative result underlines the economic impact of this perceptual shift through spatially representing the simultaneous growth of Airbnb market across the city. Inferences are made in relation to the wider discourse around city-wide uneven distributions (Quattrone *et al.*, 2016; Wachsmuth and Weisler, 2018b; Coles *et al.*, 2018; Cocola-Gant and Gago, 2019; Grisdale, 2019; Yrigoy, 2019) and the general characteristics of neighbourhoods with high Airbnb activity (Füller and Michel, 2014; Stors and Baltes, 2018; Ioannides, Röslmaier and van der Zee, 2019).

Second, digital entrepreneurialism exerts an impact on the practice of conventional rental sector. The growing role of the digital entrepreneur is argued under two themes: (1). Digital entrepreneurialism as a product of Airbnb's effort to encouraging individuals to become businesses and building the image of a "collective city space" (Stabrowski, 2017: p343); (2). The platform economy enabling individuals to participate in the professionalisation of STR sub-market (Sigala, 2019).

Regarding the increasingly complex relationship between the digital economy and current planning practice, this chapter ends with the discussion of two academic interviews that consider wider factors impeding the effective management of the digitised STR market.

6.1. Spatially separated neighbourhoods on the same digital marketplace

Results yield that Airbnb activity is spread across different types of residential neighbourhoods and develops unevenly across London. This finding echoes other researches in cities like Toronto and New York (Wachsmuth and Weisler, 2018b; Grisdale, 2019), where Airbnb distribution follows an uneven pattern and extends from the city centre to urban neighbourhoods. Meanwhile, spatial study and longitudinal analysis demonstrate divergent levels of revenue stream into the Airbnb market. This finding relates to the wider concern of the speculative nature of Airbnb-mediated STR activity (Wachsmuth and Weisler, 2018b; Cocola-Gant and Gago, 2019; Grisdale, 2019; Yrigoy, 2019), and reflects Airbnb's "inherent flexibility" that enables different housing units to be used for the profit-making purpose (Cocola-Gant and Gago, 2019: p.2).

There is also no direct evidence showing that high Airbnb revenue in one area will lead the surrounding areas to also rise in revenue. The inference is twofold: either profiting from Airbnb is exclusive to limited types of properties / neighbourhoods, or Airbnb activity is relatively imperceptible / unaccepted to property owners that are less accustomed to the operations of digital platform technologies. This observation is echoed in the interviews with agents: in South Tottenham, entrepreneurs look for specific types of property; whereas, in Kilburn, they attempt to 'open' the market by pitching to a wide range of property owners.

Researchers have found that in general, residential neighbourhoods attracting speculative investment possess 'strong cultural cachet, and leisure amenities' (Wachsmuth and Weisler, 2018: p.1155) and are 'attractive and accessible' (Quattrone *et al.*, 2016: p. 1389). The three case study neighbourhoods demonstrate this observation, but only in parts. Nine Elms has the largest redevelopment project in London and is one of the super-dense residential areas; Kilburn has a multicultural image and outstanding public transit but has not had recent large-scale regeneration; South Tottenham used to be one of the most deprived areas in London but is now awaiting (re)developments. It can be observed that whilst Airbnb-intensive neighbourhoods seem to have a culturally positive image, they still maintain great local differences and do not conform to a homogeneous category.

The growth of Airbnb is assisted by a variety of other information technologies, such as social media, which enable individuals to signify any place in a city (Stors and Baltes, 2018). The quantitative finding indicates dispersed areas with divergent features all remaining active in an overall market downturn, with no indication of a clear cause. It strengthens the understanding that Airbnb – and platform economies – should not be seen as constituting a fixed marketplace. In other words, the spatial unevenness only represents the result of platform-mediated activity, where trade ultimately depends on the dynamic reproduction of urban space in the digital realm.

6.2. Digital Entrepreneurs' Utilisation of the Digital Marketplace

As urban neighbourhoods undergo digital transformation, individuals accustomed to information technologies more easily participate in the Airbnb market (Stors and Baltes, 2018). Sigala (2019) reports that entrepreneurs are venturing beyond out-sourcing for property owners, to building networks with other actors to expand resources on the new digital marketplace (Sigala, 2019). In my study, interviewees report that Airbnb entrepreneurs have initiated cooperation with conventional letting agents, who are familiar with the local neighbourhood and managing local housing resources.

The diagram below demonstrates the structure of digital entrepreneurialism in the London private rental market, derived from research findings. By initiating contact with the local housing agencies, they might be able to find properties available for STR or attract agents with a higher profit that Airbnb offers. Once the commonhold tenancy agreement is established, managing right transfers to the entrepreneur and the property may be converted to STR. It follows that the emergence of digital entrepreneurialism specialised on the STR property service, instead of reclaiming 'under-utilised' properties that are inherently unpopular in the long-term rental market, is accelerating the reappropriation of urban accommodation.
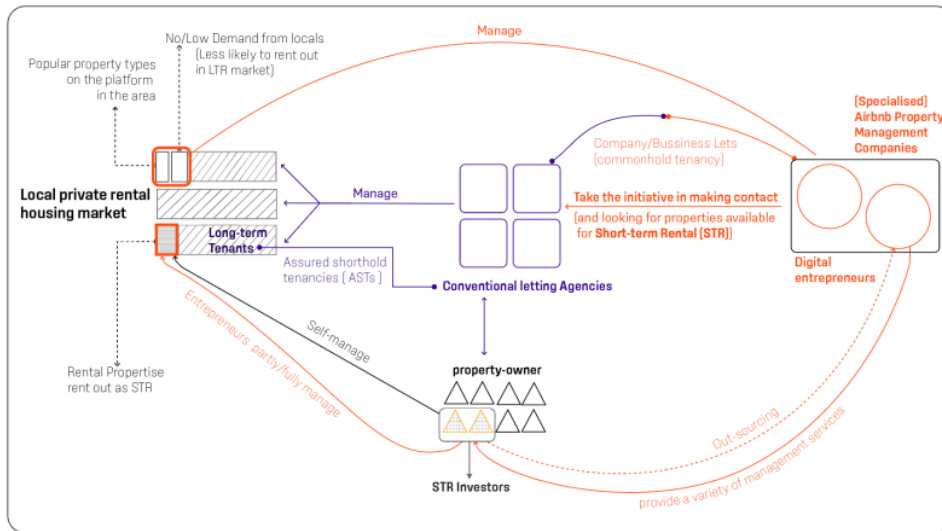
Figure 14. The possible process of how digital entrepreneurs develops their business opportunity in London private rental market. (Diagram by author)

6.3. Difficulties of managing the rise of digital-mediated STR in London

The damage to international tourism brought by the pandemic has seen some property owners converting back to longer-term tenancy agreements with the local councils or using the properties as temporary accommodation for families at risk of homelessness (research A). Meanwhile, Airbnb is advertising flats for NHS workers to alleviate pressure from the pandemic (research B). There can be observed an effort from the platform and users to shift its solely touristic use toward taking on more social responsibility. However, these are also short-term strategies conceived with the idea that international travel will resume (research A). There is little in these crisis programmes that seem to be aiming at long-term change, but more visibly they would become another part of the platform's advertisement campaign to alter its "public image" (research B).

This returns the discussion to that of perception in the digital realm as a barrier that may impede effective management of the digitised STR market. Platforms such as Airbnb curate their online profiles, which for many are the only way of knowing a business. At the same time, the longer-lasting impacts of platform economy on the city are less perceptible and more difficult to represent. Therefore, there is a schism between the representation of a digital platform and its functioning within the city.

58

Within the regulatory body itself, a schism exists between the UK government and the planning sector. The central government wants to be seen as "a deregulating force" for the nation and this overall value clashes with the reality of enforcing and maintaining existing regulations. In comparison to some other European cities, London has a strong sense of individual "private property rights" (ibid). And the public may find it difficult to accept that they must obey restrictions in their own property use based on how 'the community feels' or 'what we should do as a group' (researcher A).

Lastly, and perhaps the most spatial barrier to effective management, is that the uneven distribution of Airbnb-induced effects demands neighbourhood and even development-specific regulations. Researcher B stresses that the impact brought about by Airbnb investment can be almost negligible in parts of the city but in other parts displaces whole communities due to conversion of whole blocks / new build specifically designed for STR.

7. Conclusion

This study suggests the importance of a multi-scalar consideration, which can unpack the interactions between digital and physical dimensions of the Airbnb market. The diagram below demonstrates how the digital layer is integrated into the city context.

As Airbnb encourages individuals to participate in the virtual network, their individual incentives and actions can disrupt conventional activities and their supply of services and resources can support market growth. Therefore, the underlying trend of Airbnb development cannot be intervened by measuring the uneven spatial pattern, which does not reflect the individual-level interventions for STR activity. Instead, spatial studies uncover the impact of current development on the local community and examine the vulnerability of different neighbourhoods to rental price fluctuation.

The study of the internal dynamic of an urban neighbourhood is critical because it reveals the connection between the digital marketplace and physical development; it examines how a neighbourhood image is re-created on the virtual platforms. The divergent patterns of development observed in this study imply that the expansion process is context-specific, involving multiple actors on and off the online medium. Seen through an inter-connected multi-scalar lens, the impacts of Airbnb's proliferation are best captured as a growing interaction between the digital and physical sides of the market.

This multi-scalar framework underlines the significance of spatial analysis of city-wide development and case analysis of specific areas, to examine the most affected area (Quattrone *et al.*, 2016; Wachsmuth and Weisler, 2018b; Grisdale, 2019; Yrigoy, 2019) and to suggest the general trend of high Airbnb activity neighbourhood (Füller and Michel, 2014; Stors and Baltes, 2018; Ioannides, Röslmaier and van der Zee, 2019). At the same time, it highlights that the digitally-mediated market is facilitated through specific actors, where interaction between digitally mediated and conventional sector concretely re-shapes rental practice.
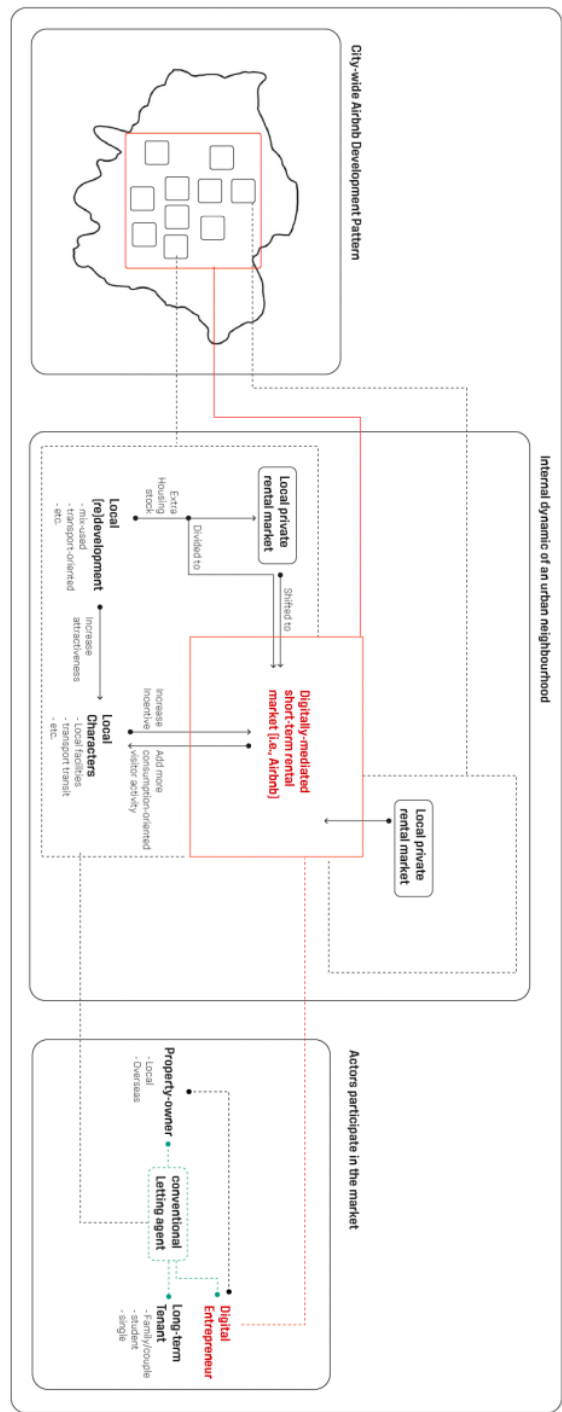
Figure 15. The digitally-mediated market interaction seen through inter-connected multi-scalar lens

61

Innovation in information technologies led to the development of Airbnb market (Ferreri and Sanyal, 2018). Digitally mediated exchanges affect the function of residential area and the functioning of planning sector (Holman, Mossa and Pani, 2018). Through the digital platforms, this active marketplace not only exists as a virtual space for different groups to cooperate, but also can extract resources in the physical environment.

All the properties participate in the same digital space connected by Airbnb. Therefore, the city experiences homogeneous change when hit by a global pandemic. On this level, it seems neighbourhood differences are insignificant in comparison to the impacts brought about by the fluctuations in the interconnected international network of trade. However, when looking closer into these general trends of market fluctuations some places exhibit outlier behaviour where Airbnb activities remain persistent relative to the larger trend.

Amongst themselves, these places also exhibit divergent behaviours in the pattern of change in the revenue and number of listings on the longitudinal axis. The decision was made to conduct field research in three of such areas and interview the local conventional letting agents, as they would be the first to notice the market impacts on the long-term conventional rental market. This yields the discovery of the emergence of digital entrepreneurs specialised at Airbnb markets, where management services introduce investment to create professionally managed Airbnb properties. It builds a relationship between property owners and the existing conventional real estate sector based on sub-letting and transferring management rights. Some agents say these new management services begin to develop the niche market untouched by standard lettings.

It can be said that this adds a new digital dimension to the local neighbourhood that accelerates the process of re-branding and reappropriation. It relies on the interconnectedness of the digital marketplace where investors may influence physical neighbourhoods / increase its market value by curating its representation on the virtual platforms. As for the planning sector, this implies a new field of regulatory interest where local urban space is not only influenced by conventional development activities but also the more subtle, digital 're-imaging' of existing properties.

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Spatial pattern of Airbnb activity at 2019

(Each dot represents one full-time Airbnb listing; A darker colour suggests a higher percentage of total revenue flow into Airbnb; Locations of case study area: Nine Elms (red) / Kilburn (purple) / South Tottenham (yellow))
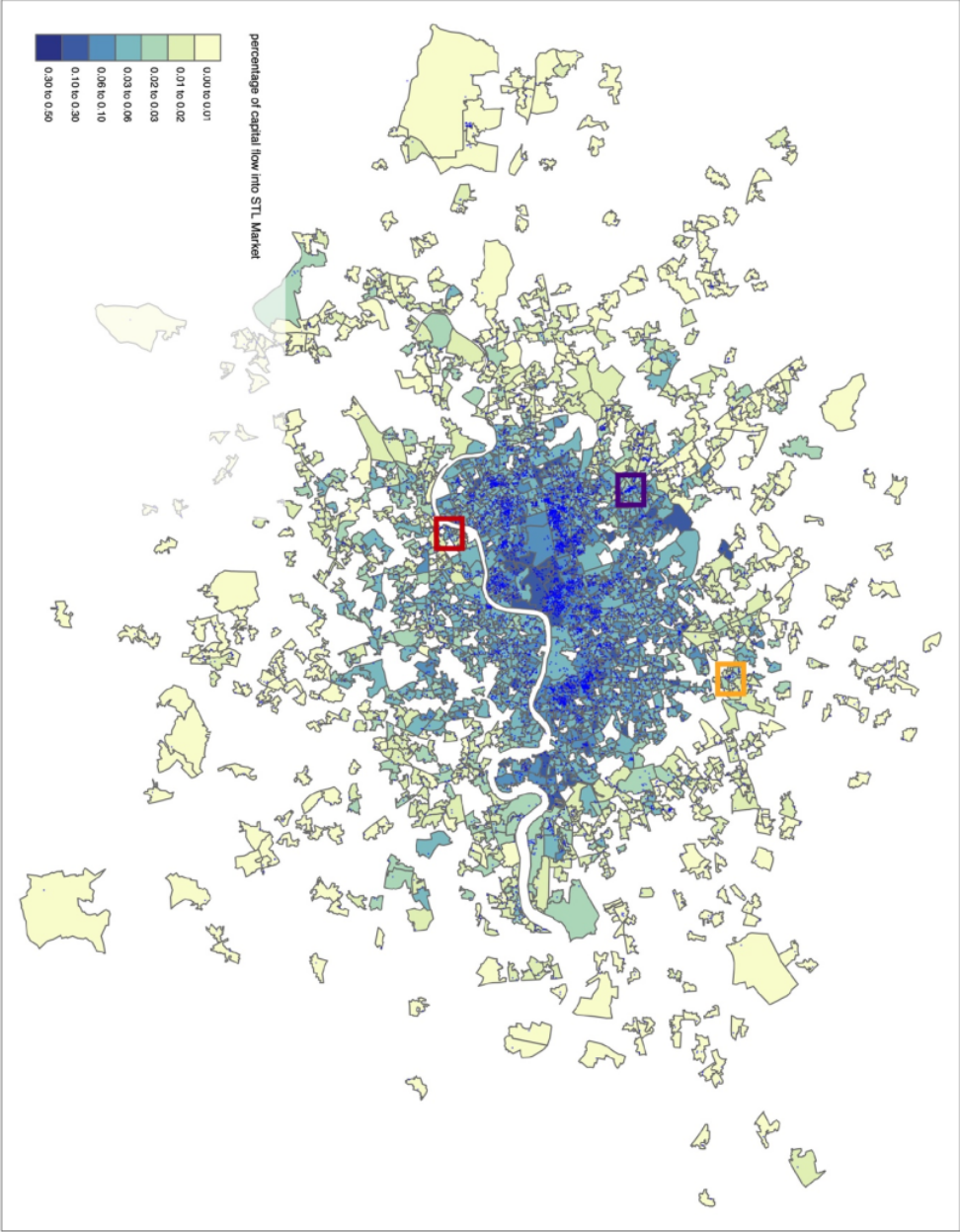
Spatial pattern of Airbnb activity at 2020
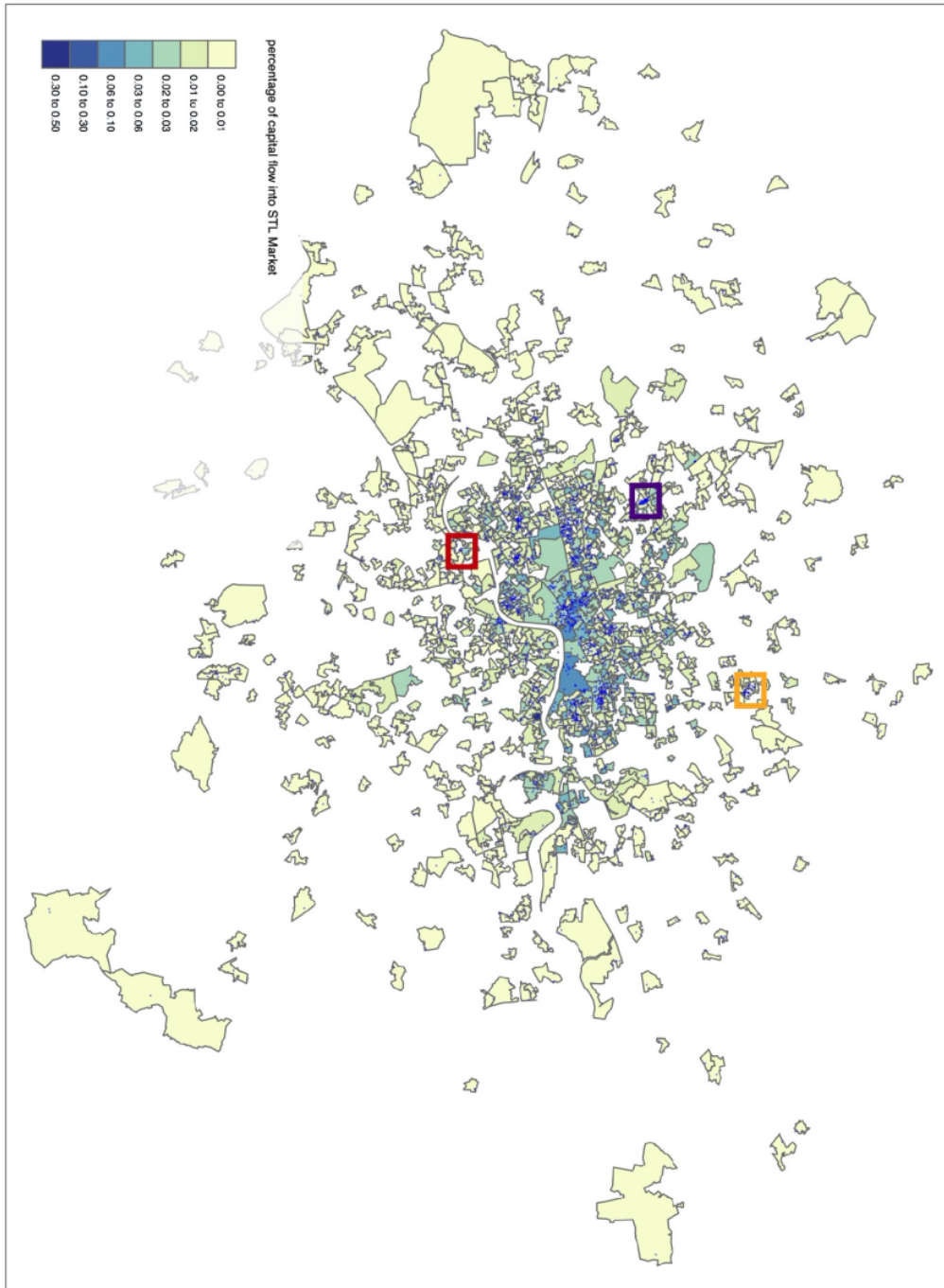
- The data from inside Airbnb website is scraped from Airbnb for any point in time and is a snapshot of listings available at that date only. Thus, the changes of data between this time and next are not captured, and the data available on a specific data may not exist now, since the listings can be removed or added from the Airbnb platform.
- The geo-referenced data is provided by Airbnb, however, due to its protection of users' privacy, the geographic coordinates are deviated from the correct location with a deviation value of 150 meters.

ACTIVE LISTINGS IN LONDON'S BOROUGHS
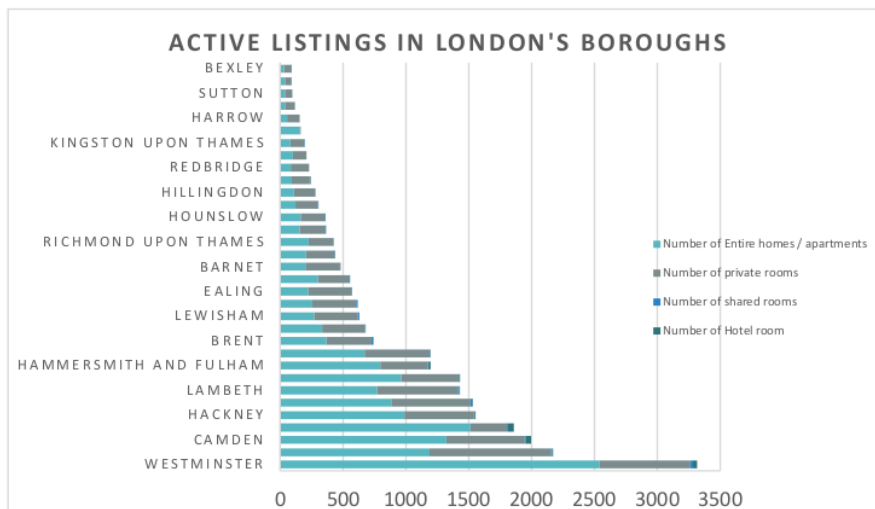
- The data has included the unique host IDs, which can be used to check the number of listings that a host had created on Airbnb. However, to get around the 90-night restrictions in London, the host might create an account at other platforms such as Vrbo and Booking.com, or create an additional account at Airbnb with the same listing.
- For the active listings in London, 17018 unique host IDs are recorded (according to the data on OCT 2020). The average number of listings that could be connected to a host unique ID is 1.5.
- The table below presented the number of active listings that rest on the hosts who has one or multi-listings linked to their unique ID.

Number of listings linked to host ID	Number of active listings	Number of hosts	Percentage of active listings host managed
1	11,551	11,551	44.8%
2	4,190	2,658	16.3%
3	1,956	1,010	7.6%
4	1,218	601	4.7%
5-10	2,858	874	11.1%
11-20	1,514	190	5.9%
21-30	696	66	2.7%

31-40	392	24	1.5%
41-50	446	22	1.7%
51-100	290	11	1.1%
101-200	414	7	1.6%
201-300	205	3	0.8%
300 or more	46	1	0.2%
Total	25,775	17,018	100%

- The occupancy model can determine whether hosts are letting out their residential units permanently as hostels to house visitors. San Francisco planning department [1] and Budget and legislative Analyst's Office [2], both have created occupancy models to quantify the Airbnb impact on local housing. Afterwards, Inside Airbnb modified the two models and construct a model termed "San Francisco model", which have been used by many planning research teams around the globe. For instance, in the housing research of short-term and holiday letting in London, the Greater London Authority (GLA) housing and land team applied this methodology to predict the occupancy rate. The methodology of the "San Francisco model" is as follows:
    - The number of bookings per year is estimated by converting the average number of reviews per month with a review rate of 50%.
    - The estimated occupancy is the estimated number of bookings per year multiplied by the presumed average length of stay, which applies in this paper was taken from the study by London First [3] that gave an assumed length of stay of 5.3 nights for international visitors who use Airbnb as accommodation in London. (If a listing has a value of minimum nights of stay that is higher than the assumed length of stay, the minimum value is used alternatively.)
    - Inside Airbnb assumed that the occupancy rate per year is capped at 255 nights or 70%, which reflects a high but reasonable rate for a highly-occupied hotel/hostel.

- For this case, the estimated occupied nights per year can be contrasted against the limitation set in the planning regulation that short-term letting can be rented within the legal limit of 90 nights. Again, as mentioned above, hosts can get around the 90-night restriction by switching between different platforms or creating additional Airbnb accounts or listings with the same house/apartment.

[1]: San Francisco Planning Department, Amendments Relating to Short-Term Rentals, April 2015

[2]: San Francisco Budget and Legislative Analyst's Office, Analysis of the impact of short-term rentals on housing, May 2015

[3]: London First, London & Partners, Airbnb, EY and Mastercard, Tourist Information: Mapping the local value of international visitors, May 2019

- Estimated occupancy rate (nights) of active listings in London:

occupancy (nights)	number of listings	percentage of listings
1 to 30	3589	13.90%
31 to 90	8279	32.10%
91 to 255	10333	40.10%
>255	3574	13.90%
total	25775	100%
> 90	13907	54%

Mean of estimated Nights per year: 140

Mean of estimated occupancy rate: 38.4%

- As the estimated occupancy rate over 90 nights, the number of active listings rest on the hosts who has one or multi-listings that linked to their unique ID:

Number of listings linked to host ID	Number of active listings	Number of hosts	percentage of listings host managed
1	5924	5924	68.38
2	2311	1189	13.73
3	1127	558	6.44
4	752	301	3.47
5 to 10	1717	451	5.21
11 to 50	1696	222	2.56
51 to 100	122	10	0.12
101 to 200	172	5	0.06
200 or more	86	3	0.03
total	13907	8663	100

- Average nightly price of active listings in London boroughs

Borough Name	Average nightly price of active listings				
	Entire home / apartment	private room	shared room	hotel room	all listings types
Westminster	203	94	28	183	178
Tower Hamlets	118	45	28	92	85
Camden	140	55	29	86	112
Kensington and Chelsea	169	75	33	138	153
Hackney	116	46	30	76	91
Southwark	138	51	23	22	100
Lambeth	123	44	31	110	85
Islington	207	55	19	27	158
Hammersmith and Fulham	134	64	24	49	110

Wandsworth	136	47	225	138	97
Brent	117	46	131	220	84
Haringey	110	40	88	85	95
Lewisham	98	35	19	/	62
Newham	130	44	24	148	80
Ealing	117	43	30	86	72
Greenwich	115	38	28	42	80
Barnet	102	42	/	277	73
Waltham Forest	87	35	28	76	60
Richmond upon Thames	143	51	/	59	100
Croydon	82	30	33	56	53
Hounslow	121	45	21	95	79
Merton	127	41	48	/	76
Hillingdon	90	37	/	48	58
Enfield	112	37	/	64	66
Redbridge	130	50	/	/	80
Bromley	90	35	/	/	61
Kingston upon Thames	109	43	17	/	71
City of London	558	51	/	/	531
Harrow	105	37	/	/	62
Barking and Dagenham	88	58	/	/	68
Sutton	80	38	/	/	55
Havering	106	29	50	/	63
Bexley	102	35	43	51	58
London	150	50	38	118	110

Processed Data

The table shows the sample of processed data for mapping the spatial distribution of Airbnb activity at 2019/2020.

Details of all processed data can be found in the link below:

https://drive.google.com/drive/folders/1jxURXmQ8URm1_ww6yfQTaslRTN23-dzT?usp=sharing

The processed data for the spatial study of Airbnb activity at 2019

neighbourhood	host listings count	property type	price	last review	reviews per month	Annual occupancy	Airbnb / private Price	proportional contribution - Airbnb
Lambeth	3	Apartment	88	15/09/2019	1.59	202.248	1.383647799	15%
Brent	1	Apartment	100	22/09/2019	1.17	148.824	1.997336884	12%
Hammersmith and Fulham	2	Apartment	85	06/10/2019	1.1	139.92	1.204534719	17%
Westminster	1	Apartment	120	10/10/2019	1.11	141.192	1.181877873	24%
Southwark	4	Apartment	85	04/08/2019	1.81	230.232	1.484284051	18%
Hammersmith and Fulham	3	Apartment	400	29/09/2019	1.33	169.176	5.668398677	48%
Tower Hamlets	2	Apartment	140	16/06/2019	1.79	227.688	2.288828338	36%
Kensington and Chelsea	2	House	105	30/07/2019	3.35	426.12	1.042011247	18%
Tower Hamlets	1	Apartment	70	23/09/2019	2.06	262.032	1.144414169	22%
Westminster	1	Boat	160	02/10/2019	4.35	553.32	1.575837163	29%
Hackney	15	Apartment	120	14/09/2019	1.79	227.688	1.954397394	28%
Kensington and Chelsea	1	Apartment	95	30/09/2019	2.86	363.792	0.942772081	17%
Lambeth	3	Apartment	240	18/09/2019	2.16	274.752	3.773584906	33%
Kensington and Chelsea	1	Apartment	170	10/09/2019	1.92	244.224	1.687065829	26%
Westminster	12	Apartment	189	18/09/2019	1.56	198.432	1.861457649	33%
Westminster	12	Apartment	229	17/08/2019	1.06	134.832	2.25541694	37%
Kensington and Chelsea	12	Apartment	159	19/09/2019	2.55	324.36	1.577902746	25%
Hammersmith and Fulham	4	Apartment	80	04/10/2019	1.31	166.632	1.133679735	16%
Kensington and Chelsea	12	Apartment	149	31/08/2019	2.01	255.672	1.478663579	24%
Barnet	5	Apartment	50	23/08/2019	1.18	150.096	1.000667111	3%
Southwark	8	Apartment	135	24/08/2019	2.32	295.104	2.357392317	26%
Islington	2	Apartment	99	07/10/2019	2.02	256.944	1.482775836	22%
Kensington and Chelsea	2	Condominium	99	09/09/2019	1.35	171.72	0.982467747	17%
Croydon	10	Townhouse	175	12/10/2019	1.16	147.552	4.605263158	8%
Newham	5	Townhouse	119	14/08/2019	1.32	167.904	2.456985547	12%
Richmond upon Thames	1	Apartment	130	30/09/2019	1.13	143.736	2.125340599	7%
Ealing	3	Apartment	60	09/10/2019	1.15	146.28	1.147227533	4%
Islington	2	Apartment	99	28/09/2019	2.05	260.76	1.482775836	22%
Westminster	1	Apartment	110	25/08/2019	1.48	188.256	1.08338805	22%
Hackney	8	Apartment	120	20/04/2019	1.34	170.448	1.954397394	28%
Lambeth	10	Apartment	88	16/09/2019	1.99	253.128	1.383647799	15%
Tower Hamlets	3	Apartment	85	10/05/2019	1.06	134.832	1.389645777	25%
Hammersmith and Fulham	1	Apartment	179	30/09/2019	1.22	155.184	2.536608408	29%
Camden	1	Apartment	99	01/10/2019	1.26	160.272	1.29018245	23%
Redbridge	1	House	150	19/08/2019	1.89	240.408	3.432494279	6%
Lambeth	3	Apartment	110	30/09/2019	2.49	316.728	1.729559748	18%
Hammersmith and Fulham	14	Apartment	100	09/10/2019	1.7	216.24	1.417099669	19%
Westminster	6	Apartment	200	05/10/2019	2.27	288.744	1.969796454	34%
Hammersmith and Fulham	14	Apartment	100	05/07/2019	2.37	301.464	1.417099669	19%
Hackney	1	Apartment	95	24/05/2019	2.96	376.512	1.54723127	24%
Lambeth	1	Apartment	160	13/07/2019	1.07	136.104	2.51572327	24%
Kensington and Chelsea	4	Apartment	95	24/07/2019	2.35	298.92	0.942772081	17%
Hackney	1	Apartment	150	13/10/2019	2.34	297.648	2.442996743	33%
Kensington and Chelsea	4	Apartment	79	02/10/2019	2.52	320.544	0.783989414	14%
Westminster	2	Apartment	70	21/09/2019	1.38	175.536	0.689428759	15%
Kensington and Chelsea	1	Apartment	100	19/09/2019	2.77	352.344	0.992391664	17%

Title of Study: Airbnb's spatial pattern across time and social context
Department: Bartlett School of Planning, University College London.
Name and Contact Details of the Principal Researcher: Zixuan Xiong
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Name and Contact Details of the UCL Supervisor: Dr Susan Moore
susan.moore@ucl.ac.uk

Information and consent form

Introduction

You are being invited to take part in a research project being undertaken by a Masters student from the Bartlett School of Planning, University College London (UCL).

Before you decide whether or not to participate it is important for you to understand why the research is being conducted and what participation will involve. Please read the following information carefully, feel free to discuss it with others if you wish, or ask the research team for clarification or further information. Please take time to decide whether or not you wish to take part.

Why is this research being conducted?

The aim of this project is to investigate the complexity of short-term rental market in London. The first part follows a quantitative method. It maps the uneven spatial distribution of Airbnb activity in order to holistically understand variegated forms of STR properties. This guides the following qualitative research, including field observations and expert interviews. Overall, the study aims to reveal the connection between the prominence of platform economy and place-specific social characteristics.

Why am I being invited to take part?

The research performs its analysis of socio-economic phenomena based on a close look on the rental property market. In order to understand the place-specific context it requires the working knowledge of local professionals who work in related sectors.

Do I have to participate?

Participation is entirely voluntary. If you do choose to participate and then change your mind, you may withdraw from the research up to 2 months after the completion of the task with no consequences and without having to give a reason.

What will happen if I choose to take part?

If you do choose to participate, you will be invited to online interview explore the issues highlighted above. The interview will be conducted at a mutually agreed location. The interview will last approximately 15 minutes and will be audio recorded (and transcribed at a later date). You will have the

opportunity to see the interview transcript and agree any amendments with the researcher after the interview is concluded.

What are the advantages of taking part?

There are no immediate benefits for participating in this project and no financial incentive or reward is offered, however it is hoped that this project will inform a more holistic understanding of the London's short-term rental market and its implications.

What are the possible disadvantages of taking part?

We anticipate no significant disadvantages associated with taking part in this project. If you experience any unexpected adverse consequences as a result of taking part in the project you are encouraged to contact the researcher as soon as possible using the contact details on the first page of this information and consent sheet.

If I choose to take part, what will happen to the data?

The interview data will be anonymised at the point of transcription and identified by a general identifier (e.g. 'Planning officer A' or 'Planning consultant B' or a suitable pseudonym). A record of participant identities and any notes will be kept separately and securely from the anonymised data. All data and information affiliated with this project will be securely stored on an encrypted computer drive and physical documents will be stored securely on University property.

The data will be only used for the purposes of this research and relevant outputs and will not be shared with any third party. The anonymised data may be utilised in the written dissertation produced at the end of this project, and this dissertation may then be made publicly available via the University Library's Open Access Portal, however no identifiable or commercial sensitive information will be accessible in this way.

What will happen to the results of the research project?

It is anticipated that the data collected in this project will be included in the dissertation produced at the end of this project, submitted for the award of a Masters degree at University College London (UCL). You will not be personally identified in any of the outputs from this work, and attributions and quotations will be anonymised. If you would like to receive an electronic copy of any outputs stemming from this project please ask the contact below who will be happy to provide this.

Concerns and / or Complaints

If you have concerns about any aspect of this research project please contact the Principal Researcher in the first instance, then escalate to the supervisor.

Informed Consent Sheet
Title of project

If you are happy to participate, please complete this consent form by ticking the boxes to acknowledge the following statements and signing your name at the bottom of the page.

Please give the signed form to the researcher conducting your interview at the interview. They will also be able to explain this consent form further with you, if required.

1.	I have read and understood the information sheet.	☐
2.	I agree to participate in the above research by attending an online interview as described on the Information Sheet.	☐
3.	I understand that my participation is entirely voluntary.	☐
4.	I understand that I may withdraw at any time without giving a reason and with no consequences.	☐
5.	I agree for the interview to be audio recorded.	☐
6.	I understand that I may see a copy of the interview transcript after it has been transcribed and agree any amendments with the researcher.	☐
7.	I understand that the intention is that interviews are anonymised and that if any of my words are used in a research output that they will not be directly attributed to me unless otherwise agreed by all parties.	☐
8.	I understand the data from this project will be considered for repository in the UCL Open Access repository as described on the Information Sheet but that this will be anonymised data only.	☐
9.	I understand that I can contact the researcher who interviewed me at any time using the email address they contacted me on to arrange the interview, or the supervisor using the contact details provided on first page of the information sheet.	☐

Participant name: **Signature:**   **Date:**

Researcher name: **Signature:**   **Date:**

The example of interview questions

1. What is usual length of your rental contract?
   a. Does your business manage Short-term rental?
   b. Is there any change of length?
   c. Is there a relation between the type of property and its tenancy length in your experience?
   d. Where is your main operation area, do you mostly manage properties around the local area here or elsewhere?

2. How do you perceive the rise of short-term rental platform, like Airbnb?
   a. In you experience, what type of property are most likely to be putted onto str platforms
   b. Do you think there are Agencies that are exclusively managing short-term rentals?

3. In your knowledge, what type of property owner are more likely to invest short-term instead of long-term rental market?

4. What do you think is the difference between managing the short-term rental and conventional long-term rental?

5. Do you think the short-term rental market has made any impact on your business or otherwise?

6. What do you think is the main incentive to invest (short-term) rental market in your area? (Local peculiarities)

7. From this point on, how do you perceive the future trend of short-term rental market?

Investigation on neighbourhood context

About Local housing market

Dimension	Indicator		Area:		
			Nine Elms	Kilburn	South Tottenham
Housing related	Average rent per month (Long-term) (£)	Studio	1708	1024	935
		1 bed	2061	1313	1181
		2 bed	3118	1661	1459
		3 bed	4897	2128	1676
	New housing units per 100 persons (2016-2020) (Borough Level)		1.84	1.78	1.79
	Property types	Detached	0.70%	2.70%	5%
		Semi-Detached	1.30%	4%	8.50%
		Terraced	6.10%	11.30%	29.60%
		Flat (purpose built)	80.60%	38.80%	39.50%
		Flat (conversion)	10%	41%	15.10%
		Flat (commercial)	1.50%	2.20%	2.20%
	Tenures	Owned (outright)	13.20%	14.20%	11.40%
		Owned (mortgaged)	14.40%	19.50%	18.40%
		Shared ownership	2.40%	0.80%	2.40%
		Social rented	37.10%	26.30%	37.10%
		Private rented	30.70%	37.80%	29%
		Rent-free	2.20%	1.50%	1.70%
	Number of bedrooms	Studio	2%	10%	7%
		1 bed	26%	28%	28%
		2 bed	60%	39%	26%
		3 bed	12%	17%	27%
		4 bed	0%	5%	10%
		5 bed	0%	1%	2%

Clearly, the price range of rental housing is broad, and Nine Elms has the widest price range. Moreover, there is no significant difference between the new housing units per 100 persons of three neighbourhoods. All areas have been actively constructing new housing. For every 100 people in these neighbourhoods, around two more units have been constructed in the past five years.

Regarding the property types, in Nine Elms, most of the building (about 80 per cent) are built for residential use only; in Kilburn, flat is nevertheless the most popular property type with a great amount of converted flat resulting from the conversion of non-residential properties or houses; and South Tottenham has more houses (about 43.1 per cent) than the other areas, but within its own area flat is still the dominant type.

The greater the number of bedrooms, the more likely the property is to house the family group. As for Kilburn and south Tottenham, they have more properties with more than three bedrooms (23 per cent and 39 per cent respectively). On the other hand, Nine Elms has a low percentage of more than three bedrooms, but 60 per cent of properties are two bedrooms.

About local socio-economic condition

Dimension		Indicator	Area:		
			Nine Elms	Kilburn	South Tottenham
Demographic & economic related	Age structure	(0-9)	10.40%	11.10%	13.70%
		(10-19)	8.80%	7.30%	12.60%
		(20-29)	23.50%	22.30%	18.40%
		(30-39)	20.20%	23.80%	18.80%
		(40-49)	14.60%	13.50%	15.40%
		(50-59)	10%	8.50%	8.90%
		>= 60	12.50%	13.50%	13.50%
	Quantity changes of domestic migrant as a percentage (Borough level)	2016	-0.80%	-1.90%	0.70%
		2017	-0.70%	-1.60%	0.40%
		2018	-0.70%	-1.70%	0%
		2019	-0.60%	-1.60%	0.50%
	Quantity changes of international migrant as a percentage (Borough level)	2016	0.40%	2.00%	0.20%
		2017	0%	1.90%	0.30%
		2018	0.30%	2.60%	0.40%
		2019	0.50%	1.80%	0.20%
	Occupation structure	Higher/intermedia managerial, administrative and professional	36%	37%	16%
		Supervisory, clerical and junior managerial, administrative and professional	34%	33%	29%
		Skilled manual workers	10%	11%	17%
		casual worker/State pensioners/unemployed	20%	20%	37%

Nine Elms and Kilburn share similar age and occupation structures. In comparison, South Tottenham has a smaller proportion of the young population and an inversed occupation structure, where the percentage of 'casual worker / state pensioners / unemployed' is the highest and that of 'Higher/intermediate managerial, administrative and professional' occupations is the lowest.

Regarding the overall changes in the quantity of the domestic and international mover, for both Nine Elms and Kilburn, the number of domestic migrants is dropping, while more international migrants have moved in. Moreover, Kilburn has the fastest growth of the international migrant within its population. By contrast, South Tottenham has experienced a growth in both international and domestic migrants.

About Transportation

Dimension	Indicator	Area:		
		Nine Elms	Kilburn	South Tottenham
Transportation related	Percentage of public transit users	56.90%	64.30%	67.40%
	Public transport accessibility scores	6b	5	6a

In all neighbourhoods, over half the residents were public transit users. For the accessibility of public transportation, all case study areas are located near public transit. Transportation for London has introduced the public transport access level (PTAL) measure that assesses how well the neighbourhood is connected to the public transportation system in London. The PTAL value range from 0 to 6, and the higher the value, the better the transport service performs in terms of its capacity and quality. PTAL value six has two sub-categories (6a and 6b), and 6b is the highest score. Nine Elms has the greatest accessibility to the service, but all case study areas can access public transport easily and have the major rail / underground / overground stations nearby. Particularly for South Tottenham area, it has an express line to Stansted Airport and will become one of the best-connected areas after the completion of Crossrail two. As Sean (2019) implies that Airbnb investors are realizing that the gap between standard market rent and Airbnb market rent is huge in inner-city neighbourhoods, particularly those near public transit.

Summary:

For South Tottenham, the continued growth in the population can lead to ever-increasing use of housing units. it also has covered a wide range of housing options, meaning it can accommodate different housing demands (i.e., couples and large family groups). Linking to the result from the longitudinal analysis of the Airbnb market, South Tottenham has experienced quick growth in its housing stock since 2018, while Airbnb's total revenue is increasing consistently. On the other hand, Kilburn has a continuous inflow of international migrants and outflow of domestic labour every year. Furthermore, even though the growth rate of the housing stock is the lowest, its housing characteristics include a large portion of converted flats, which means an increasing demand for housing. Compared with Kilburn, Nine Elms has a similar trend to a greater influx of international migrants and a comparable occupation/age structure.

Ethical clearance questionnaire

🖶 Respondent: **Zixuan Xiong** Submitted on: Thursday, 1 July 2021, 7:59 PM

Ethical Clearance Pro Forma

It is important for you to include all relevant information about your research in this form, so that your supervisor can give you the best advice on how to proceed with your research.

You are advised to read though the relevant sections of UCL's Research Integrity guidance to learn more about your ethical obligations.

Please ensure to save a copy of your completed questionnaire BEFORE hitting 'submit' (you will not be able to access it later).

Submission Details

1 Please select your programme of study.

> MPlan City Planning : MPlan City Planning

2 Please indicate the type of research work you are doing.

- ☐ Dissertation in Planning (MSc)
- ☑ Dissertation in City Planning (MPlan)
- ☐ Major Research Project

3 Please provide the current working title of your research.

Rethinking the platform-mediated short-term rental market: a study of Airbnb activity across London neighbourhoods;

4 Please select your supervisor from the drop-down list.

> Moore, Susan : Moore, Susan

Research Details

5 Please indicate here which data collection methods you expect to use. Tick all that apply.

- ☑ Interviews
- ☐ Focus Groups
- ☐ Questionnaires (including oral questions)
- ☐ Action research
- ☐ Observation / participant observation
- ☐ Documentary analysis (including use of personal records)
- ☑ Audio-visual recordings (including photographs)
- ☐ Collection/use of sensor or locational data
- ☐ Controlled trial
- ☐ Intervention study (including changing environments)
- ☐ Systematic review
- ☑ Secondary data analysis
- ☐ Advisory/consultation groups

6 Please indicate where your research will take place.

> UK only : UK only

7 Does your project involve the recruitment of participants?

'Participants' means human participants and their data (including sensor/locational data and observational notes/images.)

◉ Yes ○ No

Appropriate Safeguard, Data Storage and Security

8 Will your research involve the collection and/or use of personal data?

81

Personal data is data which relates to a living individual who can be identified from that data or from the data and other information that is either currently held, or will be held by the data controller (you, as the researcher).

This includes:

- Any expression of opinion about the individual and any intentions of the data controller or any other person toward the individual.
- Sensor, location or visual data which may reveal information that enables the identification of a face, address etc. (some postcodes cover only one property).
- Combinations of data which may reveal identifiable data, such as names, email/postal addresses, date of birth, ethnicity, descriptions of health diagnosis or conditions, computer IP address (of relating to a device with a single user).

○ Yes ○ No

9 * Is your research using or collecting:

- special category data as defined by the General Data Protection Regulation*, and/or
- data which might be considered sensitive in some countries, cultures or contexts?

*Examples of special category data are data:

- which reveals racial or ethnic origin, political opinions, religious or philosophical beliefs, trade union membership;
- concerning health (the physical or mental health of a person, including the provision of health care services);
- concerning sex life or sexual orientation;
- genetic or biometric data processed to uniquely identify a natural person.

○ Yes ● No

10 * Do you confirm that all personal data will be stored and processed in compliance with the General Data Protection Regulation (GDPR 2018)?

● Yes
○ No
○ I will not be working with any personal data

11 * I confirm that:

☑ The information in this form is accurate to the best of my knowledge.
☐ I will continue to reflect on, and update these ethical considerations in consultation with my supervisor.

=

RISK ASSESSMENT FORM
FIELD / LOCATION WORK

^UCL

The Approved Code of Practice - Management of Fieldwork should be referred to when completing this form
http://www.ucl.ac.uk/estates/safetynet/guidance/fieldwork/acop.pdf

DEPARTMENT/SECTION: BARTLETT SCHOOL OF PLANNING
LOCATION(S): LONDON
PERSONS COVERED BY THE RISK ASSESSMENT Zixuan Xiong
BRIEF DESCRIPTION OF FIELDWORK:

The interviews were conducted during a lockdown period, online / phone conversations were offered as the interview method and in-person

communication to only take place at the insistence of the interviewee. The site observation collects visual data and is carried out in three case-

study neighbourhood (Kilburn, South Tottenham, and Nine Elms) between February and April 2021.

Consider, in turn, each hazard (white on black). If **NO** hazard exists select **NO** and move to next hazard section.
If a hazard does exist select **YES** and assess the risks that could arise from that hazard in the risk assessment box.
Where risks are identified that are not adequately controlled, they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.

ENVIRONMENT	**The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard**
e.g., location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.	Examples of risk: adverse weather, illness, hypothermia, assault, getting lost. Is the risk high / medium / low?
	Walking in London. Risk:
	1. risk of crime in London. moderate risk;
	2.risk of being hit by traffic or getting lost. moderate risk;
	3. risk of extreme climate (rainfall or sun exposure). Low risk;
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

	work abroad incorporates Foreign Office advice
	participants have been trained and given all necessary information
	only accredited centres are used for rural field work
X	participants will wear appropriate clothing and footwear for the specified environment
	trained leaders accompany the trip
X	refuge is available
X	work in outside organisations is subject to their having satisfactory H&S procedures in place
X	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

I will never carry any important valuables on me apart from my mobile phone in case of emergencies which will be hidden from sight, my wallet which will have my emergency money, my credit cards and my BRP. I will know where the nearest police station is and its address in case of emergencies. I will have copied all important emergency numbers and names on my phone prior to going on my site of research in case I need to contact them.

I will always walk on pavements, use traffic lights and pedestrian crossings when I need to. I will have copied all important emergency numbers and names on my phone prior to going on my site of research in case I need to contact them, and will carry my BRP and health care cards on me.

EMERGENCIES	Where emergencies may arise use space below to identify and assess any risks
e.g., fire, accidents	Examples of risk: loss of property, loss of life
Risk: loss of property.	

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

	participants have registered with LOCATE at http://www.fco.gov.uk/en/travel-and-living-abroad/
	firefighting equipment is carried on the trip and participants know how to use it
X	contact numbers for emergency services are known to all participants
X	participants have means of contacting emergency services
	participants have been trained and given all necessary information
	a plan for rescue has been formulated, all parties understand the procedure
	the plan for rescue /emergency has a reciprocal element
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK   1   Jan 2021

EQUIPMENT	Is equipment used?	**YES**	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g., clothing, outboard motors.	Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low?		
Low risk: camera damage/loss			

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

	the departmental written Arrangement for equipment is followed
X	participants have been provided with any necessary equipment appropriate for the work
X	all equipment has been inspected, before issue, by a competent person
	all users have been advised of correct use
	special equipment is only issued to persons trained in its use by a competent person
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING	Is lone working a possibility?	**YES**	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g., alone or in isolation lone interviews.	Examples of risk: difficult to summon help. Is the risk high / medium / low?		

I will observe site myself. Risk: difficult to ask for help, lack of phone signal, inability to communicate and/or call assistance. (Low risk)

Traveling alone on foot - risk of personal attack abuse. (Moderate risk.)

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

X	the departmental written Arrangement for lone/out of hours working for field work is followed
	lone or isolated working is not allowed
X	location, route and expected time of return of lone workers is logged daily before work commences
X	all workers have the means of raising an alarm in the event of an emergency, e.g., phone, flare, whistle
X	all workers are fully familiar with emergency procedures
X	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

I will only work during daylight hours in areas where people go regularly and will plan my trip in advance. I will always notify a family member/ friend of where I will be working, when and what I will be doing in case of emergencies and I will never be without my mobile phone, which will be fully charged and in perfect working condition.

FIELDWORK   2   Jan 2021

ILL HEALTH	The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.
e.g., accident, illness, personal attack, special personal considerations or vulnerabilities.	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low? *I have no outstanding medical conditions which can inhibit my research.*
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**

	an appropriate number of trained first-aiders and first aid kits are present on the field trip
	all participants have had the necessary inoculations/ carry appropriate prophylactics
	participants have been advised of the physical demands of the trip and are deemed to be physically suited
	participants have been adequate advice on harmful plants, animals and substances they may encounter
	participants who require medication have advised the leader of this and carry sufficient medication for their needs
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

TRANSPORT	Will transport be required	**NO**		**Move to next hazard**
		YES	**X**	**Use space below to identify and assess any risks**
e.g., hired vehicles	Examples of risk: accidents arising from lack of maintenance, suitability or training Is the risk high / medium / low? *I will only travel by public transport. The transport (Bus/ train) might have an accident or break down. (Low risk)*			
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**			

X	only public transport will be used
	the vehicle will be hired from a reputable supplier
X	transport must be properly maintained in compliance with relevant national regulations
X	drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
X	drivers have been trained and hold the appropriate licence
	there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
X	sufficient spare parts carried to meet foreseeable emergencies
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	Will people be dealing with public	**YES**	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g., interviews, observing	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low? *Medium risk*		
CONTROL MEASURES	**Indicate which procedures are in place to control the identified risk**		

	all participants are trained in interviewing techniques
	interviews are contracted out to a third party
	advice and support from local groups has been sought
X	participants do not wear clothes that might cause offence or attract unwanted attention
X	interviews are conducted at neutral locations or where neither party could be at risk
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

To ensure the comfort and confidence of the interviewees time and effort was taken by the researcher to prepare succinct descriptions of the research both in written and verbal forms to fully brief the interviewee of the scope and anonymity of the interviews. The questions and conversation style were carefully crafted so as to respect the interviewees' positions and personal values. The interviews were conducted during a lockdown period and extra care was taken to ensure sanitation standards were met throughout the process. On top of that no indoor conversation would proceed, online / phone conversations were offered as the preferred interview method and in-person communication to only take place at the insistence of the interviewee.

FIELDWORK	3	Jan 2021

WORKING ON OR NEAR WATER	Will people work on or near water?	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g., rivers, marshland, sea.	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

☐	lone working on or near water will not be allowed
☐	coastguard information is understood; all work takes place outside those times when tides could prove a threat
☐	all participants are competent swimmers
☐	participants always wear adequate protective equipment, e.g., buoyancy aids, wellingtons
☐	boat is operated by a competent person
☐	all boats are equipped with an alternative means of propulsion e.g., oars
☐	participants have received any appropriate inoculations
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)	Do MH activities take place?	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g., lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.	Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

☐	the departmental written Arrangement for MH is followed
☐	the supervisor has attended a MH risk assessment course
☐	all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
☐	all persons performing MH tasks are adequately trained
☐	equipment components will be assembled on site
☐	any MH task outside the competence of staff will be done by contractors
	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

| SUBSTANCES | Will participants work with substances | NO | If 'No' move to next hazard |
| | | | If 'Yes' use space below to identify and assess any risks |

e.g., plants, chemical, biohazard, waste

Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?

| CONTROL MEASURES | Indicate which procedures are in place to control the identified risk |

[ ] the departmental written Arrangements for dealing with hazardous substances and waste are followed

[ ] all participants are given information, training and protective equipment for hazardous substances they may encounter

[ ] participants who have allergies have advised the leader of this and carry sufficient medication for their needs

[ ] waste is disposed of in a responsible manner

[ ] suitable containers are provided for hazardous waste

OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

| OTHER HAZARDS | Have you identified any other hazards? | NO | If 'No' move to next section |
| | | | If 'Yes' use space below to identify and assess any risks |

i.e., any other hazards must be noted and assessed here.

Hazard:

Risk: is the risk [ ]

| CONTROL MEASURES | Give details of control measures in place to control the identified risks |

Have you identified any risks that are not adequately controlled?

| NO | X | Move to Declaration |
| YES | | Use space below to identify the risk and what action was taken |

Is this project subject to the UCL requirements on the ethics of Non-NHS Human Research?   [NO]

If yes, please state your Project ID Number   [   ]

For more information, please refer to: http://ethics.grad.ucl.ac.uk/

| DECLARATION | The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment. |

Select the appropriate statement:

[ ] I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk

[ ] I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above

NAME OF SUPERVISOR

FIELDWORK   5   Jan 2021