Compliance with Short-term Rental Regulations: the Role of Neighbourhood Characteristics, Market Performance and the Rent Gap

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The authors report there are no competing interests to declare.

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Abstract

Scotland implemented a regulatory framework based on licences for short-term rentals (STR) in 2023. The aim of this study is to examine the determinants of compliance with regulations in Edinburgh, focusing on various neighbourhood-level factors and the performance of the STR and long-term rental (LTR) markets. Besides compliance, we explore the densities of STR listings, licences and unlicenced listings. Our results suggest a significant role of socio-economic variables (age, education, dependent children); location (tourism demand); housing market (vacant dwellings), market performance (STR and LTR income) and the rent gap. Based on the empirical analysis, various recommendations for policy are formulated.

Keywords

Short-term rentals; regulation; compliance; rent gap

1. Introduction

The digital revolution, through platforms like Airbnb, expanded the short-term rental (STR) market globally, now boasting 7.7 million listings by 5 million hosts worldwide (Airbnb 2023). This growth, driven by the 'live-like-a-local' experience (Richards 2017), the concept of 'borrowing' (Hamari et al. 2016) and seamless transactions (Gurran et al. 2020), transformed tourism (Oskam and Boswijk 2016) and rental markets (Gurran and Sadowski 2019).

Proponents of Airbnb argue that it brings income and tourism to non-touristy neighbourhoods, unlocking economic opportunities for landlords (Basuroy et al. 2020) and providing employment (Orsi et al. 2013). Critics argue that it reduces long-term rental availability (Barron et al. 2019, Horn and Merante 2017), drives up rents (Ayouba et al. 2020, Barron et al. 2021), affects housing affordability (Barron et al. 2018, Lee 2016), turns residential buildings into de-facto hotels (Wachsmuth and Weisler 2018), violates planning regulations (Shabrina et al. 2021), degrades local quality of life (Stergiou and Farmaki 2020), and exacerbates inequalities in neighbourhood development (Rabiei-Dastjerdi et al. 2022).

To mitigate the negative impacts of STR, cities worldwide have adopted various regulations (Gauß et al. 2024). Some cities, such as Barcelona, New Orleans, and Vancouver, have partially banned STRs by issuing a limited number of licenses. Other cities, such as Berlin, Hamburg, Los Angeles, Paris, and San Francisco, have limited the number of days

properties can operate. Additionally, cities like Boston, Chicago, Lisbon, New York, Rome, and Montreal now require STR operators to register with local authorities.

This research focuses on Edinburgh, the second-largest Airbnb market in the UK. Recently, STRs in the city have been regulated through a licensing scheme and planning controls, with license registry made publicly accessible.

A growing body of research examines the effectiveness of regulatory frameworks for STRs (Bekkerman et al. 2023, Bibler et al. 2021, Koster et al. 2021, Robertson et al. 2024) . The design and enforcement of regulations significantly influence their success (Wessel et al. 2024). Some policies, such as day caps, have proven effective in specific cities in controlling STR growth and performance (Duso et al. 2024, Gauß et al. 2024), while others, like STR-specific taxes, show less promising compliance (Garz and Schneider 2023). There is evidence, however, that regulations can have broader positive impacts, benefiting sectors such as hotels and accommodations (Yeon et al. 2020) and improving housing market stability (Seiler et al. 2024).

With advancements in understanding regulatory effectiveness, the question of compliance remains underexplored. Most studies focus on whether regulations achieve their intended outcomes, with limited attention given to whether and why market participants comply with these rules. Compliance with STR regulations may be shaped by multiple interrelated factors that are deeply embedded in broader market dynamics, which can vary significantly within a locality. Filling this gap is crucial for informing evidence-based policies and enhancing the effectiveness of STR regulation.

Although the literature highlights the challenges related to the enforcement of STR regulations (Leshinsky and Schatz 2018; Park et al. 2019), little is known about the factors influencing compliance. Based on the literature on STR supply and performance in urban destinations (Sarkar et al. 2020; Gyódi and Nawaro 2021, Panahandeh et al. 2025), we expect that socio-economic and neighbourhood characteristics significantly influence compliance behaviour. As property owners participate in both the STR and long-term rental (LTR) markets, and their choice between the two markets are motivated by financial and regulatory incentives (Belot et al. 2024; Wachsmuth and Weisler 2018), we hypothesise that STR and LTR market dynamics are also important determinants for compliance.

This paper aims to address these gaps by offering fresh insights into STR regulations through the lens of compliance. It contributes empirical evidence to understanding the challenges and opportunities associated with STR regulation and improves targeted enforcement. The research questions are the following:

- What neighbourhood-level factors influence compliance with STR regulations?
- How STR and LTR market performances impact compliance with STR regulations, and in what ways?
- How does the rent gap, as a measure of financial incentives from STRs, affect compliance with STR regulations?

The paper will be organized as follows: in section 2. related literature is discussed. Section 3. presents data and methods, followed by a summary of results in section 4. Section 5 discusses the main findings. Finally, the study ends with conclusions and policy recommendations.

2. Related literature

2.1. Effectiveness of STR regulations

The impact of STR regulations is multifaceted, influencing both the hotel accommodation industry and the housing market. This paper focuses specifically on the housing market as STR closely affects housing availability and affordability.

2.1.1. Effectiveness in controlling the STR market

Emerging research demonstrates that STR regulations bring significant impact the availability and performance of platforms like Airbnb. Restrictions have been shown to reduce supply (Bekkerman et al. 2023, Koster et al. 2021), particularly for highly available listings (Duso et al. 2024), while also decreasing revenues and booking activity (Robertson et al. 2024, Yeon et al. 2022). However, these restrictions can lead to spillover effects, such as increased Airbnb usage in neighbouring areas (Valentin 2021).

The effectiveness varies depending on the specific policy and local context. In a study of 13 European cities, Wessel et al. (2024) compared the effects of various STR regulations targeting market supply, performance, and operations. They found that Airbnb's operations were less impacted by restrictive policies, both in terms of size and performance metrics. In contrast, temporal restrictions, such as day caps, most significantly reduced listing availability, whereas geographical restrictions, such as local bans, proved largely ineffective. Other studies also confirm the contextual effect. A tax on STRs in Norway showed limited impact (Garz and Schneider 2023a) on the size of the STR market with a concerning compliance issue. In contrast, a data-sharing agreement between the Danish government and Airbnb successfully reduced listing activity and prices (Garz and Schneider 2023b).

2.1.2. Impact on the housing market

Stricter STR regulations, especially on whole-unit rentals, are often justified by their potential to alleviate housing market pressures. STRs have been linked to rising rents (Barron et al. 2021, Horn and Merante 2017) and house prices (Chen et al. 2022, Koster et al. 2021) in urban areas. A handful of research focusing on regulations suggests that STR regulations can effectively return properties to the LTR market, as seen in Barcelona (reported by Colomb and Moreira de Souza 2023) and Berlin (reported by Duso et al. 2020). Other studies show that regulations contribute to easing rental prices (Seiler et al. 2024, Valentin 2021), increasing housing stock (Bibler et al. 2022b, Chen et al. 2021), and reducing house prices (Koster et al. 2021).

2.1.3. Effectiveness of licences and registration

Regulatory approaches to STRs vary across cities and regions, in response to market dynamics, such as the scale of commercial activities, existing regulations in related sectors, such as tourist levies and housing rent caps, and the broader economic or political objectives of regulation, such as maximizing tourism benefits or responses to platform lobbying.

A common approach is the introduction of licences or registration. Most cities adopt this strategy often in combination with additional measures such as day caps or zonal restrictions, as seen in Amsterdam, Barcelona, and Berlin. Other cities like Lisbon, Athens, and Rome take a more relaxed approach without imposing other approaches (Bei and Celata 2023). Edinburgh does not ban STRs but requires planning permission, where local councils issue permits only if properties meet the criteria for a change of use from residential to commercial.

Existing research has explored effectiveness of licensing and registration regulations, often through comparative analyses of different cities, considering their combined effects with other controls. In the US, Koster et al. (2021) used quasi-experimental methods to study 18 regulated and 88 unregulated cities in Los Angeles County, where registries differentiate between "room" and "entire property" listings. They found significant reductions in Airbnb listings and modest declines in housing prices and rents. Chen et al. (2021) applying a counterfactual method to compare 15 regulated and 15 unregulated cities, observed initial declines in new listings post-regulation, with licensing regulations particularly deterring new STR listings due to upfront monetary costs. Bibler et al. (2022a) analysed registration enforcement in Chicago and Los Angeles using fixed effects models. They round substantial reductions in Airbnb supply, bookings, and housing prices. In Europe, Hübscher and Kallert (2023) conducted a comparative analysis of Amsterdam, Berlin, and

London. Amsterdam and Berlin implemented registration strategies alongside stricter supplementary policies, resulting in a significant reduction in short-term rental supply, redistribution of listings, and, in the case of Amsterdam, a decrease in the prevalence of multi-listing hosts.

With the majority of methods designed to examine the causal impact, there remains a significant gap in understanding the factors influencing compliance. Identifying what drives compliance to individual and combined regulatory approaches, such as the licensing and registration scheme, has become a pressing issue as it is critical not only for evaluating the effectiveness of these regulations but also for improving enforcement strategies.

2.2. Factors influencing compliance in STR

Compliance with housing regulations is a complex issue that varies significantly based on contextual factors. This paper situates STR regulation within the broader framework of factors that typically influence housing policy while recognizing its unique characteristics and challenges.

2.2.1. The Complexity of Compliance in the Digital Age

The globalized digital mediation of online platforms introduces additional complexities and barriers to compliance with STR regulations. STRs are described as being "dispersed unevenly, interwoven with formal housing topography, and often physically undetectable when viewed from the street or above" (Barry Born 2021). As part of "datafied middle-income rental markets" (ibid.), STRs are deeply embedded in digital ecosystems, complicating regulatory oversight.

The digital nature of STR platforms affects compliance in several ways. While these platforms make properties visible to global users, this visibility does not extend to public authorities responsible for enforcement. Host and listing details are often withheld, reducing opportunities for platform self-regulation and enabling illegal activities (Colomb and Moreira de Souza 2023). Moreover, platforms have historically resisted sharing individualized, geo-localized data with authorities, further exacerbating compliance challenges. This lack of transparency creates obstacles for monitoring and enforcement at scale. For example, city governments in the U.S. and Europe have faced prolonged struggles with platforms over access to data critical for regulation (Ferreri and Sanyal 2018, Hoffman and Heisler 2020, Söderström and Mermet 2020). The importance of information asymmetries and the perceived risks of non-compliance has been also emphasised by Park et al. (2019), who surveyed STR hosts in South Korea.

2.2.2. Diverse Operator Profiles and Challenges to Transparency

Compliance is further complicated by the diverse composition of STR operators. These range from private individuals renting out underutilized resources for additional income (Einav et al. 2016) to professional operators managing multiple properties as part of commercial-scale activities (Chen et al. 2022). Professional hosts are often accused of disproportionate negative impacts on housing markets, drawing regulatory scrutiny. However, the lack of transparency and data-sharing by platforms prevents regulators from effectively distinguishing between casual and professional operators, hampering targeted compliance enforcement.

This opacity fosters a culture in which landlords operating on STR platforms may view non-compliance as a calculated risk, often feeling emboldened by the perceived "protection" provided by the platforms. These platforms, which frequently regard regulation as a threat to their business model, further complicate enforcement efforts. Individuals with higher levels of education or greater experience in navigating legal and regulatory frameworks may be more adept at exploiting policy loopholes or circumventing compliance measures. There is a need for a deeper understanding of the motivations and contextual factors influencing compliance, particularly among different demographic and professional groups.

2.2.3. Demographic Factors Driving Illegal Housing and Informality in the STR Market

As interest grows in understanding whether, how, and what aspects of platform-mediated STRs should be regulated (Wessel et al. 2024), the fundamental question of what constitutes "illegal" or "informal" housing becomes important. A body of research argues that STRs have transformed into a "platform real estate" market (Fields and Rogers 2021, Shaw 2020), disrupting traditional power dynamics by centralizing control over rental and property data (Boeing et al. 2021), and introducing new forms of informality within the housing sector (Ferreri and Sanyal 2022).

Demographically, unlike the traditional concept of "informality of need," which refers to housing solutions driven by the urban poor to meet basic living requirements, STRs have fostered an "informality of desire." This form of informality is primarily exploited by affluent individuals seeking to generate additional income or fulfil social aspirations (Devlin 2018).

Findings in compliance with LTR regulation also suggest that individuals' reactions to regulation are shaped not only by the policies themselves but also by their experience in the housing market and educational background, which in turn influence their interpretation of policy intent. For instance, the recent rent cap policy in Scotland, which

followed a temporary rent freeze, has been perceived by landlords as a signal of increasing regulatory intervention in the rental market. This perception of policy risk has deterred investment in the Build to Rent sector (Marsh et al. 2023).

Further investigation is required to assess whether specific groups are more or less likely to comply with STR regulations in cases of illegal STR activities.

2.2.4. Location Factors Driving Illegal Housing and Informality in the STR Market

Non-compliance with housing regulations varies in different contexts. For example, research by HMRC in the UK revealed that in 2017, fewer than half of the landlords registered in London's Newham Council declared their property income for taxation purposes (Collinson 2017). In Glasgow and Edinburgh, only 1.4% and 4.2% of the population, respectively, declared property income, despite these cities hosting growing populations of students, young professionals, and migrant communities (Farnood and Jones 2023).

Geographically, STR listings are often concentrated in neighbourhoods close to urban centres, tourist attractions, and areas rich in amenities (Ki and Lee 2019). These areas tend to share socioeconomic characteristics, such as higher-income and well-educated populations, younger demographics, and mixed racial composition (Quattrone et al. 2016).

Whether illegal STR activities are more likely influenced by any specific neighbourhood factors similar or different to this group remains an open question.

2.2.5. Market Factors influencing compliance with STR Regulations

Market incentives play a critical role in shaping compliance behaviour, though these incentives often operate in endogenous ways. Robertson and Young (2018) found that in urban hotspots where "harder" rent controls have been implemented, landlords frequently failed to comply, and authorities did not always enforce regulations. In contrast, rent controls in areas with less intense demand pressures appeared to function more effectively.

Belot et al. (2024) investigate the motivations and practices of commercial STR hosts in Montreal (Canada) by focusing on the regulatory and platform dynamics shaping these activities. Drawing on Bosma's (2022) concept of "practices of professionalization," the research highlights how platforms influence host behaviours and how these interact with the regulatory frameworks governing STRs. In many cases commercial STR operations are illegal, creating a distinct regulatory gap. This gap exists between the well-established and stringent regulations governing LTRs and the weakly enforced rules for STRs. This

discrepancy incentivizes landlords to move units from the LTR market to the STR market through 'push factor', where strict LTR regulations discourage participation by landlords, and 'pull factor', where the relatively lax STR rules attract landlords seeking fewer constraints and greater control over their properties.

This regulatory gap allows STRs to bypass tenant protections traditionally linked to the LTR market, with financial incentives remaining a primary driver. The significance of this gap also emphasizes the financial dynamics: when there is a substantial STR-induced rent gap (Wachsmuth and Weisler 2018), financial incentives are likely to outweigh concerns related to power and control afforded by the regulatory differences.

This raises important questions about how compliance with STR regulations is influenced by market incentives.

In summary, while most research evaluates the effectiveness of STR regulations and enforcement, few studies examine the drivers of compliance empirically. This is a critical gap, as regulatory effectiveness and compliance are not synonymous. Research must move beyond assessing outcomes to understand the neighbourhood, demographic, and market incentives shaping compliance decisions among STR operators.

3. Data and Method

3.1. Study area

Similar to other popular tourist destinations, Edinburgh, Scotland's capital, has experienced a rapid expansion of the STR market, largely driven by platforms like Airbnb. Listings are heavily concentrated in the city centre, which has more than twice the total number of entire-property listings compared to other neighbourhoods in Scotland (Rae 2017). This concentration has raised widespread concerns among residents, community groups, and businesses about its impact on the availability and affordability of residential housing.

The Scottish Government has implemented a licensing scheme which had been rolled out on October 1, 2022, and ran for one year. Existing hosts could continue operating if they submitted an application or held an approved license by the October 1, 2023 deadline, while new hosts are prohibited from operating before having a license. By January 1, 2025, all STRs must operate with a license to avoid a £2,500 fine and potential criminal charges (Scottish Government 2023). Additionally, on September 5, 2022, Edinburgh became Scotland's first designated STR control area (Edinburgh City Council 2022), granting the

city council the authority to require planning permission for STRs as a prerequisite for licensing. Types of licences are shown in Table 1.

Table 1. Types of STL licenses in Scotland.

Secondary letting	Letting out a property where the host doesn't usually live, such as a second home or holiday home
Home letting	Letting out all or part of the host's home while they're away, such as while they're on holiday
Home sharing	Renting out all or part of the host's home while they're living there
Home letting and home sharing	Letting out all or part of the host's home while they're living there and when they're away

This paper will focus on entire home rentals due to the low number of private and shared rooms in Edinburgh (only 143 listings in January 2024). Entire homes listings are often associated with negative impacts on neighbourhoods and a diminishing of Airbnb's original "sharing" ethos. Therefore, we will examine "Secondary Letting" and "Home Letting" licenses, as well as their valid applications.

3.2. Data

To analyse compliance with regulations, we compare STR licenses from the Edinburgh Council's registry with market listings from the Inside Airbnb platform, aggregating both datasets to 111 Intermediate Zones (neighbourhoods with populations of 2,500–6,000). These relatively large zones help offset inaccuracies in Airbnb listing locations. The rent gap is calculated using income per bedroom estimates derived from Zoopla (a leading LTR platform) and Inside Airbnb data. Neighbourhood factors are sourced from the latest census.

3.2.1. STR license data

The publicly accessible STR license registry, regularly updated by the City of Edinburgh Council (CEC), is used[1]. It contains 4,788 entries for license applications dated 04 October 2022 to 03 October 2024. Each entry includes property address, details, applicant information, license type, application status, and decision outcomes. Using the Unique Property Reference Number from the registry, we map the properties to neighbourhoods via the National Statistics UPRN Lookup. For unmatched entries (4%), we use their postcodes and manual matching instead. This gives us 4,629 matched licenses.

[1] Accessed at October 14, 2024.

We included licenses with statuses indicating active or operational businesses[2] and excluded those submitted after the 01 October 2023 deadline. For analysis, "Home letting" and "Secondary letting" licenses were grouped under "home letting," covering 2,314 properties.

3.2.2. STR data - Airbnb

STR market data from Inside Airbnb provides monthly tracking of listings, prices, and reviews from 2021 to 2024. Missing data, for May 2021, was interpolated using averages from adjacent months. Listings were filtered to include those with fewer than 10 bedrooms, at least one review per month (indicating active operation), common residential property types, and valid prices. They were categorized into "entire home" and "shared/private room" types by neighbourhoods.

For comparison with license data, January 2024 data, including 3,373 entire home listings, is selected for analysis. Income estimates incorporate the number of bedrooms, prices, monthly reviews, and minimum stay requirements for each listing, detailed further in the method section.

3.2.3. LTR data – Zoopla

LTR data was obtained from Zoopla, a leading UK rental platform, via the Urban Big Data Centre, covering listings from 2021–2022. Similar to Airbnb data, we focused on rentals with valid prices, common property types[3], and up to 10 bedrooms, excluding offers with weekly rents below £79 (bottom 1% across Scotland). The final dataset included 2,832 rentals in Edinburgh.

3.2.3. Neighbourhood characteristics data

Socio-economic and demographic characteristics of neighbourhoods were sourced from the Scotland Census 2022. These variables, widely used in prior research, provide controls for evaluating the impact of regulations across cities and regions and assessing STR effects on rental and housing markets. A detailed list is presented in Table 2.

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[2] Active application types include "application received," "license issued," "superseded," "consultees outstanding," "pending decision," or "decision made".

3 Property types include 'Semi-detached house', 'Flat', 'Detached house', 'Terraced house', 'Town house', 'Cottage', 'Studio', 'End terrace house', 'Villa', 'Maisonette', 'Detached bungalow', 'Bungalow', 'Semi-detached bungalow', 'Terraced bungalow', 'Mews house', 'Barn conversion', 'Link-detached house', 'Country house', 'Farmhouse', 'Lodge', 'Block of flats', 'Land'

Table 2. Neighbourhood factors and sources.

Category	Indicator	Name	Data Source	Literature
Age	Aged 65 and over total population (Rate)	65+	Census 2022 table UV110	(Barron et al. 2021, Chaves Fonseca 2024)
Education	Degree level qualifications or above over population (Rate)	degree+rate	Census 2022 table UV501	(Jin et al. 2024, Seiler et al. 2024)
Employment	All people aged 16 and over in employment the week before the census over population over 16 years age (Rate)	employment rate	Census 2022 table UV606	(Barron et al. 2021, Chaves Fonseca 2024, Seiler et al. 2024)
Immigration background	Born in the UK over population (Rate)	born in the UK rate	Census 2022 table UV801	(Garz and Schneider 2023b)
Household	Married or civil partnership couple household and Cohabiting couple household with dependent children over households (Rate)	couple WithDepChild rate	Census 2022 table UV116	(Jin et al. 2024)
Racial	White over all people (Rate)	white rate	Census 2022 table UV201	(Jin et al. 2024, Seiler et al. 2024)
Tenure	Private rented over all occupied households (Rate)	rental owned	Census 2022 table UV404	(Jin et al. 2024, Seiler et al. 2024)
Housing	Vacant dwellings over total dwellings (Rate)	vacant dwelling rate	Small area household estimates 2023	(Barron et al. 2021, Chaves Fonseca 2024)
Deprivation	Income deprived population over total population (Rate)	deprivation	Scottish Multiple Deprivation 2020	(Garz and Schneider 2023b)
POIs	'Attractions' (03) and 'Accommodation' (0101) over households	attraction dens accommodation dens	Ordnance Survey Point of Interests (retrieved Oct 2024)	(Chaves Fonseca 2024, Jin et al. 2024)

3.3. Method

3.3.1. Airbnb income

We estimate Airbnb income using the "San Francisco" occupancy model from Inside Airbnb. This model calculates occupancy rates by multiplying the estimated number of bookings (derived from monthly reviews, assuming 50% of guests leave a review) by the average length of stay. For stays exceeding Edinburgh's citywide average of 3 days, the host's minimum night requirement determines the average length.

Monthly income estimates for each listing are calculated across the study period to support rent gap estimation. This estimation involves assumptions applied at both city and listing levels. The limitations of this approach in calculating the rent gap are discussed in Wang et al. (2023).

3.3.2. Zoopla income and the STR induced rent gap

Monthly long-term rental incomes are derived from weekly rates on Zoopla, using only the latest annual observation for listings in case advertised multiple times or for extended periods. To evaluate homeowners' incentives to rent in the STR market, we compare potential revenue streams from short-term and long-term rentals.

Following Wang et al. (2023), the STR rent gap is calculated by dividing the median monthly Airbnb income by the median Zoopla income for each neighbourhood. To ensure comparability, incomes are expressed per bedroom for the 2021–2022 period. Median monthly incomes are first calculated per neighbourhood, then aggregated across all months. For reliability, only neighbourhoods with more than two unique Airbnb listings and Zoopla offers are included.

3.3.3. Compliance rate and illegal listings

The compliance rate for January 2024 is calculated by comparing the number of valid licenses and applications under the "home letting" category with the number of "entire home" Airbnb listings in each neighbourhood. This rate may exceed 1 if the number of licenses issued or pending surpasses the observed Airbnb listings. It is therefore a reflection of relative compliance rather than absolute compliance. Higher rates indicate greater willingness to comply. Two neighbourhoods without any short-term rental listings are excluded.

The number of illegal listings is calculated by subtracting valid licenses and applications from total Airbnb listings, with illegal density expressed as a ratio to the total number of households in each neighbourhood.

The compliance rate and illegal listing densities are related but different in nature. The compliance rate is the share of legal listings on the STR market. Illegal density is the share of illegal supply relative to the housing supply.

There is an assumption that Airbnb data approximates the overall STR supply. While Airbnb is the dominant platform for private short-term accommodations, it is not the sole provider. This limitation is unlikely to bring bias to our analysis, provided that the spatial distribution of Airbnb listings aligns with that of STRs offered through other channels.

3.3.4. Modelling compliance and illegal listings

We employ a multiple linear model to analyse the impact of various factors, including neighbourhood characteristics, LTR and STR market performance, and the rent gap. Besides the compliance rate and the density of illegal supply, we also examine the densities of STR listings and licences. The following equation will be estimated:

$$Y_i = \beta_0 + \beta_i x_1 + \beta_j x_2 + \beta_k x_3 + \varepsilon_i$$

Where Y_i is either:

- listing density, as the listing per 100 households
- licence density, as the licence per 100 households
- compliance rate,
- illegal listing density, as the illegal listings per 100 households,

x_1 includes the neighbourhood factors, x_2 includes the market factors, x_3 is the rent gap, and ε is the error term.

The model will be estimated using OLS with robust standard errors.

4. Results

4.1. Descriptive statistics

Figure 1 presents histograms of the analysed variables. Listing and license densities exhibit similar distributions. The compliance rate and illegal listing distribution reveal a significant number of active Airbnb listings operating without a license. Of the 109 neighbourhoods with Airbnb activity, 97 have some degree of illegal offerings, 7 have equal numbers of licenses and listings, and 5 have more licenses than listings. The median compliance rate is 0.5, suggesting the average neighbourhood has twice as many Airbnb listings as licenses.

Figure 1. Distribution of the dependent variables

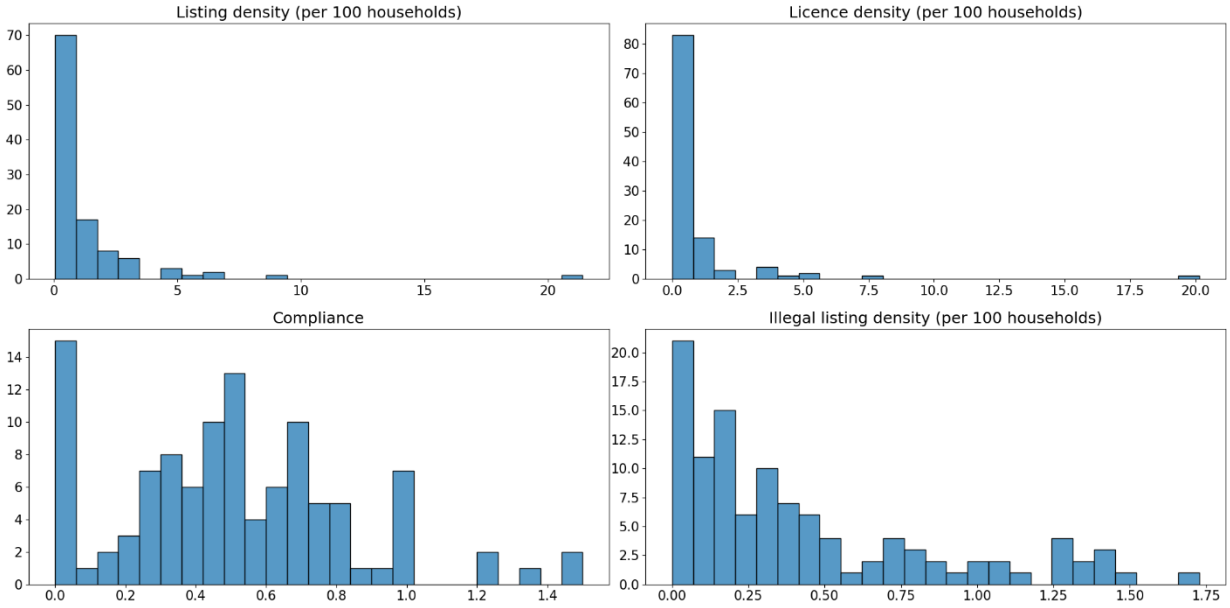
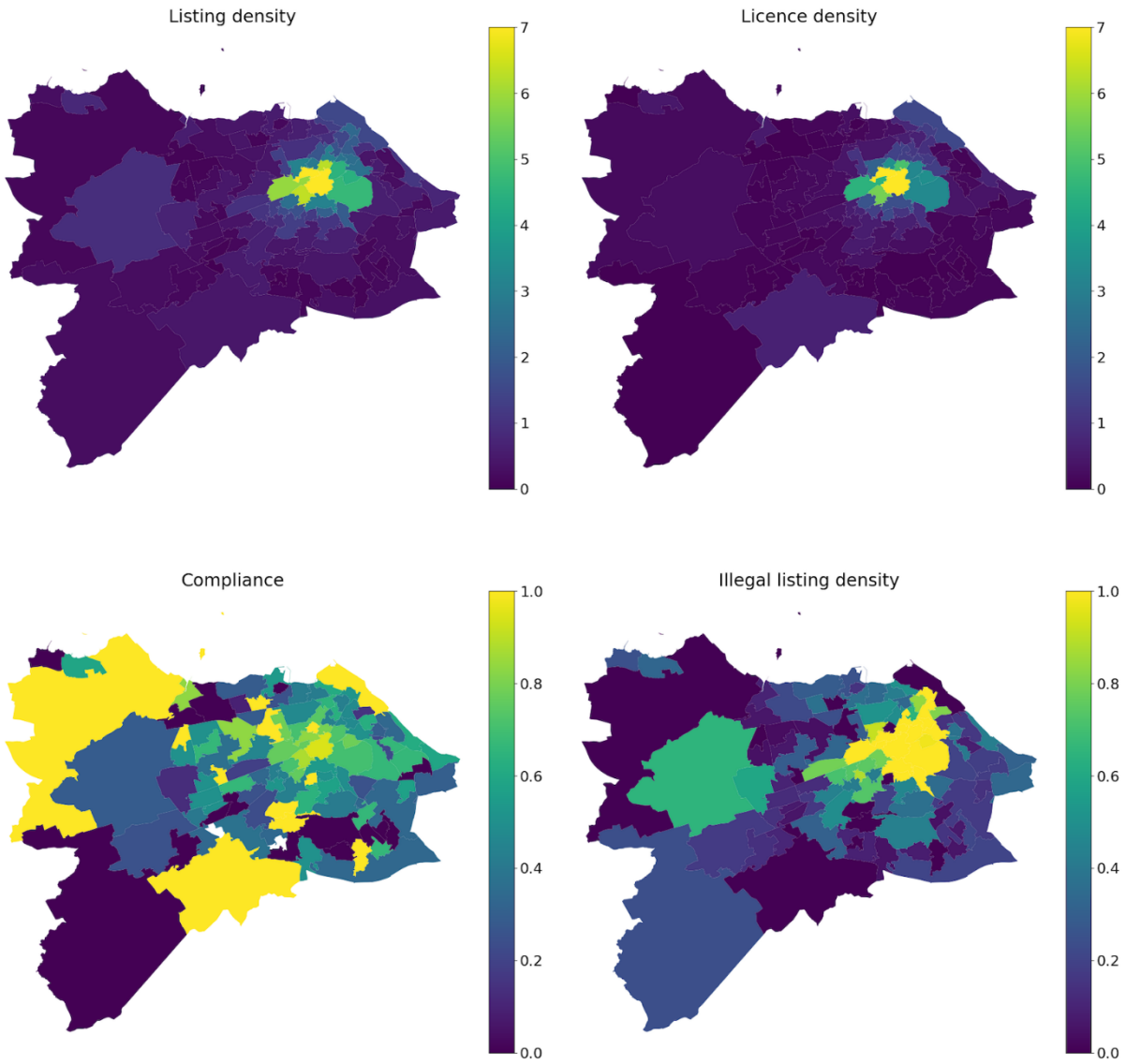


Figure 2 illustrates the spatial patterns of the analysed variables. All variables, except compliance values, exhibit spatial clustering (Moran's I statistics provided in the Appendix). Listing and license densities show similar patterns, suggesting that the factors driving legal STR provision align closely with the overall Airbnb market. Illegal listing densities follow a centre-periphery pattern, with higher values observed in some affluent suburban neighbourhoods in the West. In contrast, compliance values are more scattered and lack a clear spatial pattern, likely due to the lower Airbnb supply in areas farther from the city centre.

Figure 2: Spatial distribution of the analysed variables

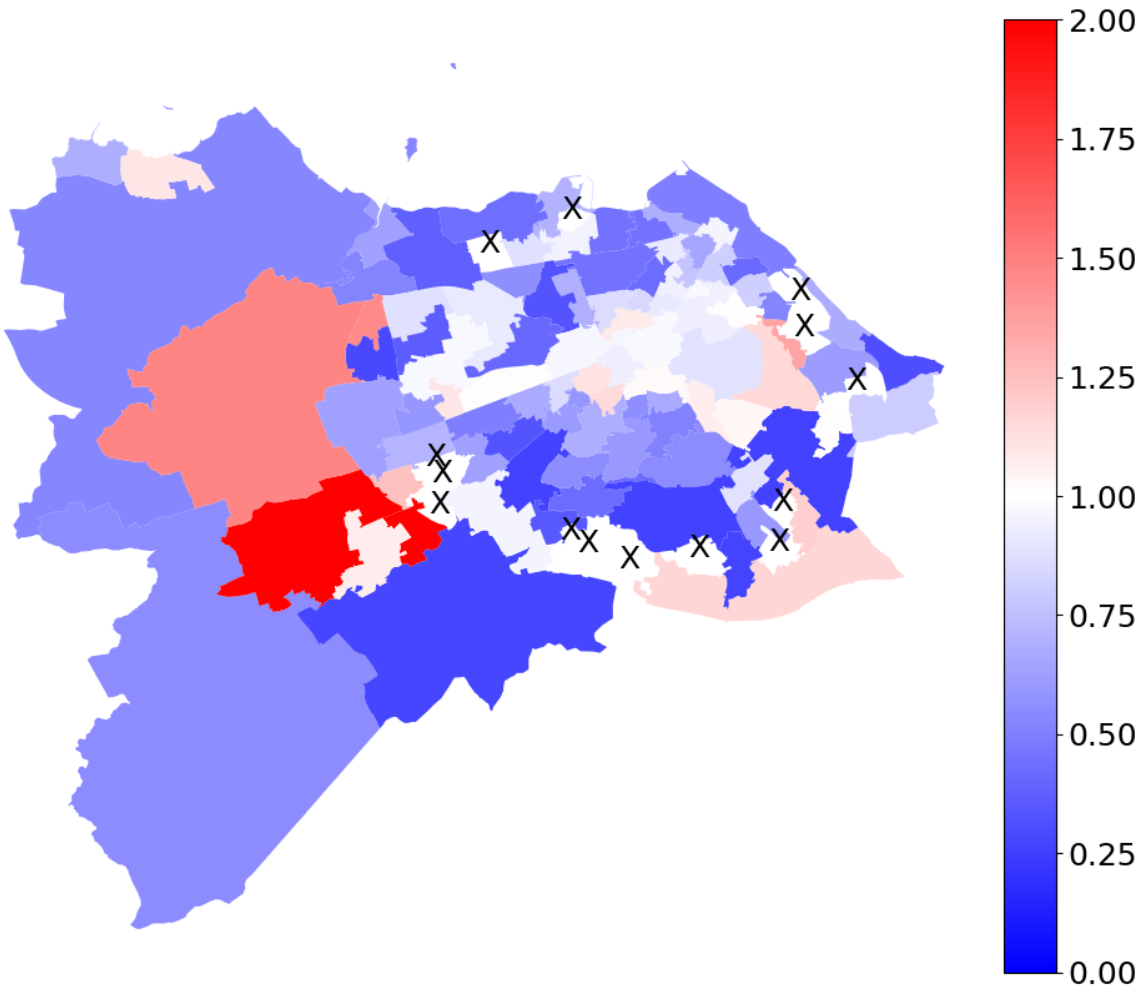


We now turn to rental incomes and the rent gap. Figure A3 (Appendix) displays the estimated median per-bedroom incomes in each neighbourhood. It indicates that LTR is more profitable in most areas. Of the 97 neighbourhoods with sufficient observations, Airbnb incomes exceed LTR in 20, indicating higher incentives for property owners to remain in the STR market in these areas.

Figure 4 maps the rent gap, with neighbourhoods with significantly lower (blue) or higher (red) Airbnb incomes relative to long-term rentals. The spatial dependence of these values suggests that neighbourhood characteristics shape relative income levels. In the city

centre, Airbnb and LTR revenues are comparable, which indicates rent gaps have already closed. However, further from the centre, differences favour long-term incomes, except in affluent neighbourhoods in the western part of the city, where Airbnb remains more profitable.

Figure 4: The spatial distribution of the rent gap (X marks areas without enough observations)



4.2. Relationship between the variables

Table 3 summarizes the Pearson correlations between dependent and explanatory variables. Listing and license densities show similar relationships which indicates that the factors driving overall and legal STR supply are similar. STR supply correlates significantly with neighbourhood socio-economic and demographic factors (age distribution, immigrant share, education level, household composition), housing market characteristics (private rentals, vacant dwellings), location (density of attractions, density of hotels and other accommodation), and market performance (LTR and STR incomes). No significant relationships were found with income deprivation, employment rate, or the rent gap.

For illegal STR supply, the drivers are similar, but socio-economic factors play a stronger role, while location factors are less influential. Compliance rates, in contrast, are more closely related to tenure and housing market variables, with weaker ties to location and socio-economic factors probably because of their spatially scattered nature. Stronger LTR markets correlate with lower incentives for illegal STRs.

Lastly, correlations between income variables and the rent gap show weak collinearity. The weak correlation between LTR and STR incomes suggests spatial income variations, as reflected in the rent gap map.

Table 3. Pearson Correlation for selected variables

	listing dens	licence dens	compliance	Illegal dens	rent gap	airbnb Income	ltr rent
listing dens	1.00***	0.99***	0.25**	0.61***	0.15	0.58***	0.63***
licence dens	0.99***	1.00***	0.31***	0.48***	0.13	0.54***	0.60***
compliance	0.25**	0.31***	1.00***	-0.09	-0.07	0.17*	0.39***
illegal dens	0.61***	0.48***	-0.09	1.00***	0.18*	0.55***	0.54***
deprivation	-0.08	-0.07	-0.05	-0.12	0.02	-0.16	-0.36***
65+	-0.35***	-0.30***	-0.22**	-0.48***	-0.11	-0.31***	-0.27***
25-34 rate	0.28***	0.21**	0.11	0.54***	0.12	0.34***	0.32***
employment rate	-0.17*	-0.20*	0.05	0.05	-0.06	-0.08	-0.05
degree+ rate	0.22**	0.19*	0.29***	0.33***	-0.16	0.22**	0.65***
born in the UK rate	-0.44***	-0.38***	-0.18*	-0.57***	-0.15	-0.41***	-0.38***
1PersonHousehold rate	0.41***	0.35***	0.08	0.55***	0.09	0.39***	0.45***
couple WithDepChild rate	-0.53***	-0.45***	-0.10	-0.67***	-0.14	-0.48***	-0.51***
white rate	-0.24**	-0.20**	-0.04	-0.29***	-0.14	-0.21**	-0.09

rental owned	0.63***	0.58***	0.23**	0.63***	0.13	0.51***	0.55***
vacant dwelling rate	0.65***	0.62***	0.35***	0.59***	0.09	0.52***	0.65***
accommodation dens	0.84***	0.84***	0.15	0.45***	0.15	0.46***	0.42***
attraction dens	0.91***	0.93***	0.19*	0.38***	0.11	0.44***	0.46***
rent gap	0.15	0.13	-0.07	0.18*	1.00***	0.79***	-0.13
airbnb income	0.58***	0.54***	0.17*	0.55***	0.79***	1.00***	0.46***
ltr rent	0.63***	0.60***	0.39***	0.54***	-0.13	0.46***	1.00***

4.3. Regression analysis

Based on the analysis of correlations and the analysis of collinearity (presented in the Appendix), the final model specifications have been selected. All combinations of income variables and the rent gap are tested in order to gain a better understanding on the role of market performance and economic incentives.

The model results for licence and listing densities are presented in the Appendix (Table A3 and A4). The results support that licence densities are affected by neighbourhood variables; location attributes and market performance. Licence densities are higher in neighbourhoods with higher shares of educated population and more tourist attractions.

The results concerning market performance and financial incentives provide a nuanced picture. Licence densities increase with higher STR and LTR income, while the rent gap is not significant. This might signal that property owners applied for a licence primarily based on potential incomes and the overall housing market performance. When tested together with STR income, the influence of the rent gap is statistically significant and negative, which signals that licence densities vary across high STR income areas. This may be related to the moderating effect of long-term rental incomes.

Moreover, market performance variables seem to interact with education levels: while licence densities increase with education, this effect is insignificant when controlling for the LTR rent, or the STR income together with the rent gap. This may suggest that educated households are more likely to observe and evaluate complex market factors when investing in the STR market.

The results are very similar in the case of listing densities, as suggested by Figure 2 and the analysis of correlations. However, there are some minor differences. It is worth noting that while LTR incomes do not affect directly Airbnb supply, the rent gap is significant,

signalling the role of financial incentives. Listing densities are also higher in areas with less dependent children; and higher in the vicinity of hotels and other accommodation providers.

Next, let us focus on two measures of compliance: the density of illegal supply (Table 4) and the compliance rate (Table 5). In the case of illegal supply densities, the socio-economic determinants are similar as in the case of overall STR supply, with significantly higher densities due to education and less households with dependent children. While attractions are not significant, illegal supply increases in neighbourhoods dense in other tourist accommodation, suggesting that hosts decide to join the STR market in areas where demand for lodging is high. In the case of financial incentives, the results also resemble the relationships with overall STR supply: illegal supply is higher in areas with greater STR income and rent gap, while LTR income is insignificant or has a negative effect.

In the case of the compliance rate, the results suggest a more diverse list of determinants. First, compliance is higher in neighbourhoods with a higher share of working age population, and lower in areas with more elderly. Compliance is also higher in neighbourhoods with more children which is in line with the lower densities of illegal supply. Second, the housing market is also important, as compliance increases with a greater share of vacant dwellings. Third, location factors also play a role, with higher compliance in areas dense in attractions, but lower in neighbourhoods with greater accommodation supply. This finding also follows the results concerning illegal supply.

Finally, the results provide further insights related to market performance and financial incentives. Unlike overall or illegal STR supply, STR income does not directly influence compliance. However, LTR income is significant, signalling higher adoption of rules in areas with a strong housing market. When controlling for STR income and the rent gap, both variables are significant: areas with higher STR income and lower gap have higher compliance rate. These results suggest that LTR income is the main driver of compliance, as high rents and strong rental market discourage hosts to provide illegal accommodation.

It is also worth noting that the impact of education becomes insignificant when adding LTR income to the model. This supports that property owners in affluent and educated neighbourhoods analyse multiple market factors in their decision process.

Table 4. Regression results for illegal STR densities

	Dependent variable: illegal dens						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
const	0.565*	0.476	0.598*	0.436	0.570*	0.511*	0.446
	(0.299)	(0.301)	(0.308)	(0.304)	(0.326)	(0.310)	(0.318)
65+	-0.376	-0.456	-0.367	-0.419	-0.484	-0.448	-0.416
	(0.645)	(0.642)	(0.648)	(0.643)	(0.647)	(0.644)	(0.647)
coupleWithDepChildRate	-3.00***	-2.803***	-3.059***	-2.933***	-2.674***	-2.866***	-2.948***
	(0.819)	(0.809)	(0.811)	(0.806)	(0.818)	(0.800)	(0.807)
degree+ rate	0.892***	0.841***	0.998***	0.966***	0.667**	0.952***	0.989***
	(0.250)	(0.243)	(0.325)	(0.253)	(0.311)	(0.323)	(0.327)
rental owned	0.130	0.096	0.139	0.120	0.072	0.106	0.122
	(0.179)	(0.180)	(0.183)	(0.178)	(0.191)	(0.183)	(0.183)
vacant dwelling rate	-2.425	-2.882	-2.243	-2.452	-3.379	-2.692	-2.410
	(3.657)	(3.573)	(3.640)	(3.634)	(3.566)	(3.545)	(3.618)
attraction dens	-0.020	-0.020	-0.018	-0.017	-0.024	-0.018	-0.017
	(0.017)	(0.016)	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)
accommodation dens	0.566***	0.508***	0.562***	0.526***	0.501**	0.504***	0.526***
	(0.194)	(0.197)	(0.193)	(0.193)	(0.204)	(0.195)	(0.193)
airbnb income		0.000**			0.001	0.000**	
		(0.000)			(0.001)	(0.000)	
LTR rent			-0.000			-0.000	-0.000
			(0.000)			(0.000)	(0.000)
rent gap				0.124**	-0.190		0.122**
				(0.058)	(0.251)		(0.058)
Observations	97	97	97	97	97	97	97
R^2	0.598	0.613	0.599	0.608	0.616	0.614	0.608
Adjusted R^2	0.566	0.578	0.562	0.572	0.576	0.574	0.567
Residual Std. Error	0.290 (df=89)	0.286 (df=88)	0.292 (df=88)	0.288 (df=88)	0.287 (df=87)	0.288 (df=87)	0.290 (df=87)

F Statistic	18.863* ** (df=7; 89)	18.541** * (df=8; 88)	16.572** * (df=8; 88)	17.485** * (df=8; 88)	17.133** * (df=9; 87)	16.556** * (df=9; 87)	15.674** * (df=9; 87)
	*p<0.1; **p<0.05; ***p<0.01						

Table 5. Regression results for compliance rate

	Dependent variable: compliance						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
const	-0.346	-0.354	-0.486*	-0.315	-0.157	-0.493**	-0.496*
	(0.253)	(0.247)	(0.257)	(0.249)	(0.253)	(0.250)	(0.256)
65+	-1.809***	-1.816***	-1.844***	-1.798***	-1.876***	-1.851***	-1.847***
	(0.689)	(0.691)	(0.691)	(0.691)	(0.706)	(0.694)	(0.693)
coupleWithDepChildRate	2.996***	3.015***	3.247***	2.980***	3.288***	3.263***	3.254***
	(1.033)	(1.023)	(1.030)	(1.026)	(1.020)	(1.019)	(1.022)
degree+ rate	0.562**	0.558**	0.116	0.545**	0.191	0.112	0.115
	(0.237)	(0.245)	(0.270)	(0.232)	(0.288)	(0.271)	(0.271)
rental owned	0.024	0.020	-0.017	0.026	-0.031	-0.019	-0.018
	(0.107)	(0.110)	(0.101)	(0.108)	(0.109)	(0.105)	(0.103)
vacant DwellingRate	9.973***	9.929***	9.207***	9.979***	8.880***	9.169***	9.196***
	(2.659)	(2.703)	(2.572)	(2.686)	(2.624)	(2.624)	(2.604)
attraction dens	0.019**	0.019**	0.010	0.018**	0.011	0.010	0.010
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
accommodation dens	-0.228**	-0.234**	-0.211**	-0.219*	-0.249**	-0.216**	-0.214**
	(0.112)	(0.113)	(0.101)	(0.112)	(0.106)	(0.103)	(0.103)
airbnb income		0.000			0.001**	0.000	
		(0.000)			(0.000)	(0.000)	
LTR rent			0.001**			0.001**	0.001**
			(0.000)			(0.000)	(0.000)
rent gap				-0.029	-0.402**		0.008

				(0.081)	(0.186)		(0.085)
Observations	97	97	97	97	97	97	97
R^2	0.299	0.299	0.328	0.300	0.320	0.328	0.328
Adjusted R^2	0.244	0.236	0.267	0.237	0.250	0.259	0.259
Residual Std. Error	0.286 (df=89)	0.287 (df=88)	0.281 (df=88)	0.287 (df=88)	0.285 (df=87)	0.283 (df=87)	0.283 (df=87)
F Statistic	9.671*** (df=7; 89)	8.549*** (df=8; 88)	8.467*** (df=8; 88)	8.546*** (df=8; 88)	6.619*** (df=9; 87)	7.582*** (df=9; 87)	7.567*** (df=9; 87)
	*p<0.1; **p<0.05; ***p<0.01						

5. Discussion

The results shed more light on the determinants of compliance with regulations and STR supply in the context of a major city with large tourism demand. Our main findings are summarised below.

The results present the important role of location characteristics. First, STR densities increase in touristic areas. Second, tourism demand is an important driver of illegal supply, as compliance is lower in the vicinity of hotels and other accommodation providers. This supports the major role of incentives in the avoidance of regulations.

The results also highlight the important role of the demographic factors, especially the level of education. In general, education facilitates the participation in the STR market. However, its influence on compliance is complex: on the one hand, higher levels of education increase the share of legal STR supply. On the other hand, the concentration of illegal STR accommodation is also higher in educated areas. Moreover, the role of education decreases when the performance of the LTR market is considered. This suggests that educated property-owners analyse the risks and benefits related to unlicenced accommodation provision and join the market under certain circumstances.

Other significant factors include other household attributes: age and dependent children. The results support that households with children tend not to join the STR market, and if they do, they are more likely to comply with regulations. In the case of age, while the results are less robust, a greater share of working age population increases participation in the STR market, and also compliance to rules. The lower compliance in areas with older population may signal challenges related to elderly containment and needing adequate public campaigns.

Finally, our analysis provides detailed insights on the role of market performance and financial incentives. Both the expected LTR and STR incomes influence participation in the STR market, however, their effects on compliance differ from each other. High STR income provides a significant incentive to engage in illegal accommodation provision, while high LTR income has the opposite effect, providing a high-revenue alternative to unlicenced STRs. Our results also support the role of the rent gap: neighbourhoods with an open STR rent gap have higher levels of illegal supply.

6. Conclusions and Policy Recommendations

Our analysis addressed major research gaps related to the neighbourhood determinants of compliance in the STR market. Based on the example of Edinburgh, our study demonstrated that compliance is affected by geographical characteristics (lower compliance in areas with high tourism demand); neighbourhood attributes (lower in areas with greater share of elderly population; higher in areas with greater share of households with dependent children; higher in areas with a greater share of educated population); housing market; by market performance (higher compliance in the case of high LTR expected income) and financial incentives (lower compliance in the case of higher STR rent gap). Moreover, the results provide detailed insights into the various channels these variables affect compliance. Most significantly, while higher education level leads to a higher compliance ratio, it also facilitates higher densities of illegal STR supply, suggesting that educated households assess risks and analyse the market.

Based on the results, we can formulate several recommendations for policy aiming at curbing STR in major cities. First, enforcement activities may target specific areas of the city, such as touristic neighbourhoods with many hotels; areas where STR hosts have high incomes; areas where the long-term are relatively low. Second, as market performance and financial incentives are proven to be significant factors for illegal STR supply, policy may concentrate on limiting STR income. This may be achieved by taxation rules or the introduction of annual day caps. These measures must be enforceable, requiring access for cities to data from STR platforms. Third, local authorities may put additional efforts into information campaigns and guides for property owners. The link between age attributes and compliance suggests the need to increase regulation enforcement in areas with a higher share of senior population.

Appendix

Table A1. Moran's I statistic

	Moran's I	P-value
listing dens	0.506	0.001
licence dens	0.439	0.001
rent gap	0.178	0.001
illegal dens	0.55	0.001

Figure A1 Long-term rental and short-term rental incomes in Intermediate Zones

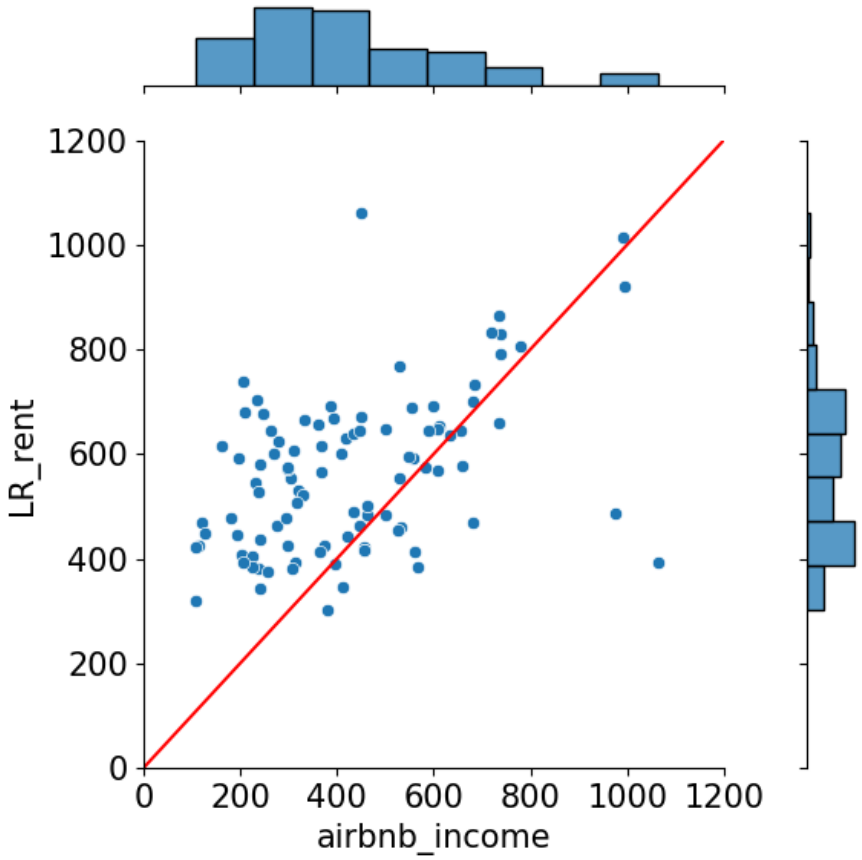


Table A2. VIF Statistic

65+	**19.611619**
coupleWithDepChildRate	22.930649
rentalOwned	8.299279
vacantSescondDwellingRate	19.663783
accommodation dens	4.520921
attraction dens	5.293555
airbnb income	97.654694
LTR rent	72.764649
degree+Rate	41.889289
rent gap	62.983715

Table A3. Regression analysis explaining licence densities

	Dependent variable: licence dens						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
const	-0.331	-0.519	-0.685	-0.447	0.377	-0.866	-0.953
	(0.701)	(0.698)	(0.661)	(0.728)	(0.716)	(0.659)	(0.685)
65+	-1.844	-2.015*	-1.933	-1.883	-2.285**	-2.101*	-2.020*
	(1.276)	(1.204)	(1.186)	(1.260)	(1.066)	(1.122)	(1.148)
coupleWithDepChildRate	-3.627	-3.209	-2.994	-3.567	-1.970	-2.591	-2.799
	(2.300)	(2.256)	(2.205)	(2.307)	(2.072)	(2.170)	(2.197)
degree+rate	1.826***	1.718***	0.700	1.893***	0.054	0.606	0.685
	(0.475)	(0.468)	(0.716)	(0.490)	(0.685)	(0.709)	(0.717)
rentalOwned	-0.357	-0.428	-0.459	-0.366	-0.660*	-0.528	-0.489
	(0.419)	(0.420)	(0.407)	(0.423)	(0.392)	(0.407)	(0.409)
vacantDwellingRate	12.112	11.141	10.180	12.088	6.380	9.245	9.886
	(9.308)	(8.770)	(9.000)	(9.285)	(8.068)	(8.589)	(8.872)
attraction dens	0.547***	0.547***	0.525***	0.549***	0.510***	0.525***	0.526***
	(0.054)	(0.054)	(0.056)	(0.054)	(0.055)	(0.055)	(0.056)
accommodation dens	1.078	0.956	1.121	1.043	0.888	1.000	1.057
	(0.702)	(0.693)	(0.711)	(0.704)	(0.685)	(0.703)	(0.710)
airbnb income		0.001***			0.004***	0.001***	
		(0.000)			(0.001)	(0.000)	
LTR rent			0.002**			0.002**	0.002**

			(0.001)			(0.001)	(0.001)
rent gap				0.111	-1.824***		0.215**
				(0.115)	(0.614)		(0.099)
Observations	97	97	97	97	97	97	97
R^2	0.927	0.929	0.930	0.927	0.937	0.932	0.931
Adjusted R^2	0.921	0.923	0.924	0.920	0.931	0.926	0.924
Residual Std. Error	0.662 (df=89)	0.654 (df=88)	0.649 (df=88)	0.664 (df=88)	0.618 (df=87)	0.641 (df=87)	0.648 (df=87)
F Statistic	370.266*** (df=7; 89)	254.400*** (df=8; 88)	323.363*** (df=8; 88)	307.403*** (df=8; 88)	165.105*** (df=9; 87)	226.031*** (df=9; 87)	256.810*** (df=9; 87)
	*p<0.1; **p<0.05; ***p<0.01						

Table A4. Regression analysis explaining listing densities

	Dependent variable: listing dens						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
const	0.395	0.126	0.113	0.150	1.061*	-0.149	-0.296
	(0.646)	(0.625)	(0.647)	(0.651)	(0.633)	(0.625)	(0.648)
65+	-1.989	-2.234*	-2.060	-2.071	-2.516**	-2.302*	-2.192*
	(1.361)	(1.253)	(1.294)	(1.328)	(1.090)	(1.194)	(1.234)
coupleWith Dep Child rate	-7.136***	-6.538***	-6.631***	-7.010***	-5.246***	-6.048***	-6.333***
	(2.193)	(2.091)	(2.188)	(2.171)	(1.977)	(2.098)	(2.146)
degree+ rate	2.631***	2.476***	1.731**	2.772***	0.741	1.595*	1.708**
	(0.515)	(0.497)	(0.845)	(0.538)	(0.786)	(0.833)	(0.846)
rental Owned	-0.224	-0.326	-0.305	-0.242	-0.567*	-0.404	-0.351
	(0.366)	(0.362)	(0.355)	(0.371)	(0.326)	(0.350)	(0.356)
vacant DwellingRate	7.404	6.013	5.860	7.353	1.049	4.510	5.414
	(9.442)	(8.651)	(9.277)	(9.321)	(7.877)	(8.631)	(9.067)
attraction dens	0.523***	0.522***	0.505***	0.527***	0.484***	0.505***	0.507***
	(0.057)	(0.056)	(0.058)	(0.057)	(0.056)	(0.057)	(0.058)
accommodation dens	1.752**	1.577**	1.786**	1.677**	1.506**	1.612**	1.690**

	(0.717)	(0.698)	(0.730)	(0.710)	(0.706)	(0.712)	(0.723)
airbnb income		0.001***			0.005***	0.001***	
		(0.000)			(0.001)	(0.000)	
LTR rent			0.001			0.001	0.002*
			(0.001)			(0.001)	(0.001)
rent gap				0.236**	-1.901***		0.327***
				(0.110)	(0.625)		(0.099)
Observations	97	97	97	97	97	97	97
R^2	0.934	0.938	0.936	0.935	0.946	0.940	0.938
Adjusted R^2	0.929	0.933	0.930	0.929	0.940	0.934	0.932
Residual Std. Error	0.689 (df=89)	0.670 (df=88)	0.683 (df=88)	0.687 (df=88)	0.632 (df=87)	0.664 (df=87)	0.676 (df=87)
F Statistic	1249.446* ** (df=7; 89)	1265.224 *** (df=8; 88)	1260.449 *** (df=8; 88)	1239.228* ** (df=8; 88)	764.613* ** (df=9; 87)	1181.484 *** (df=9; 87)	1342.773 *** (df=9; 87)
	*p<0.1; **p<0.05; ***p<0.01						

References

Airbnb (2023) *Airbnb q4-2023 and full-year financial results*, Available: https://news.airbnb.com/airbnb-q4-2023-and-full-year-financial-results/ [Accessed 15-08-2024 2024].

Ayouba, K., Breuillé, M.-L., Grivault, C. and Le Gallo, J. (2020) Does airbnb disrupt the private rental market? An empirical analysis for french cities. *International Regional Science Review, 43*(1-2), pp. 76-104.

Barron, K., Kung, E. and Proserpio, D. (2018) The sharing economy and housing affordability: Evidence from airbnb. in *EC*. pp. 5.

Barron, K., Kung, E. and Proserpio, D. (2019) When airbnb listings in a city increase, so do rent prices. *Harvard Business Review*.

Barron, K., Kung, E. and Proserpio, D. (2021) The effect of home-sharing on house prices and rents: Evidence from airbnb. *Marketing Science, 40*(1), pp. 23-47.

Barry Born, T. (2021) Proactive state geographies: Geocoded intelligence in london's 'suburban shanty towns'. *Environment and Planning D: Society and Space, 39*(4), pp. 609-626.

Basuroy, S., Kim, Y. and Proserpio, D. (2020) Estimating the impact of airbnb on the local economy: Evidence from the restaurant industry. *Available at SSRN 3516983*.

Bei, G. and Celata, F. (2023) Challenges and effects of short-term rentals regulation: A counterfactual assessment of european cities. *Annals of Tourism Research, 101*, pp. 103605.

Bekkerman, R., Cohen, M. C., Kung, E., Maiden, J. and Proserpio, D. (2023) The effect of short-term rentals on residential investment. *Marketing Science, 42*(4), pp. 819-834.

Belot, C., Kerrigan, D. and Wachsmuth, D. (2024) The motivations and practices of commercial short-term rental operators in the short-term/long-term "regulatory gap". *Urban Research & Practice*, pp. 1-26.

Bibler, A., Teltser, K. and Tremblay, M. J. (2022a) Short-term rentals, home prices, and housing affordability: Evidence from airbnb registration enforcement. *Andrew Young School of Policy Studies Research Paper Series*.

Bibler, A., Teltser, K. and Tremblay, M. J. (2022b) Short-term rental platforms and homeowner displacement: Evidence from airbnb registration enforcement. *Andrew Young School of Policy Studies Research Paper Series Forthcoming*.

Bibler, A. J., Teltser, K. F. and Tremblay, M. J. (2021) Inferring tax compliance from pass-through: Evidence from airbnb tax enforcement agreements. *Review of Economics and Statistics, 103*(4), pp. 636-651.

Boeing, G., Besbris, M., D. and Wegmann, J. (2021) Tilted platforms: Rental housing technology and the rise of urban big data oligopolies. *Urban Transformations, 3*, pp. 1-10.

Bosma, J. R. (2022) Platformed professionalization: Labor, assets, and earning a livelihood through airbnb. *Environment and Planning A: Economy and Space, 54*(4), pp. 595-610.

Chaves Fonseca, C. (2024) Short-term rentals and residential rents: Evidence from a regulation in santa monica. *International journal of housing markets and analysis*.

Chen, W., Wei, Z. and Xie, K. (2022) The battle for homes: How does home sharing disrupt local residential markets? *Management Science, 68*(12), pp. 8589-8612.

Chen, Y., Huang, Y. and Tan, C. H. (2021) Short-term rental and its regulations on the home-sharing platform. *Information & Management, 58*(3), pp. 103322.

Collinson, P. (2017) Half of landlords in one london borough fail to declare rental income. *The Guardian, 13*.

Colomb, C. and Moreira de Souza, T. (2023) Illegal short-term rentals, regulatory enforcement and informal practices in the age of digital platforms. *European Urban and Regional Studies*, pp. 09697764231155386.

Devlin, R. T. (2018) Asking 'third world questions' of first world informality: Using southern theory to parse needs from desires in an analysis of informal urbanism of the global north. *Planning Theory, 17*(4), pp. 568-587.

Duso, T., Michelsen, C., Schaefer, M. and Tran, K. D. (2020) Airbnb and rents: Evidence from berlin.

Duso, T., Michelsen, C., Schäfer, M. and Tran, K. D. (2024) Airbnb and rental markets: Evidence from berlin. *Regional Science and Urban Economics, 106*, pp. 104007.

Edinburgh City Council (2022) *Short-term let control area*, Available: https://www.edinburgh.gov.uk/planning-13/proposal-designate-short-term-let-control-area. [Accessed 30-09-2024].

Einav, L., Farronato, C. and Levin, J. (2016) Peer-to-peer markets. *Annual Review of Economics, 8*(1), pp. 615-635.

Farnood, F. and Jones, C. (2023) Has the revival in the scottish private rented sector since the millennium achieved maturity? *Housing Studies, 38*(6), pp. 963-984.

Ferreri, M. and Sanyal, R. (2018) Platform economies and urban planning: Airbnb and regulated deregulation in london. *Urban Studies, 55*(15), pp. 3353-3368.

Ferreri, M. and Sanyal, R. (2022) Digital informalisation: Rental housing, platforms, and the management of risk. *Housing Studies, 37*(6), pp. 1035-1053.

Fields, D. and Rogers, D. (2021) Towards a critical housing studies research agenda on platform real estate. *Housing, theory and society, 38*(1), pp. 72-94.

Garz, M. and Schneider, A. (2023) Taxation of short-term rentals: Evidence from the introduction of the “airbnb tax” in norway. *Economics Letters, 226*, pp. 111120.

Garz, M. and Schneider, A. (2023a) Taxation of short-term rentals: Evidence from the introduction of the “airbnb tax” in norway. *Economics Letters, 226*, pp. 111120.

Garz, M. and Schneider, A. (2023b) Data sharing and tax enforcement: Evidence from short-term rentals in denmark. *Regional Science and Urban Economics, 101*, pp. 103912.

Gauß, P., Gensler, S., Kortenhaus, M., Riedel, N. and Schneider, A. (2024) Regulating the sharing economy: The effects of day caps on short-and long-term rental markets and stakeholder outcomes. *Journal of the Academy of Marketing Science*, pp. 1-24.

Gurran, N. and Sadowski, J. (2019) Regulatory combat? How the" sharing economy" is disrupting planning practice. *Planning Theory & Practice, 20*(2), pp. 274-279.

Gurran, N., Searle, G. and Phibbs, P. (2020) Urban planning in the age of airbnb: Coase, property rights, and spatial regulation. in *Disruptive urbanism*: Routledge. pp. 7-24.

Gyódi, K. and Nawaro, Ł. (2021) Determinants of airbnb prices in european cities: A spatial econometrics approach. *Tourism management, 86*, pp. 104319.

Hamari, J., Sjöklint, M. and Ukkonen, A. (2016) The sharing economy: Why people participate in collaborative consumption. *Journal of the association for information science and technology, 67*(9), pp. 2047-2059.

Hoffman, L. M. and Heisler, B. S. (2020) *Airbnb, short-term rentals and the future of housing,* Routledge.

Horn, K. and Merante, M. (2017) Is home sharing driving up rents? Evidence from airbnb in boston. *Journal of Housing Economics, 38*, pp. 14-24.

Hübscher, M. and Kallert, T. (2023) Taming airbnb locally: Analysing regulations in amsterdam, berlin and london. *Tijdschrift voor economische en sociale geografie, 114*(1), pp. 6-27.

Jin, G. Z., Wagman, L. and Zhong, M. (2024) The effects of short-term rental regulation: Insights from chicago. *International Journal of Industrial Organization, 96*, pp. 103087.

Ki, D. and Lee, S. (2019) Spatial distribution and location characteristics of airbnb in seoul, korea. *Sustainability, 11*(15), pp. 4108.

Koster, H. R., Van Ommeren, J. and Volkhausen, N. (2021) Short-term rentals and the housing market: Quasi-experimental evidence from airbnb in los angeles. *Journal of Urban Economics, 124*, pp. 103356.

Lee, D. (2016) How airbnb short-term rentals exacerbate los angeles's affordable housing crisis: Analysis and policy recommendations. *Harv. L. & Pol'y Rev., 10*, pp. 229.

Leshinsky, R., & Schatz, L. (2018). “I Don’t Think My Landlord Will Find Out:” Airbnb and the Challenges of Enforcement. Urban Policy and Research, 36(4), 417–428. https://doi.org/10.1080/08111146.2018.1429260

Marsh, A., Gibb, K., Harrington, N. and Smith, B. (2023) The impact of regulatory reform on the private rented sector. in: Glasgow: CaCHE, University of Glasgow.

Panahandeh, A., Rabiei-Dastjerdi, H., Goktas, P. and McArdle, G. (2025) Answering new urban questions: Using explainable ai-driven analysis to identify determinants of airbnb price in dublin. *Expert Systems with Applications, 260*, pp. 125360.

Park, S.K., Kwak, K.T. and Lee, B.G. (2019) Policy compliance and deterrence mechanism in the sharing economy: Accommodation sharing in Korea, *Internet Research 29 (*5), pp. 1124-1148

Rae, A. (2017) Analysis of short-term lets data for edinburgh, Available: https://greens.scot/sites/default/files/AnalysisShortTermLetsDataforEdinburgh_AlasdairRae_PDF-FINAL_2.pdf. [Accessed 30-09-2024].

Scottish Goverment (2023) Short term lets - licensing scheme part 1: Guidance for hosts and operators. https://www.edinburgh.gov.uk/planning-13/proposal-designate-short-term-let-control-area [Accessed 30-09-2024].

Orsi, J., Eskandari-Qajar, Y., Weissman, E., Hall, M., Mann, A. and Luna, M. (2013) Policies for shareable cities: A sharing economy policy primer for urban leaders. *Oakland:: Sustainable Economies Law Center*.

Oskam, J. and Boswijk, A. (2016) Airbnb: The future of networked hospitality businesses. *Journal of tourism futures*.

Quattrone, G., Proserpio, D., Quercia, D., Capra, L. and Musolesi, M. (2016) Who benefits from the" sharing" economy of airbnb? in *Proceedings of the 25th international conference on world wide web*. pp. 1385-1394.

Rabiei-Dastjerdi, H., McArdle, G. and Hynes, W. (2022) Which came first, the gentrification or the airbnb? Identifying spatial patterns of neighbourhood change using airbnb data. *Habitat International, 125*, pp. 102582.

Richards, G. (2017) Sharing the new localities of tourism. *Collaborative economy and tourism: Perspectives, politics, policies and prospects*, pp. 169-184.

Robertson, D. and Young, G. (2018) An evaluation of rent regulation measures within scotland's private rented sector.

Robertson, C., Dejean, S. and Suire, R. (2024) “Airbnb in the city”: Assessing short-term rental regulation in bordeaux. *The Annals of Regional Science, 72*(2), pp. 647-682.

Sarkar, A., Koohikamali, M. and Pick, J. B. (2020) Spatial and socioeconomic analysis of host participation in the sharing economy: Airbnb in new york city. *Information Technology & People, 33*(3), pp. 983-1009.

Seiler, M. J., Siebert, R. B. and Yang, L. (2024) Airbnb or not airbnb? That is the question: How airbnb bans disrupt rental markets. *Real Estate Economics, 52*(1), pp. 239-270.

Shabrina, Z., Arcaute, E. and Batty, M. (2021) Airbnb and its potential impact on the london housing market. *Urban Studies*, pp. 0042098020970865.

Shaw, J. (2020) Platform real estate: Theory and practice of new urban real estate markets. *Urban Geography, 41*(8), pp. 1037-1064.

Söderström, O. and Mermet, A.-C. (2020) When airbnb sits in the control room: Platform urbanism as actually existing smart urbanism in reykjavík. *Frontiers in Sustainable Cities, 2*, pp. 15.

Stergiou, D. P. and Farmaki, A. (2020) Resident perceptions of the impacts of p2p accommodation: Implications for neighbourhoods. *International Journal of Hospitality Management, 91*, pp. 102411.

Valentin, M. (2021) Regulating short - term rental housing: Evidence from new orleans. *Real Estate Economics, 49*(1), pp. 152-186.

Wachsmuth, D. and Weisler, A. (2018) Airbnb and the rent gap: Gentrification through the sharing economy. *Environment and Planning A: Economy and Space, 50*(6), pp. 1147-1170.

Wang, Y., Livingston, M., McArthur, D. P. and Bailey, N. (2023) The challenges of measuring the short-term rental market: An analysis of open data on airbnb activity. *Housing Studies*, pp. 1-20.

Wessel, M., Schmidt-Kessen, M. J. and Hukal, P. (2024) Regulating short-term rental platforms: The effects of local regulatory responses on airbnb's operations in europe. *Industrial and Corporate Change*, pp. dtad075.

Yeon, J., Kim, S. J., Song, K. and Kim, J. (2022) Examining the impact of short-term rental regulation on peer-to-peer accommodation performance: A difference-in-differences approach. *Current issues in Tourism, 25*(19), pp. 3212-3224.

Yeon, J., Song, H. J. and Lee, S. (2020) Impact of short-term rental regulation on hotel industry: A difference-in-differences approach. *Annals of Tourism Research, 83*, pp. 102939.