A Work Project, presented as part of the requirements for the Award of a Master's degree in Management from the Nova School of Business and Economics.

Lisbon's Airbnb Market and Gentrification
Current developments through the pandemic and the implications for public policy

Louis Heinermann

Work project carried out under the supervision of:

Rodrigo Belo

16/12/2022

Abstract

Lisbon's seemingly unstoppable growth of Airbnbs and the coherently gentrification, have been interrupted during Covid-19. As tourist flows are returning to the city, this paper focuses on the changes in the short-term rental market, addresses the current impact of gentrification/touristification in Lisbon's Civil Parishes, and identifies which aspects drive resilience and significant price increases for short-term rentals. Moreover, it shows trends in the market and gives implications for legislators.

Keywords: Airbnb, Gentrification, Touristification, Short-Term Rentals, Public Policy

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

1. Introduction

While Lisbon was driven by solid suburbanization and the population escape from the city center until the crisis in 2008, as housing stock quality decreased in the center due to low rents and related refusal of landlords to renovate, rehabilitation has been needed in the center (Lestegás 2019). The government incentivized private investments by liberalizing the housing market and implementing favorable laws for transnational investors, such as the Non-Habitual Residents regime and Golden Visa for substantial investments in real estate to attract rehabilitation. Especially with the easing of evictions and favorable tax regimes for Short-Term Rentals (STR), apartments were rehabilitated and switched from Long-Term Rental (LTR) to STR, driving gentrification across marginal levels with the touristification of areas (Barata-Salgueiro, Mendes, and Guimarães 2018; Sequera and Nofre 2020; Dagkouli-Kyriakoglou et al. 2022). As Lisbon has gained continuous popularity among tourists and won several prices as a top destination (ePortugal 2020; World Travel Awards 2022), tourist numbers and nights increased continuously over the last decade. Simultaneously grew the number of Alojamento Local (AL)/Licensed STR apartments and new players on platforms like Airbnb. While this seemingly unstoppable rise of STRs, which has been able to due to favorable legislation, has seemed to be interrupted during the Covid-19 pandemic. The number of arriving air passengers and booked nights reached (almost) Pre-Covid-19 levels in September 2022 in Lisbon (INE 2022c; 2022a; 2022b; Sylvers 2021); it is to be answered how the STR sector, namely with Airbnb has developed. While it is inarguable that the landscape of Airbnb has changed during the Covid-19 pandemic, this work highlights the development and changes of Airbnb in Lisbon and their implication on touristification and gentrification. For this, I consider the quarterly September 2018 to September 2019 and September 2021 to September 2022 data. Where to my best belief, I am among the first to analyze Airbnb data for late 2022 in Lisbon.

2. Literature Review

2.1. Recap of Airbnbs / Legislation in Lisbon

Airbnb, founded in 2008 in the US, operates as an online platform for short-term stays and tourist activities. Nowadays, it is active in more than 220 countries with six million listings and has over four million hosts worldwide, making it one of the biggest competitors in the accommodation industry (Airbnb Inc. 2022; Larpin et al. 2019). While Airbnb started to operate in Portugal in 2009, namely in Lisbon as the first city, it was driven by rapid growth in the Portuguese capital (Airbnb Inc. 2016). Especially favorable legislation enabled the listings growth in Lisbon.

Starting in 2008 with the creation of Alojamento Local (AL), reformed in 2014, Portugal created a legal framework for temporary accommodation services which do not fulfill the requirements for hotels (Decree Law 39/2008, Decree Law 128/2014). With the liberalization of the housing market, under the pressure of the Troika and the need for rehabilitation of dwellings in cities, reforms on lease and renovation regimes took place (Law 30/2012, Law 31/2012). In addition to a favorable fiscal framework (Law 104/2018), these changes have simplified evictions, which in sum created lucrative incentives for investors of STR.

While municipalities did not have a legal framework to restrict the growth of AL in their territory, the national government created possibilities for municipalities in 2018 to restrict registrations in high-density zones (Law 62/2018). Following this, Lisbon issued a ban on new registries in 2018 (Resolution n.o 462/AML/2018) for the zones Bairro Alto / Madragoa and Castelo / Alfama / Mouraria (corresponding to part of the parishes of Estrela, Misericórdia and Santo António, and part of the parishes of Santa Maria Maior and São Vicente), where 25% or more of the dwellings are registered as AL. In 2019 the restrictions were extended to the zones Graça and Colina de

Santana (corresponding to part of the parishes of São Vicente and part of the parishes of Arroios and Santo António) (Resolution No. 189/AML/2019). While here, the long period between the announcement and the implementation of the restrictions led to a peak in registrations (Peralta, Pereira dos Santos, and Gonçalves 2020), the effect of the restriction will only be accessible in the future, as AL licenses cannot be transferred from one legal entity to another.

As Covid-19 affected the tourism market and respectively the bookings dropped for STRs/ALs, the Municipality of Lisbon (ML) issued the "Safe Rent Program" in 2020 (Resolution 68/CM/2020) to incentivize STR landlords to rent their property for a minimum of 5 years to the ML. While the ML would offer rental payments for up to three years upfront, it would follow to rent these dwellings for a partial amount as social housing (Warren and Almeida 2020). Although the goal was to get 1,000 dwellings for social housing, only 117 properties joined the program, from which only 45 were AL (The Portugal News 2020a). While additional 107 apartments (40 ALs) joined in the second safe rent program, the program still kept behind expectations missing the goal of 1,0000 dwellings (The Portugal News 2020b).

In April 2022, the ML imposed an additional immediate suspension for the registry of AL in Lisbon, this time based on Civil Parish (CP) (the smallest local administrative unit in Portugal), they restricted the registry for CPs, where the share of AL is equal to or greater than 2.5% of the number of permanent dwellings (Resolution 123/AML/2022). This led to a freeze in 15 of 25 parishes, where Santa Maria Maior (52%), Misericordia (39%), Santo Antonio (26%), Sao Vicente (16%), Arroios (14%), and Estrella (11%) had the highest density of AL (CML 2022). The suspension is active six months since issued, with one renewal of six months or until the alteration of the Municipal Regulation on Local Accommodation comes into force (Resolution 123/AML/2022).

2.2. Current Research on Airbnbs / Short Term Rental Market

In the previous literature regarding the development of Airbnbs and gentrification and touristification, several aspects of the STR market have been researched: price/demand determinants, professionalization of Airbnbs, implications on gentrification/touristification, the rent gap, and the impact of Covid-19/survival analysis.

As for price (or demand), several studies examined determinants for price with hedonic pricing models across several periods but not between periods to analyze price increases in the Airbnb market over time. Here, little is known about which factors drive price increases. For stationary price determinants however, the location, such as Instagram spots, the distance to metro stations (Deboosere et al. 2019), and the concentration of food services/shops (Perez-Sanchez et al. 2018). While for listings, amenities, guest capacity, and the number of bathrooms, and hosts, attributes, like super-host status and professionality of the host/multi-listings hosts (Wang and Nicolau 2017; Xie and Mao 2017) have been analyzed and found to be significant for price and demand determinations.

Especially in the latter part, the professionalization of hosts has been subject to recent research, as the market is professionalizing, and little is known about the actors. While professional hosts so far have been identified as hosts with more than one (Xie and Mao 2017; Agustín Cocola-Gant et al. 2021; Demir and Emekli 2021; Kourtit et al. 2022; Gil and Sequera 2022), two (Schäfer and Braun 2016), or three (Singh Garha 2021) listings or as commercial hosts if they have more than 183 days of availability (Gil and Sequera 2022), Cocola-Gant et al. (2021) have contributed with a case study in Lisbon and Porto. In the study they show that also seemingly individual hosts outsource to agencies and correct the share of these actors. The example of “Porto Concierge”

stands out as they manage 700 apartments without having a host id themselves (Agustín Cocola-Gant et al. 2021). Moreover, Agustin Cocola-Gant and Gago (2021) contribute to fieldwork in Alfama (Lisbon), where they show that most properties are bought-to-let by foreign investors, which are then managed mainly by agencies. Also, outside of Lisbon, researchers have seen an increase in the professionalization of the market over time (Deboosere et al. 2019; Demir and Emekli 2021; Gil and Sequera 2022; Garha and Azevedo 2022). Going forward, I will take the definition of multi-host as more than one and adapt the definition of corporate hosts (>10) (Agustín Cocola-Gant et al. 2021). On the other hand, the trend developments of professionalization in the post-Covid-19 landscape need further study.

Next to the professionalization of the market also, Covid-19 had an impact on the market, here Liang et al. (2021), as one of the first, analyzed the effects of Covid-19 by checking changes in demand and occupation rates and performing a sentiment analysis on reviews to access language/origin of guests, resulting in finding significant decreases in bookings with trends for suburbanized rentals and different timings in the analyzed cities for the period between 2018 to 2020.

Others analyzed the survival rates of Airbnbs, here from Jan 2020 to August 2021, under consideration of unequal demand from different customer groups, finding that hosts with more listings, entire apartments, and especially luxury listings, tend to be more resilient (Kourtit et al. 2022). While Dolnicar and Zare (2020) argue that not all hosts will continue on Airbnb, as some will opt out for LTR to cover costs if they cannot afford the vacancy, it will ultimately drop the total listing number. Here the study in Barcelona, Beijing, London, Milan, New York, and Paris shows that hosts have a high tendency to leave Airbnb in response to the pandemic, with 30-50% of hosts deleting their listing in March 2020 and 70% after March 2021 compared to March 2018,

additionally, it shows that centrality to the center has a negative impact of survival in the investigated period (Kourtit et al. 2022). At the same time, professional hosts utilized listing across several platforms, even for intermediate rentals (6-12 months), to increase occupation temporarily during Covid-19 times (Dagkouli-Kyriakoglou et al. 2022). Garha and Azevedo (2022) focused in Lisbon and Barcelona on the housing market related to Airbnb and the impact of Covid-19 on Airbnbs from September 2019 to December 2020. They show that Lisbon has a significantly higher share of entire apartments than Barcelona, that commercial listings (listings annually being offered for more than 183 days) increased over the period, and that casual hosts have been affected stronger by the pandemic.

Significantly, central areas and their respective density in Airbnbs impact the rental price and the supply for LTR, as stock switches from LTR to STR to unlock the "rent gap" between LTR vs. STR. This finding also goes hand in hand with other research regarding rent increases, showing that with increased listings per area, the rents and prices for apartments in the area increase as well (Lestegás, Lois-González, and Seixas 2018; Peralta, Pereira dos Santos, and Gonçalves 2020; Cheung and Yiu 2022; Amore, de Bernardi, and Arvanitis 2022). Notably, the touristification of areas can impact a new higher base rent, pushing out residents (Cheung and Yiu 2022). Lisbon, specifically the historic center, serve as an example of urban regeneration with tourism, driven by an investor-friendly legal framework and accompanied by touristification/gentrification. Difficult to separate as they appear together, both have driven the landscape in the neighborhoods from evicted tenants to upgraded shops (Barata-Salgueiro, Mendes, and Guimarães 2018; Lestegás, Lois-González, and Seixas 2018). Gentrification, initially defined as the process of renovating house stock in poor and working-class neighborhoods in the center and making these available for upper classes and therefore evicting the original population (Smith 1996), takes place in Lisbon

next to touristification, which is also described as Airbnbization as Airbnb is the biggest competitor in the STR market (Richards 2014; Larpin et al. 2019).

According to Sequera and Nofre (2020), Lisbon and other Southern-European cities serve as one of the newest, most aggressive form of urban accumulation by dispossession and geographical displacement against the working and middle classes (locals and migrants), driven by the reproduction of global financial capital. Alfama (Santa Maria Maior) is the best-researched neighborhood in Lisbon, where the tourism-driven displacement due to the competition between limited housing stock between investors/developers and residents underlines the major shift of LHC regarding unstable touristification; naming the neighborhood a "touristscape" is an excellent example of the fast reduction of the rent gap by increasing house prices and displacing tenants (Lestegás 2019; Sequera and Nofre 2020; Bugalski 2020; Agustin Cocola-Gant and Gago 2021; Amore, de Bernardi, and Arvanitis 2022; Dudás et al. 2017; Barron, Kung, and Proserpio 2018). Although "arbnbization" is taking place, residents have a balanced view as they see the opportunities with tourists and dwelling preservation but also fear the higher rents; in the process of airbnbization, entire apartments become de-facto hotels, presenting a loss of housing stock for LTR and residents, which is problematic for future city development (Chamusca et al. 2019). As for some major US cities, Ding and Hwang (2022) could show that the impact of Covid-19 led to the relaxation of gentrification in exposed neighborhoods, this has not been recorded for Lisbon.

2.3. Research Topic

Although research has previously been conducted on gentrification/touristification in Lisbon, it has primarily focused on individual neighborhoods and previous periods. Also, in the case of Covid-19, a survival analysis considering the endemic times and price analysis in contrast to touristification over a more extended period still needs to be included in Lisbon.

In this study, I will focus on (1) the development of Airbnbs in Lisbon and their implication for the parishes by looking at (a) general development on listings with distribution/density affection of parishes, (b) the professionalization of hosts, (c) survival rates and attributes of listings over-time, and (d) the price development of listings considering affected neighborhoods and host attributes. In a second step, I will use data on (2) the resident population development from the 2011 and 2021 censuses to investigate (a) population decreases, (b) the increase of foreign residents, and (c) the increase of education levels per parishes, where I finally conclude how all these results contribute to gentrification/touristification in Lisbon and in the specific areas.

Following the literature and the intended analysis, the following research questions are defined:

1. Which civil parishes are affected specifically by Airbnb listings during the observed period?
2. Is the market professionalization/share of prof. listings continuing to increase after Covid-19?
3. Are the Airbnbs in these affected areas more resilient to survive (Covid-19) than others?
4. Are professional/corporate Airbnbs more resilient to survive (Covid-19) than others?
5. Is the price significantly increasing over the observed period?
6. Is the price significantly more increasing in affected areas than in others?
7. Is the price significantly more increasing if the host has multiple listings/ is corporate?
8. Does the demographic development of residents underline the pressure of Airbnb development in the affected areas?

Therefore, my research contributes by analyzing recent Airbnb and population developments in the context of touristification/gentrification and giving implications for public policy in Lisbon.

3. Methodology

3.1. Data Collection

On the Airbnb part, web-scraped data has been used from Murray Cox Project InsideAirbnb, where quarterly data is available for the past year; data collected here represents the period September 2021 to September 2022 (InsideAirbnb 2022). For the previous data from September 2018 to September 2019, I have been able to get access to previous InsideAirbnb data used in another research from the faculty. For the previous data, I have common information such as location, listings type, price, minimum nights, and the number of reviews. In contrast, the latter data has additional features such as the number of bedrooms, beds, bathrooms, and capacity, as well as review scores and amenities of the listings. Due to the asymmetry of information across the periods, I have run tests on a common information level for all periods and extended models for periods with additional information. While the data, especially the more detailed data, had unknown values, these have been filled with common assumptions (Appendix 1).

Moreover, detailed location attributes such as city, civil parish, and neighborhood names have been collected based on the coordinates from OpenStreetMap, as the original data showed discrepancies. Additionally, the coordinates on all metro stations within Lisbon are collected to calculate the haversine distance to the nearest metro stations (Appendix 2). Since earlier periods do not have breakdowns of the apartment listings count of the hosts, this is calculated for all based on the host apartment listings in the Lisbon district. As defined in previous literature, Lisbon's Historic Center (LHC) is defined as the CPs Santa Maria Maior, Misericórdia, São Vicente, Santo António, and Arroios and listings are marked with the *historic_center* variable. Furthermore, as the inflation peaked in 2022, prices are corrected to the 2018 base by using the annual average inflation rate for 2019 and 2021 and, for the case of 2022, the year-to-date average (Table 4).

Data on accommodation rental nights, disembarked passengers, and the censuses of 2011 and 2021 for population developments are used from Portugal's Statistic Institute (INE 2022c; 2022a; 2022b; 2022d).

3.2. Overall Framework

In the first step, the general development of the number of listings per type over the considered period is measured for the holistic development and impact of Covid-19 on listings in Lisbon. Moving forward, only apartment listings are considered, as they represent the major (>75%) share of listings and present potential housing stock lost to STR.

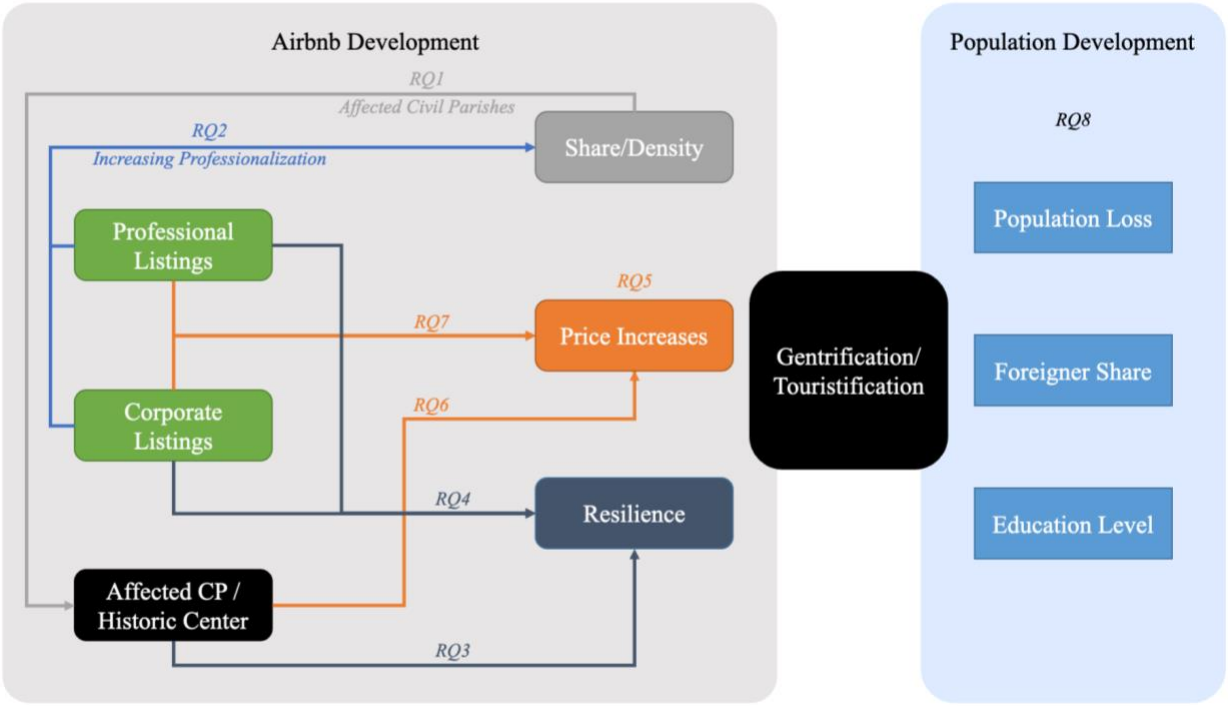

Figure 1: Research Questions Framework

In the framework above, the development of Airbnbs is analyzed considering the aspects of distribution, professionalization, price increase, and resilience with regard to gentrification and touristification in Lisbon. High density of listings, price increases, and resilience are considered as indicators for (the danger of) gentrification/touristification. The interactions can be described as follows: when listing prices increase, the rent gap increases as landlords can generate higher

earnings with STR, which ultimately puts price pressure on LTR rents; as the share of listings increases in an area (or has a high density), the amount of LTR apartment decreases (is low in the area), which ultimately reduces living space for residents/pushes them out of the area; when listings have high resilience, their tendency to withstand crises/vacancy is high, which ultimately makes LTR incentives less attractive.

As for RQ1, affected CPs are determined by considering spatial distribution and concentration in CPs by (a) the number of apartments, (b) apartments per km^2, (c) total share of listings, and (d) Kernel Density Estimate Plot (KDE) over time.

Professionalization of the listings (RQ2) over time is examined with time series analysis of (a) the share of professional listings (multi-listings host) and corporate listings (>10 listings) and (b) the share of multi-list and corporate hosts and their respective growth rates on holistic and CP levels. Moreover, listing numbers and share trends are (linearly) extrapolated to provide a future outlook on the market dynamics. Additionally, the degree of professionalization is accessed on a CP level. As determined in previous research, there is a strong change in the composition of Airbnb listings. So for a first overview, the turnover rates of the periods are determined (turnover rate: delisted apartments divided by the average listings number per year). Comprehending resilience of listings, the influence of professionalization (RQ4), and the influence of being located in the historic center/most affected area (RQ3) is accessed. For this purpose, logistic regression will assess the survival of a listing in the next year/period and the influencing factors on the probability of survival. While price increases are expected to increase overall (RQ5), professionalization of listings (RQ7) and location in the historic center (RQ6) are expected to have an influence on the price increase. Therefore, the average listing price increases across periods are calculated, while other price determinants are assessed with the OLS model.

Next to the Airbnb development, the framework also accesses direct indications of gentrification/touristification in the development of the resident population on the CP level to answer RQ9 by considering aspects of population loss, increasing foreigner share, and rise in education levels. From the influence of rising prices and related dwindling housing, the loss of residents in CPs is inferred as the remaining housing becomes less desirable and affordable. Furthermore, the effect of a rising share of foreigners can indicate another form of displacement of residents, as wealthier foreigners (higher purchasing power than locals) reshape the competition in the housing market and ultimately replace local residents. Finally, the rising tertiary education is considered to perceive whether better educated and assumingly wealthier residents take over rather lower-class residents' areas. Concluding, these three aspects are used to evaluate gentrification/touristification by looking at the population development of the last decade.

3.2.1. Logistic Regression (Survival Estimation)

Research question 3 and 4 lead to the hypotheses that (i) Airbnbs in LHR are more resilient than outside, (ii) professional hosts are more resilient than non-professional hosts, and (iii) corporate hosts are more resilient than non-corporate hosts.

To test the three hypotheses, four logistic models are created to assess whether the factors in question significantly relate to the survival of the listings. The logistic model estimates the probability for the event (survival) to occur. The first three models follow the following equation:

$$P(Survival) = \frac{1}{1 + \exp(-x_i^T \beta)}$$

x = (*price, minimum_nights, multi-host, corporate host, nearest_metrostation_meter, historic_center*); β = vector of coefficients

Equation 1: Survival Model / Logistic Regression

For the fourth (extended) model, as mentioned in the data chapter, the additional fields *accommodates, bathrooms, bedrooms, beds*, and *number_reviews* are used. Based on the common significance level of 95%, the p-values of the determinator are evaluated.

3.2.2. OLS-Regression / Mann-Whitney-U-Test (Price Development)

Research Questions 6, 7, and 8 lead to the hypotheses (iv) prices increase significantly per period, (v) prices for the historic center increase more than outside, (vi) prices of listings managed by professional hosts increase more than others, and (vii) prices of listings by corporate host increase stronger than others.

At first, complementing the OLS regression, the Mann-Whitney-U Test is run to determine whether prices between periods differentiate. In this test, the non-parametric equivalent of the t-test compares two independent unpaired samples based on ordinary or continuous variables and assesses which sample is bigger than the other. As the listing price does not follow a normal distribution, this test is run to compare periods (Table 16, Table 17).

The following OLS model is used to estimate the significance of each determinator, following the equation (for models 1, 2, and 3):

$$Price = \beta_0 + \beta_1 * NextYear + \beta_2 * HistoricCenter + \beta_3 * HistoricCenter * NextYear + \beta_4 * MultiHost + \beta_4 * MultiHost * NextYear + \beta_5 * CorpHost + \beta_6 * CorpHost * NextYear$$

Equation 2: OLS Regression / Price Development

Model 4 includes additional features as these are available for the time points 2021 and 2022 following the equation:

$$Price = \beta_0 + \beta_1 * NextYear + \beta_2 * HistoricCenter + \beta_3 * HistoricCenter * NextYear + \beta_4 * MultiHost + \beta_4 * MultiHost * NextYear + \beta_5 * CorpHost + \beta_6 * CorpHost * NextYear + \beta_7 * MetroStationIn500Meter + \beta_8 * Accommodates + \beta_9 * Bathrooms + \beta_{10} * NumberOfReviews$$

Equation 3: OLS Regression / Price Development (Extended)

4. Results

4.1. General development of listings / Affected areas

As shown in Figure 2, after continuous growth, the total listing peaked in September 2019 at 18270, following Covid-19; the assumption of Dolnicar and Zare (2020) proves true that listing numbers have significantly dropped (to 12951; by -29.11%) and that hosts might opt out for LTR. Only in March 2022 did entire homes/apartments start to grow again, followed by other listing types in July 2022, however, at a lower growth rate than before.

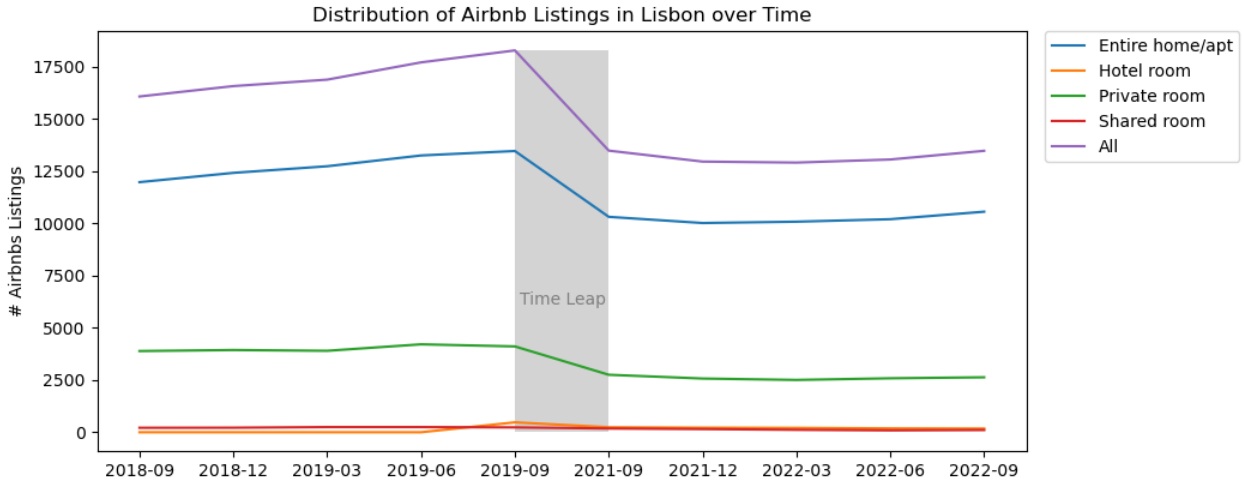

Figure 2: Distribution of Airbnb Listings over time

Therefore, Covid-19 has impacted listings and releveled the number of listings to a new base from where they eventually started to grow slightly (at a lower rate) again. The suspension of new AL registrations from March 2022 cannot be directly accessed in the data, as listed Airbnbs do not necessarily represent all ALs, especially since some AL may temporarily choose to rent on the LTR market, and discrepancies between licensed ALs and Airbnb listings occur. However, the slower growth rate in Airbnb listings could indicate the first effects. Furthermore, apartments still represent the most significant portion (>75%) of the listings in Lisbon. Continuing with apartment listings, as explained in the methodology, the most Airbnbs apartments in Lisbon are in Santa Maria

Maior (25.95%), Misericórdia (18.47%), Arroios (10.58%), São Vicente (8.73%), and Santo António (8.03%), which is congruent with the number of apartments per CP (Table 6). When looking at apartments per square km, to put the numbers into context, Santa Maria Maior (909.97Apt/km^2), Misericórdia (889.95 Apt/km^2), Santo António (586.46 Apt/km^2), Arroios (523.94 Apt/km^2), and São Vicente (462.81 Apt/km^2) are affected the most (Sep-2022 numbers) by Airbnbs Apartments (Figure 7, Figure 8, Table 7). The KDE Plots also show the highest spatial density of apartments in Misericórdia and Santa Maria Maior across periods, with slighter expansion towards São Vicente, Arroios, and Santa Antonio. Noteworthy, when comparing the four density plots, is also that some individual further accumulations occur in the density plot in the north of the city, which disappear over the period and indicate a stronger concentration towards the center in the south (Figure 9, Figure 10, Figure 11, Figure 12).

Concluding the results of occurrence per CP, the distribution per sqm in the CPs, and density plots, Santa Maria Maior, Misericórdia, Santo António, Arroios, and São Vicente are affected the strongest by Airbnb accumulation in Lisbon. Consistent with this area is also the historic center, where many of the city's sights and attractions are located. This is why this area is also referred to as the historic center of Lisbon (LHC).

4.2. Professionalization of Hosts

Professionalization plays a significant role in the Airbnb market in Lisbon as 73.14% of apartment listings are professional (host has more than 1 apartment) and 31.42% corporate (host has more than ten apartments) in September 2022. While Covid-19 impacted the whole STR market, with the drop in tourists and demand for accommodations nights, not all listings were affected the same and delisted equally. When looking at growth rates, single apartments had more substantial decline

rates than professional and corporate apartments, which, vice versa, led to an increasing share of professional and corporate hosts in the market.

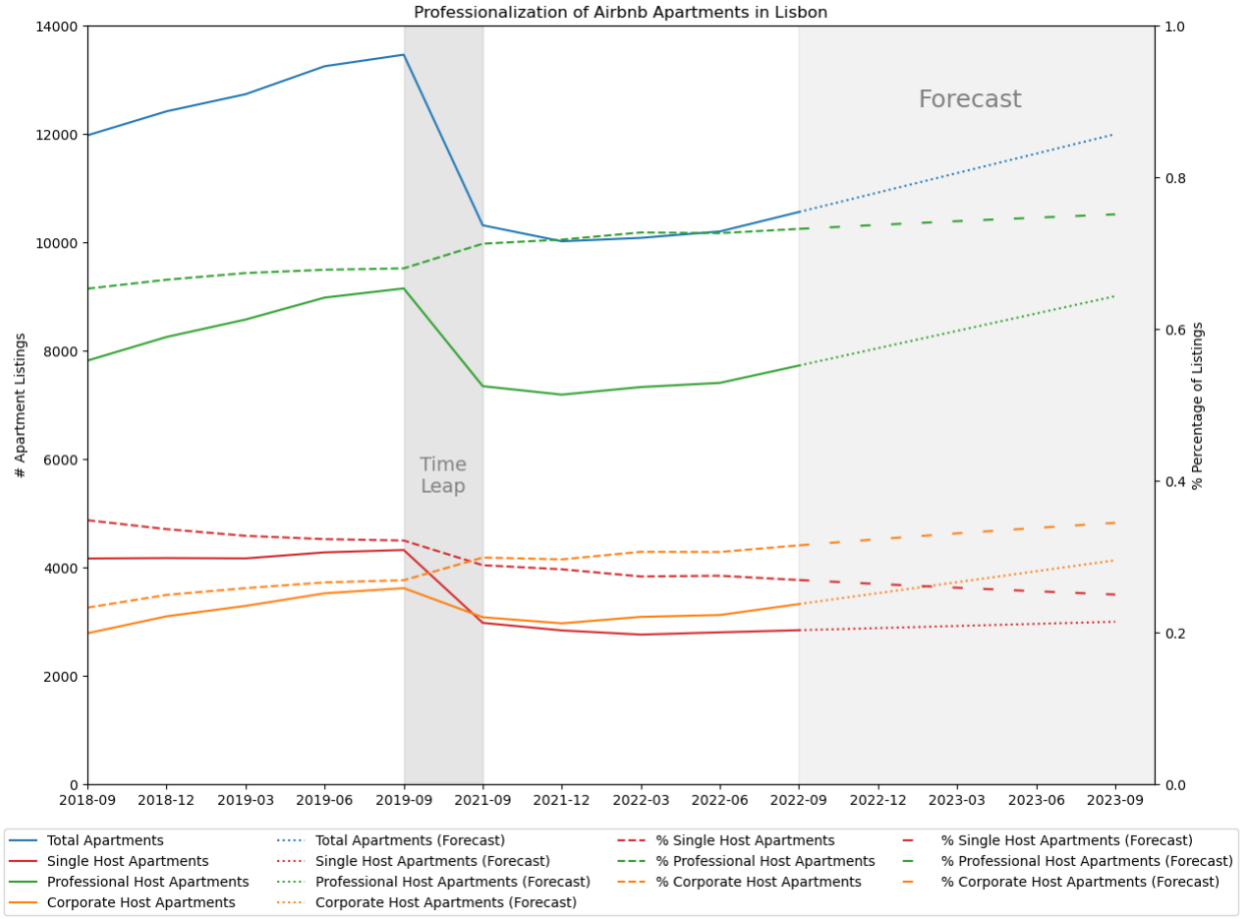

Figure 3: Professionalization Development

Continuing the trends, especially the slower growth of single-host apartments, could ultimately lead to their insignificance in the market. In contrast, corporate listings considering their development and the forecasted growth, increase their significance most substantial in the market. The overtaking of single listings by corporate listings during Covid-19 underlines this trend. While growth rates differ across single, professional, and corporate listings, their market share respectively changes over time (Figure 15, Table 11). Concluding for research question (2), continuous and increasing professionalizing of the market in Lisbon is present. When accessing the affection of professionalization in the CP, the LHC, in particular Santa Maria Maior (80.03%),

Misericórdia (77.32%), and Santo António (76.15%), has an above average (73.14%) proportion of professional listings, next to Campolide (77.97%), implying the highest concentration of professional apartments in Lisbon (Figure 13, Table 12).

For corporate listings, affections in CPs differ slightly, next to Campolide (48.31%), Santo António (40.02%), Avenidas Novas (37.45%), Santa Maria Maior (35.41%), Misericórdia (35.25%) show the highest concentration. Noteworthy, is again that the LHC (33.76%) has a higher concentration of corporate hosts than CPs outside (25.50%) (Figure 14, Table 13).

4.3. Listings Resilience (Survival of Listings)

Listings turnover has been significant throughout the observed period, with 20.01% (2018 → 2019), 50.06% (2019 → 2021), and 25.83% (2021 → 2022), with notice that the second period consists of two years and not one year.

Models	(1) 2018-19		(2) 2019-21		(3) 2021-22		(4) 2021-22 Extended	
No. Observations:	11967		13457		10307		10307	
Survive (True)	79.17%		56.75%		78.04%		78.04%	
Historic Center (True)	61.65%		61.45%		62.81%		62.81%	
Multi-Host (True)	65.17%		67.94%		71.18%		71.18%	
Corporate Host (True)	23.21%		26.83%		29.81%		29.81%	
Log-Likelihood:	-6087.3		-9100.3		-5368.9		-5181.9	
LL-Null:	-6123.8		-9204.6		-5425.1		-5425.1	
LLR p-value:	9.61E-14		2.75E-42		6.42E-22		2.65E-97	
	coefficient	***p-value***	**coefficient**	***p-value***	**coefficient**	***p-value***	**coefficient**	***p-value***
const	0.9944	***0.00000***	0.1168	***0.02900***	0.91060	***0.0000***	0.5398	***0.0000***
price	0.0003	*0.13000*	-0.0002	*0.23500*	-0.00030	***0.0030***	-0.0003	***0.0110***
minimum_nights	-0.0028	*0.15800*	-1.06E-05	*0.99400*	-0.00580	***0.0010***	-0.0046	***0.0080***
MultiHost	0.0969	*0.05900*	0.0823	***0.04900***	0.32180	***0.0000***	0.3470	***0.0000***
CorpHost	0.1617	***0.00800***	-0.425	***0.00000***	-0.28220	***0.0000***	-0.1791	***0.0030***
nearest_metrostation_meter	-2.2E-06	*0.93800*	-4.84E-05	***0.03800***	0.00003	*0.3170*	2.88E-05	*0.3590*
historic_center	0.3163	***0.00000***	0.37210	***0.00000***	0.36360	***0.0000***	1.45E-01	***0.0160***
accommodates	-	-	-	-	-	-	0.0124	*0.5820*
bathrooms	-	-	-	-	-	-	0.1204	***0.0130***
bedrooms	-	-	-	-	-	-	-0.0484	*0.2940*
beds	-	-	-	-	-	-	-0.0189	*0.4770*
number_of_reviews	-	-	-	-	-	-	0.0077	***0.0000***

Table 1: Survival Models / Logistic Regression

Referring to Table 1, the logistic models show a significant positive impact on survival for listings located in the historic center across all models, answering hypothesis (i) that Airbnbs are significantly more resilient in the LHR than listings outside. The significant impact of localization

in the historic center on survival and the already high Airbnb density in the center highlights the threatening resilience of Airbnbs in the area.

Contrary to professional listings, listings of corporate hosts have a holistically significant impact on survival. However, while corporate listings had a positive effect before Covid-19, they had a negative impact afterward. High vacancy and the missing revenues of STR assets might explain the delisting and temporary offering on the LTR market or other platforms, as Dolnicar and Zare (2020) suggested and Agustín Cocola-Gant et al. (2021) showed in interviews with STR agencies. In conclusion, for hypotheses (ii) and (iii), professional listings are more resilient than non-professional listings, and corporate listings do not seem more resilient than non-corporate hosts. Moreover, price and minimum nights were not significant during the first two periods but became significant "after" Covid-19. While the distance to the nearest metro station seemed negatively significant for the period during Covid-19, it was not significant outside Covid-19. In the extended model, the bathroom number and number of reviews also significantly positively impacted survival probability.

4.4. Price Increases Over Time

In Lisbon, average inflation-corrected Airbnb prices increased from 2018 to 2019 by 3.05%, from 2019 to 2021 by 10.68%, and from 2021 to 2022 by 28.10%, when considering the Mann-Whitney-U Test price increase are significant across all periods (Table 17). The most substantial price increase of 28.10% is from 2021 to 2022, which is also consistent with the results of models 3 and 4. Here, prices depending on the model, on average, increased by circa 20/21€ from 2021 to 2022, whereas for previous periods, the *NextYear* (variable) has been insignificant for a 95% significance level of price. While for all models, the presence of a metro station within 500 meters has been significant for the price, in later periods, its effect on price increased, likewise to the results of

Deboosere et al. (2019). Being located in the historical center only has been significant in 2021 and 2022, whereas for model 4, the price also increased significantly in that period when the listing was in the LHC.

Models	(1) 2018-19		(2) 2019-21		(3) 2021-22		(4) 2021-22 Extended	
No. Observations:	25050		23522		20782		20782	
R-squared:	0.018		0.026		0.065		0.361	
Adj. R-squared:	0.017		0.026		0.065		0.361	
	coefficient	***p-value***	**coefficient**	***p-value***	**coefficient**	***p-value***	**coefficient**	***p-value***
const	79.9676	***0.0000***	81.9074	***0.0000***	83.5935	***0.0000***	-11.7608	***0.0000***
NextYear	2.3208	*0.1040*	2.7621	*0.1320*	20.1683	***0.0000***	21.6990	***0.0000***
historic_center	-1.7610	*0.1030*	-1.0572	*0.3870*	-0.8896	*0.6240*	7.9301	***0.0000***
hcenter*NextYear	1.4058	*0.3290*	2.1248	*0.2370*	2.9806	*0.2260*	4.8335	***0.0180***
MultiHost	0.0424	*0.9680*	-1.4298	*0.2510*	3.5727	*0.0600*	5.8223	***0.0000***
MultiHost*NextYear	-1.4676	*0.3270*	5.0617	***0.0080***	2.3976	*0.3740*	1.9925	*0.3710*
CorpHost	12.2603	***0.0000***	9.6878	***0.0000***	14.6095	***0.0000***	2.8265	*0.0690*
CorpHost*NextYear	-2.5224	*0.1190*	5.2763	***0.0060***	13.8807	***0.0000***	14.3057	***0.0000***
metrostations_in500m	4.6739	***0.0000***	5.6051	***0.0000***	8.1870	***0.0000***	4.3906	***0.0000***
accommodates	-	-	-	-	-	-	10.9224	***0.0000***
bathrooms	-	-	-	-	-	-	40.7843	***0.0000***
number_of_reviews	-	-	-	-	-	-	-0.0910	***0.0000***

Table 2: Price Models / OLS Regression

Corporate listings generally were listed with higher prices across all periods, whereas from 2019 onwards, their prices also significantly increased more per period than those from other listings. Consequently, corporate hosts managed to list with higher prices and increased prices more significantly over periods than others. In contrast, professional listings have been insignificant for higher prices and price increases, with exceptions in models 2 and 4. Physical attributes, such as capacity and number of bathrooms, as well as the number of reviews, also strongly impacted the price.

In terms of the hypotheses, it can be concluded that (iv) prices do increase significantly in 2022 but not significantly in 2019 and 2021, according to the OLS. Moreover, (v) prices in the historic center do not increase more than outside, except in model 4 for 2022, and (vi) prices of listings managed by professional hosts do not generally increase more significantly than single listings, with an exception in 2021. Finally, (vii) corporate listings prices increased more substantially than other listings prices after 2019.

When considering only CP with a minimum of 100 listings, the highest average price increase in 2022 had the CPs Estrella (33.78%), Campo de Ourique (32.11%), Santa Maria Maior (31.22%), Misericórdia (30.91%), Penha de França (30.14%), and Arroios (29.66%). The rising prices combined with the high concentration of professional and corporate listings in the LHC underline the pressure in the city center. The substantial price increase in 2022 might be related to the overall decrease in listing numbers and the higher demand compared to previous periods (tourist levels on the 2019 level, but not listing numbers) (Figure 5).

4.5. Touristification/Gentrification in Lisbon

As pointed out in previous chapters, the CP of Santa Maria Maior, Misericórdia, São Vicente, Santo António, and Arroios (LHC) have been the most impacted by Airbnb apartments. The Census 2011 and 2021 data shows similar trends as Misericórdia, Santa Maria Maior, São Vicent, and Santo António have the highest relative population loss in Lisbon (Figure 4), underlining the resident displacement (by assumingly tourists).

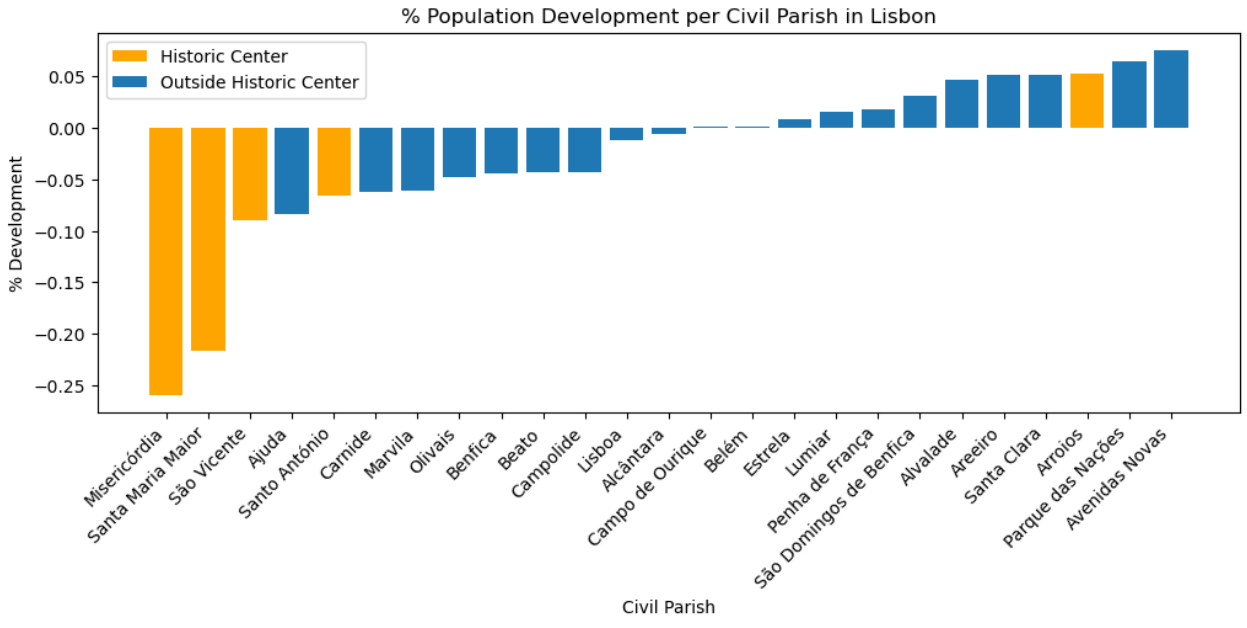

Figure 4: Population Growth (2011 vs. 2022) per CP

Additionally, to the ongoing population loss, the share of foreigners has rapidly increased in these CPs, leaving the LHC on top with the highest foreigner shares in Lisbon (Figure 16), underlining another aspect of gentrification, the displacement of the local population with foreigners.

For education levels, all parishes have seen increases in tertiary education, whereas the LHC had above average (34.42%) concentration with São Vicente (64.33%), Arroios (51.55%), Santa Maria Maior (46.87%), Misericórdia (39.60%), and Santo António (37.71%) (Figure 17).

5. Discussion

5.1. Conclusion

Generally, Covid-19 impacted listing numbers to drop from 18,270 (13,457 apartments) in September 2019 to 13,475 (10,307) in September 2021. While apartments only started to grow again in December 2021, growth was beneath Pre-Covid-19 levels (12.45% vs. 2.39%). While some areas in the LHR have restrictions for new AL licenses, listing increases in these areas were mainly possible with already registered ALs. However, this could explain the slower growth rates compared to Pre-Covid-19 times. Additionally, as the growth rates of corporate, professional, and single apartments differed, the former's concentration continued to increase over time. If these trends continue in the future, as the forecast suggests, this could lead to a corporately dominated market, which is more revenue driven as indicated by higher prices and price increases of corporate hosts. Combined with the higher resilience of corporate listings, this development is to be observed with caution.

While overall prices (inflation-corrected) are increasing, the average prices in the historic center increased above average, underlining the problem of touristification in Lisbon and its historic center. Additionally, Airbnbs in the LHC were found to be more resilient than others, which makes it unlikely for them to discontinue STR without incentivization/restriction. While the market

overall further professionalized with increasing multi-host listings and corporate-host listings, the center has been affected by the highest concentrations of these listings, implying stronger resilience and significantly higher price increases in these areas over time. Looking at the impact of survival from corporate listings (in the regression), it seems that they strategically left the platform during Covid-19 to maximize their revenue by avoiding vacancies and monetizing assets elsewhere. This goes hand in hand with the research of Agustín Cocola-Gant et al. (2021) on professionalized hosts, who showed that agencies tended to utilize platforms such as idealista.pt (Portuguese real estate platform) for LTR of STR during Covid-19 to minimize vacancy.

The population development, derived from the 2011 and 2021 census comparison, revealed critical population loss in the historic center, implying resident displacement. However, the rising share of foreign residents in these CPs indicated further displacement of local residents. Although the increase in tertiary education implies marginal gentrification in Lisbon, it has been significant in the historic center but not conspicuous to a particular degree. Concluding, especially when looking at the share of ALs per Conventional Dwelling, in particular, Santa Maria Maior (52%), and Misericórdia (39%) show very alarming levels, followed by the other CP in the center Santo António (26%), São Vicente (16%) and Arroios (14%), congruent with the other findings (Table 8).

Comparison with previous literature reveals a discrepancy in the resilience of listing over Covid. Kourtit et al. (2022) conclude that listings outside the center had a higher survival probability during (and towards the end) Covid-19. While they also conclude that entire apartments have a higher resilience, the fact that they consider private rooms and shared rooms and a slightly different time period in their analysis might explain the difference to some extent. The professionalization of hosts is also significant for the survival of listings from 2019 onwards, which underlines common results with Kourtit et al. (2022).

5.2. Implications / Public Policy

The national government's legal foundation for regulating AL registration at the municipal level was a significant step forward in the realignment of the AL landscape in Portugal, allowing Municipalities to put their legislation. With the first action of the ML in 2018/19, smaller AL crowded zones were closed to new AL registration. While this action was not noticeable in the short term due to its delayed enactment, property owners intending to register ALs could still do so. However, it may reduce the number of ALs in the long term, as the sale of AL property to another legal entity extinguishes the license. Similar effects can be expected from the current suspension for new ALs in April, which is spatially much more extensive, including 15 of the 24 CPs. As the current freeze expires in April 2023 or earlier when a new Regulation for ALs in ML is passed, it is time to act for the ML. While other incentive programs, such as the Renda Segura I and II, could have been more successful, considering low applications, especially from ALs, other initiatives are needed.

Considering the regulations and prohibitions in other cities, some cities prohibit the rental of entire apartments entirely (e.g., Santa Monica) or limit the days to e.g., 30 days (e.g. Amsterdam), 90 days (e.g. Berlin / London / Reykjavik) or 120 days (Paris) (City of Amsterdam 2022; City of Berlin 2022; City of London 2022; City of Reykjavik and Airbnb Inc. 2018; 56 Paris Real Estate 2022). While most cities require the registration of these apartments, these conditions usually apply only to apartments of the primary residence. In apartments of the secondary residence (or apartments entirely for STR), if allowed, cities require further conditions. Paris has the highest regulations, as landlords have to prove the provision of the tripled amount of residential space elsewhere.

While in Lisbon, the rehabilitation of dwellings was highly driven by the rise of STRs and their incentives for investors. Limiting days or additional requirements, such as providing LTR housing

for a specific share of STR apartments, may also be considered for Lisbon. Especially due to the large share of professional hosts and corporate hosts, these measures are not unrealistic as several apartments are carried by individual entities.

5.3. Limitations and Future Research

Noteworthy is, again, the information asymmetry across periods, especially for the price regression major determinants, such as physical attributes and capacity of listings, have been missing for earlier data. This resulted in significantly smaller R squares for the affected models, when comparing models 1,2, and 3 with model 4, as highly correlated features were missing (see Table 18). Nevertheless, the models offer insights into the features' impact on price. Additionally, OLS models generally have limitations in explaining variance in spatial data, while for further analysis and higher explanation of variance, spatial models could be tested.

Due to the use of unofficial sources, such as InsideAirbnb, and the lack of an official source, the data quality cannot be fully verified. Here actual data from the AL registry should be considered when available. Additionally, as this research primarily used the listings data of Airbnbs, this does not respectively translate into the actual number of ALs, as other platforms are also present, and some ALs could be rented temporarily elsewhere. However, as Airbnb is AL's main competitor of ALs, the data should correspond to the general development in the STR market.

While Agustín Cocola-Gant et al. (2021) have already started to investigate the professionalization of the STR market with a different approach, it should be continued to get the agencies' perspective to understand their resilience and efficient pricing further. Specifically, a quantitative analysis, potentially revenue based, on how they have been able to do better than normal listings could quantify the results. Moreover, future research should consider data from the AL registry to get a holistic view on AL developments.

References

56 Paris Real Estate. 2022. “Are Paris Airbnb Rentals Allowed These Days?” August 18, 2022. https://56paris.com/en/are-paris-airbnb-rentals-allowed.

Airbnb Inc. 2016. “Overview of the Airbnb Community in Lisbon & Portugal.” June 2016. https://www.airbnbcitizen.com/wp-content/uploads/2016/06/Portugal_EIS_English_20160627b.pdf.

———. 2022. “About Us.” Airbnb Newsroom. 2022. https://news.airbnb.com/about-us/.

Amore, Alberto, Cecilia de Bernardi, and Pavlos Arvanitis. 2022. “The Impacts of Airbnb in Athens, Lisbon and Milan: A Rent Gap Theory Perspective.” *Current Issues in Tourism* 25 (20): 3329–42. https://doi.org/10.1080/13683500.2020.1742674.

Barata-Salgueiro, Teresa, Luis Mendes, and Pedro Guimarães. 2018. *Tourism & Gentrification in Contemporary Metropolises: International Perspectives*. Edited by Maria Gravari-Barbas and Sandra Guinand. Contemporary Geographies of Leisure, Tourism and Mobility. Abingdon, Oxon ; New York, NY: Routledge, Taylor & Francis Group.

Barron, Kyle, Edward Kung, and Davide Proserpio. 2018. “The Sharing Economy and Housing Affordability: Evidence from Airbnb.” *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3006832.

Bugalski, Łukasz. 2020. “The Undisrupted Growth of the Airbnb Phenomenon between 2014–2020. The Touristification of European Cities before the COVID-19 Outbreak.” *Sustainability* 12 (23): 9841. https://doi.org/10.3390/su12239841.

Chamusca, Pedro, José Rio Fernandes, Luís Carvalho, and Thiago Mendes. 2019. “The Role of Airbnb Creating a ‘New’-Old City Centre: Facts, Problems and Controversies in Porto.” *Boletín de La Asociación de Geógrafos Españoles*, no. 83 (December). https://doi.org/10.21138/bage.2820.

Cheung, Ka Shing, and Chung Yim Yiu. 2022. “Touristification, Airbnb and the Tourism-Led Rent Gap: Evidence from a Revealed Preference Approach.” *Tourism Management* 92 (October): 104567. https://doi.org/10.1016/j.tourman.2022.104567.

City of Amsterdam. 2022. “Apply for a Permit.” Webpagina. English Site. Gemeente Amsterdam. 2022. https://www.amsterdam.nl/en/housing/holiday-rentals/applying-permit/.

City of Berlin. 2022. “Ferienwohnungsvermietung – Genehmigung Einer Zeitweisen Vermietung Der Berliner Hauptwohnung Oder Nebenwohnung [Vacation Rental - Approval of Temporary Rental of the Berlin Main or Secondary Residence].” 2022. https://service.berlin.de/dienstleistung/328146/.

City of London. 2022. “Short Term and Holiday Lets in London | London City Hall.” 2022. https://www.london.gov.uk/programmes-strategies/housing-and-land/improving-private-rented-sector/short-term-and-holiday-lets-london.

City of Reykjavik, and Airbnb Inc. 2018. “Helping Hosts to Share Their Homes Responsibly in Iceland.” https://fundur.reykjavik.is/sites/default/files/agenda-items/airbnb_enska.pdf.

CML, Câmara Municipal de Lisboa. 2022. “Alojamento Local.” MUNICÍPIO de LISBOA. 2022. https://www.lisboa.pt/cidade/economia-e-inovacao/setores-estrategicos/alojamento-local.

Cocola-Gant, Agustin, and Ana Gago. 2021. “Airbnb, Buy-to-Let Investment and Tourism-Driven Displacement: A Case Study in Lisbon.” *Environment and Planning A: Economy and Space* 53 (7): 1671–88. https://doi.org/10.1177/0308518X19869012.

Cocola-Gant, Agustín, Jaime Jover, Luís Carvalho, and Pedro Chamusca. 2021. "Corporate Hosts: The Rise of Professional Management in the Short-Term Rental Industry." *Tourism Management Perspectives* 40 (October): 100879. https://doi.org/10.1016/j.tmp.2021.100879.

Dagkouli-Kyriakoglou, Myrto, Simone Tulumello, Agustin Cocola-Gant, Chiara Iacovone, and Dimitris Pettas. 2022. "Digital Mediated Short-Term Rentals in the (Post-)Pandemic City." *Digital Geography and Society* 3: 100028. https://doi.org/10.1016/j.diggeo.2022.100028.

Deboosere, Robbin, Danielle Jane Kerrigan, David Wachsmuth, and Ahmed El-Geneidy. 2019. "Location, Location and Professionalization: A Multilevel Hedonic Analysis of Airbnb Listing Prices and Revenue." *Regional Studies, Regional Science* 6 (1): 143–56. https://doi.org/10.1080/21681376.2019.1592699.

Demir, Ersin, and Gözde Emekli. 2021. "Is Airbnb No Longer a Sharing Economy Platform? Evidence from Europe's Top 10 Airbnb Destinations." *Anatolia* 32 (3): 470–88. https://doi.org/10.1080/13032917.2021.1890626.

Ding, Lei, and Jackelyn Hwang. 2022. "Has COVID Reversed Gentrification in Major U.S. Cities? An Empirical Examination of Residential Mobility in Gentrifying Neighborhoods During the COVID-19 Crisis." Working paper (Federal Reserve Bank of Philadelphia) 22–20. Working Paper (Federal Reserve Bank of Philadelphia). Federal Reserve Bank of Philadelphia. https://doi.org/10.21799/frbp.wp.2022.20.

Dolnicar, Sara, and Samira Zare. 2020. "COVID19 and Airbnb – Disrupting the Disruptor." *Annals of Tourism Research* 83 (July): 102961. https://doi.org/10.1016/j.annals.2020.102961.

Dudás, Gábor, György Vida, Tamás Kovalcsik, and Lajos Boros. 2017. "A Socio-Economic Analysis of Airbnb in New York City." *Regional Statistics* 7 (1): 135–51. https://doi.org/10.15196/RS07108.

ePortugal. 2020. "Portugal Has Been Elected the Best European Destination for the Fourth Consecutive Year - EPortugal.Gov.Pt." November 2, 2020. https://eportugal.gov.pt/en/noticias/portugal-eleito-melhor-destino-europeu-pelo-quarto-ano-consecutivo.

Garha, Nachatter Singh, and Alda Botelho Azevedo. 2022. "Airbnb and the Housing Market in the COVID-19 Pandemic." *Análise Social* 57 (1 (242)): 4–31.

Gil, Javier, and Jorge Sequera. 2022. "The Professionalization of Airbnb in Madrid: Far from a Collaborative Economy." *Current Issues in Tourism* 25 (20): 3343–62. https://doi.org/10.1080/13683500.2020.1757628.

INE, Instituto Nacional de Estatística. 2022a. "Nights (No.) in Tourist Accommodation Establishments by Geographic Localization (NUTS - 2013) and Type (Tourist Accommodation Establishment); Annual." July 19, 2022. https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&contecto=pi&indOcorrCod=0009183&selTab=tab0.

———. 2022b. "Nights (No.) in Tourist Accommodation Establishments by Geographic Localization (NUTS - 2013) and Type (Tourist Accommodation Establishment); Monthly." October 31, 2022. https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&contecto=pi&indOcorrCod=0009808&selTab=tab0.

———. 2022c. "Disembarked Passengers (No.) in Airports by Geographic Localization, Type of Traffic and Nature of Traffic; Monthly - Statistics Portugal, Airports and Airfields Survey." Instituto Nacional de Estatística (INE). November 16, 2022.

https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&contecto=pi&indOcorrCod=0000861&selTab=tab0&xlang=en.

———. 2022d. “Resident Population (No.) by Place of Residence (at the Census 2021 Moment), Sex, Age Group and Nationality; Decennial.” November 23, 2022. https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0001680&contexto=bd&selTab=tab2.

InsideAirbnb. 2022. “Database of Webscraped Airbnb Listings.” 2022. http://insideairbnb.com/get-the-data.

Kourtit, Karima, Peter Nijkamp, John Östh, and Umut Turk. 2022. “Airbnb and COVID-19: SPACE-TIME Vulnerability Effects in Six World-Cities.” *Tourism Management* 93 (December): 104569. https://doi.org/10.1016/j.tourman.2022.104569.

Larpin, Blaise, Julien Mabillard, Miriam Scaglione, Pascal Favre, and Roland Schegg. 2019. “An Analysis of Regional Developments of Airbnb in Switzerland: Insights into Growth Patterns of a P2P Platform.” In *Information and Communication Technologies in Tourism 2019*, edited by Juho Pesonen and Julia Neidhardt, 92–103. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-05940-8_8.

Lestegás, Iago. 2019. “Lisbon After the Crisis: From Credit-fuelled Suburbanization to Tourist-driven Gentrification.” *International Journal of Urban and Regional Research* 43 (4): 705–23. https://doi.org/10.1111/1468-2427.12826.

Lestegás, Iago, Rubén-Camilo Lois-González, and João Seixas. 2018. “The Global Rent Gap of Lisbon’s Historic Centre.” *International Journal of Sustainable Development and Planning* 13 (04): 683–94. https://doi.org/10.2495/SDP-V13-N4-683-694.

Liang, Shuai, Hong Leng, Qing Yuan, and Chao Yuan. 2021. “Impact of the COVID-19 Pandemic: Insights from Vacation Rentals in Twelve Mega Cities.” *Sustainable Cities and Society* 74 (November): 103121. https://doi.org/10.1016/j.scs.2021.103121.

Peralta, Susana, João Pereira dos Santos, and Duarte Gonçalves. 2020. “Do Short-Term Rentals Increase Housing Prices? Quasi-Experimental Evidence from Lisbon.” GEE Papers 0155. Gabinete de Estratégia e Estudos, Ministério da Economia. https://EconPapers.repec.org/RePEc:mde:wpaper:0155.

Perez-Sanchez, V., Leticia Serrano-Estrada, Pablo Marti, and Raul-Tomas Mora-Garcia. 2018. “The What, Where, and Why of Airbnb Price Determinants.” *Sustainability* 10 (12): 4596. https://doi.org/10.3390/su10124596.

Richards, Greg. 2014. “The New Geographies of Tourism: Space, Place and Locality.” In .

Schäfer, Philipp, and Nicole Braun. 2016. “Misuse through Short-Term Rentals on the Berlin Housing Market.” *International Journal of Housing Markets and Analysis* 9 (2): 287–311. https://doi.org/10.1108/IJHMA-05-2015-0023.

Sequera, Jorge, and Jordi Nofre. 2020. “Touristification, Transnational Gentrification and Urban Change in Lisbon: The Neighbourhood of Alfama.” *Urban Studies* 57 (15): 3169–89. https://doi.org/10.1177/0042098019883734.

Singh Garha, Nachatter. 2021. “The Spatial Penetration of Airbnb in the Main Tourist Cities of Spain: Extent and Determinants.” *Documents d’Anàlisi Geogràfica* 68 (1): 167–94. https://doi.org/10.5565/rev/dag.681.

Smith, Neil. 1996. *The New Urban Frontier: Gentrification and the Revanchist City*. London ; New York: Routledge.

Sylvers, Eric. 2021. “Endemic Covid-19 Has Arrived in Portugal. This Is What It Looks Like.” *The Wall Street Journal*, October 25, 2021. https://www.wsj.com/articles/endemic-covid-19-has-arrived-in-portugal-this-is-what-it-looks-like-11635073461.

The Portugal News. 2020a. “Lisbon Opens the Second Safe Rent Programme.” September 27, 2020. https://www.theportugalnews.com/news/lisbon-opens-the-second-safe-rent-programme/55932.

———. 2020b. “Lisbon Adds 107 More Houses to Safe Rent Programme.” December 6, 2020. https://www.theportugalnews.com/news/2020-12-06/lisbon-adds-107-more-houses-to-safe-rent-programme/57081.

Wang, Dan, and Juan L. Nicolau. 2017. “Price Determinants of Sharing Economy Based Accommodation Rental: A Study of Listings from 33 Cities on Airbnb.Com.” *International Journal of Hospitality Management* 62 (April): 120–31. https://doi.org/10.1016/j.ijhm.2016.12.007.

Warren, Hayley, and Henrique Almeida. 2020. “Airbnb Hosts Resist Government Program to Free Up Housing.” *Bloomberg.Com*, July 28, 2020. https://www.bloomberg.com/graphics/2020-airbnb-short-let-reforms-lisbon/.

World Travel Awards. 2022. “Turismo de Lisboa Nominee Profile on WorldTravelAwards.Com.” World Travel Awards. 2022. https://www.worldtravelawards.com/profile-8079-turismo-de-lisboa.

Xie, Karen, and Zhenxing Mao. 2017. “The Impacts of Quality and Quantity Attributes of Airbnb Hosts on Listing Performance.” *International Journal of Contemporary Hospitality Management* 29 (9): 2240–60. https://doi.org/10.1108/IJCHM-07-2016-0345.

Appendix

Glossary / Explanation

Abbreviation	Meaning
LHC	Lisbon Historic Center
LMA	Lisbon Metropolitan Area
STR	Short-Term Rental
LTR	Long-Term Rental
AL	"Alojamento Local" / STR Apartment License
KDE	Kernel Density Estimate (KDE
CP	Civil Parish

Data Preparation

Missing Values are filled under following assumptions:

Bedrooms

- Private Room → 1 Bedroom
- 1 Bed → 1 Bedroom
- Studio → 1 Bedroom
- Max 2 People → 1 Bedroom
- Rest: Mode of airbnb type and beds number

Bathrooms:

- Mode of airbnb type and accommodates number

Appendix 1: Filling Missing Value

Metro station:

For each Airbnb, the haversine distance to all metro stations, which considers the earth's curvature, is calculated to evaluate the nearest station and the respective distance (Figure 18.)

Appendix 2: Metro station distance

Figures

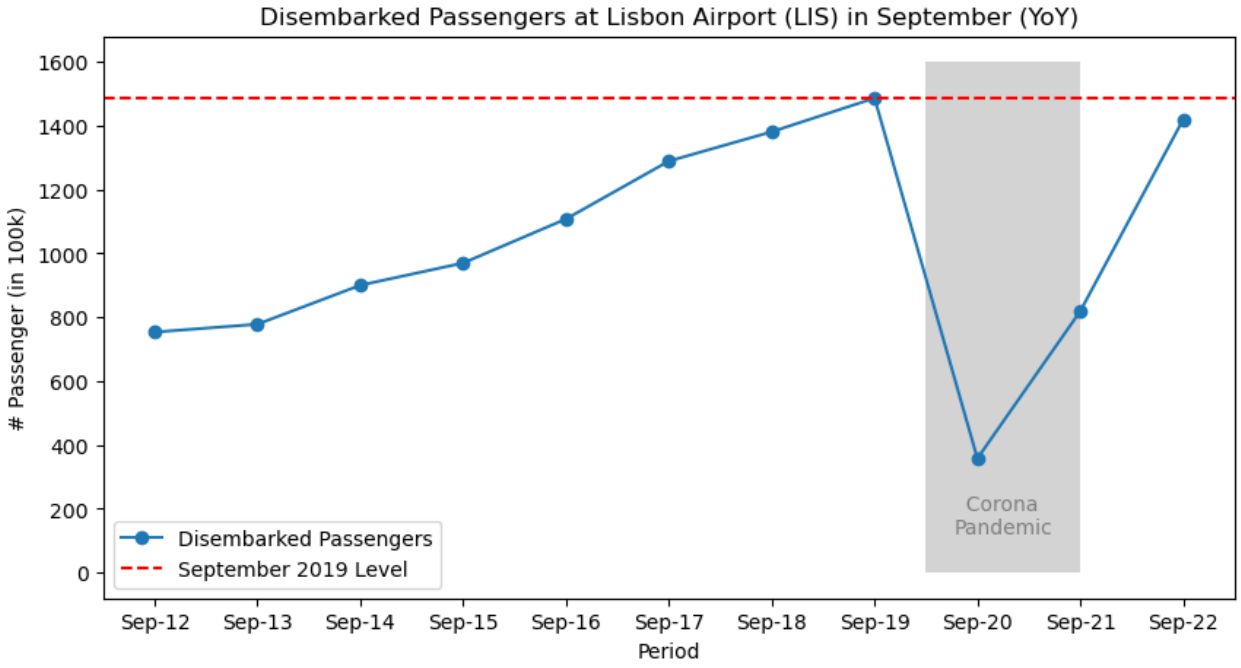

Figure 5: Disembarked Passenger at Lisbon Airport

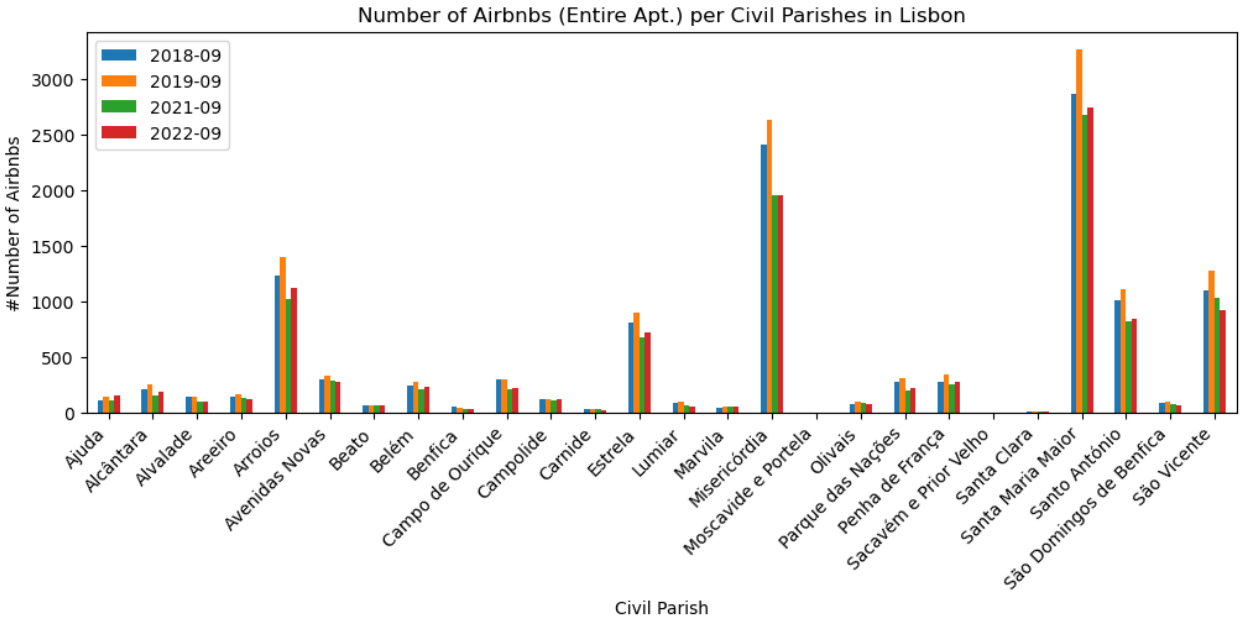

Figure 6: Listing Development per Civil Parish

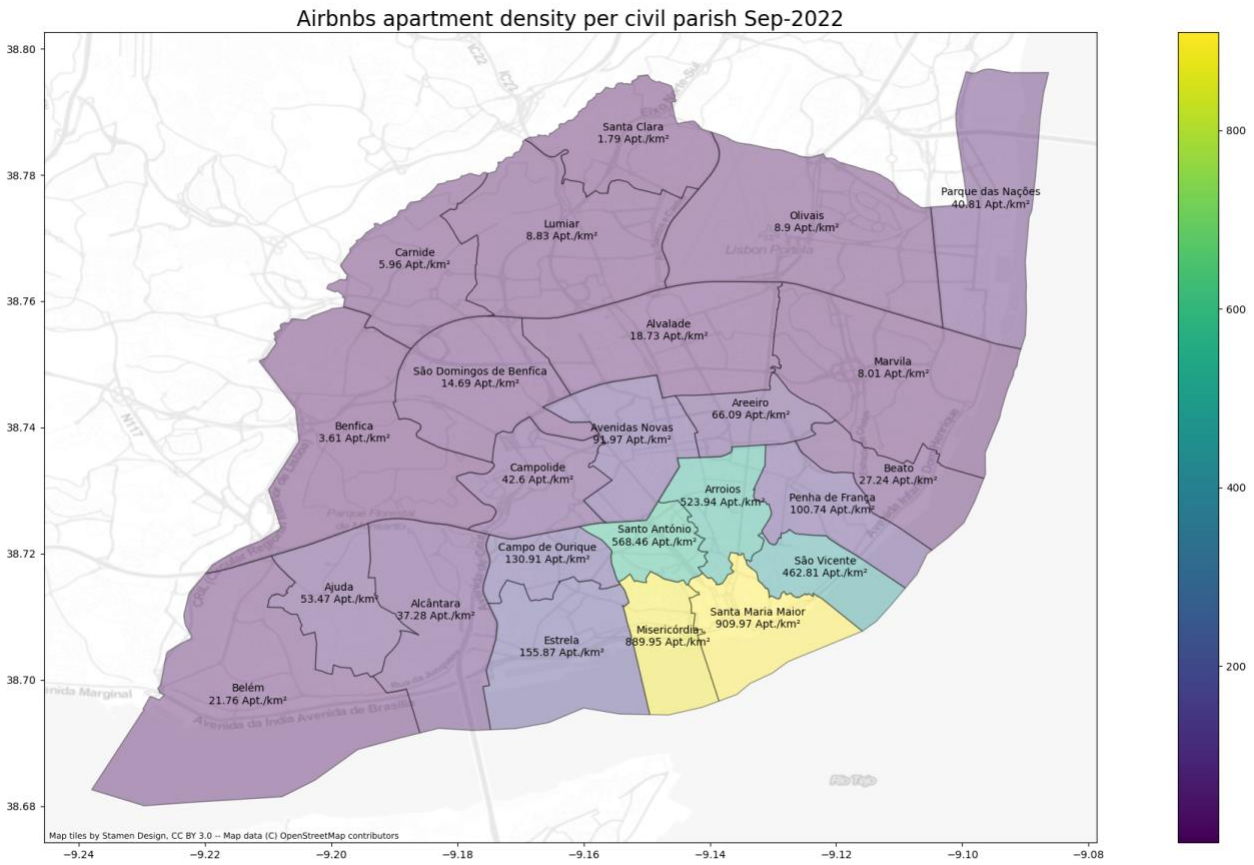

Figure 7: Apartment Density (Apartments per square km)

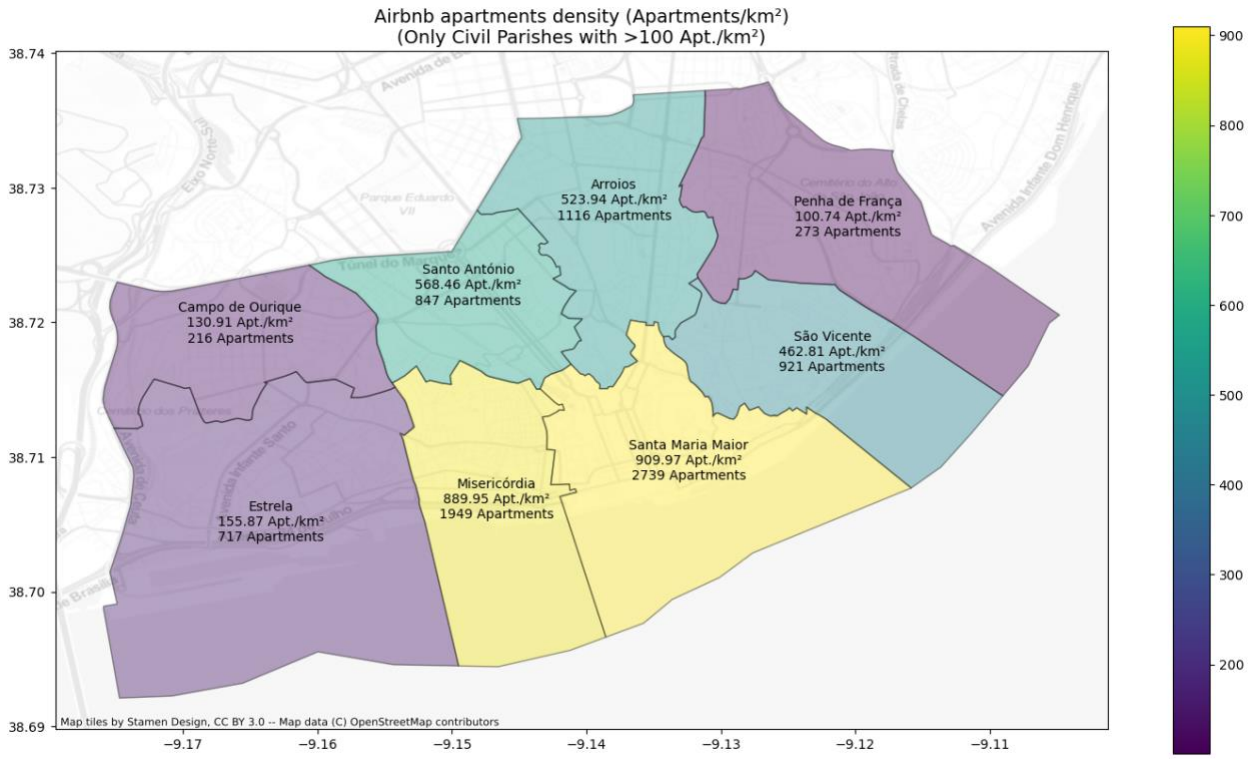

Figure 8: Apartment Density (Over 100 Apartments)

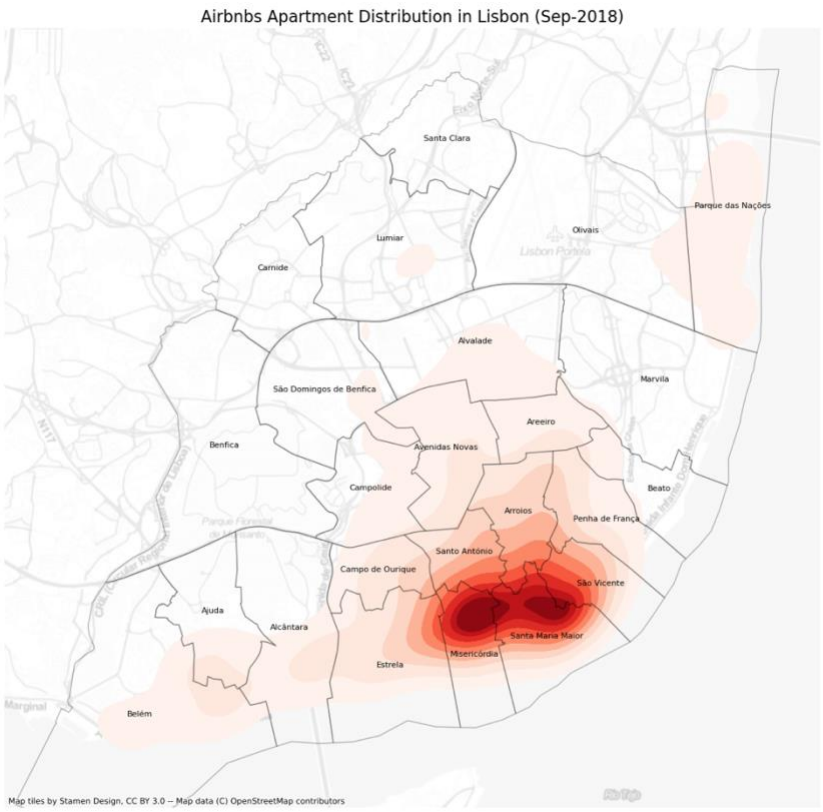

Figure 9: Apartment Density - KDE Plot (Sep-2018)

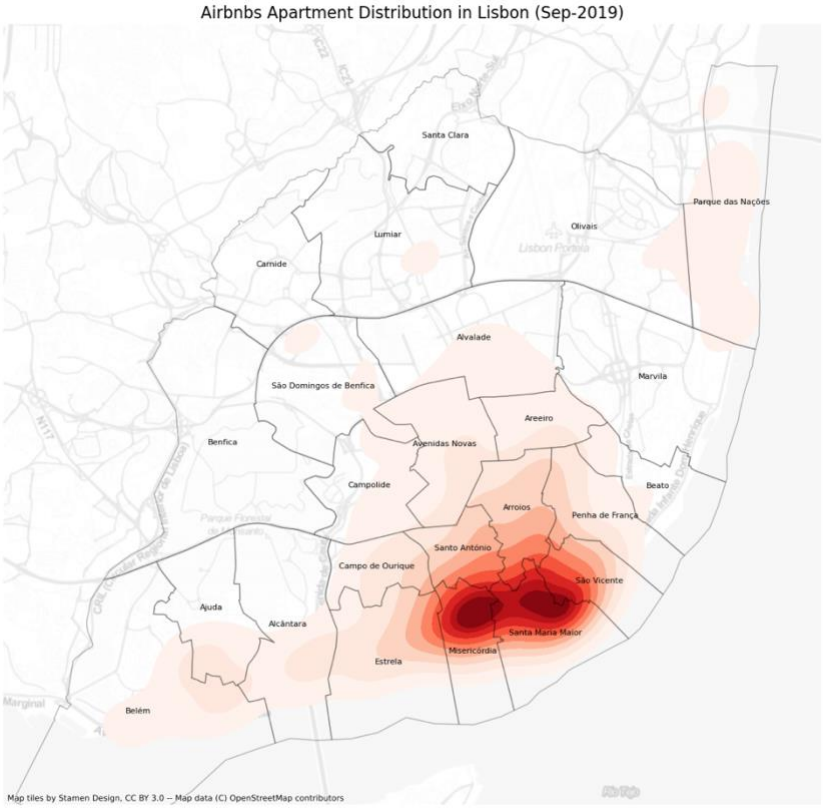

Figure 10: Apartment Density - KDE Plot (Sep-2019)

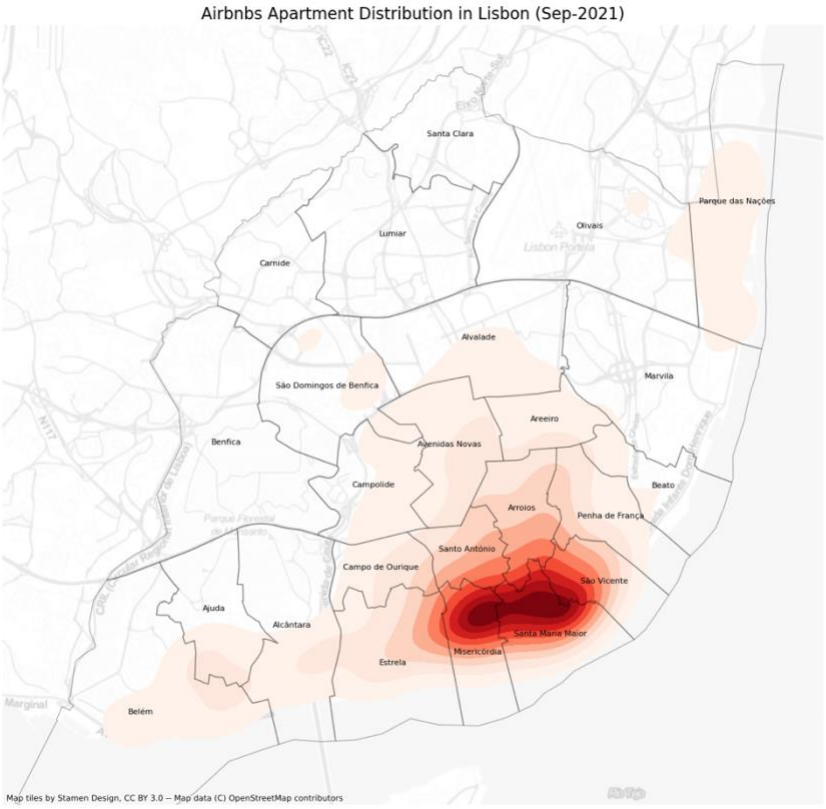

Figure 11: Apartment Density - KDE Plot (Sep-2021)

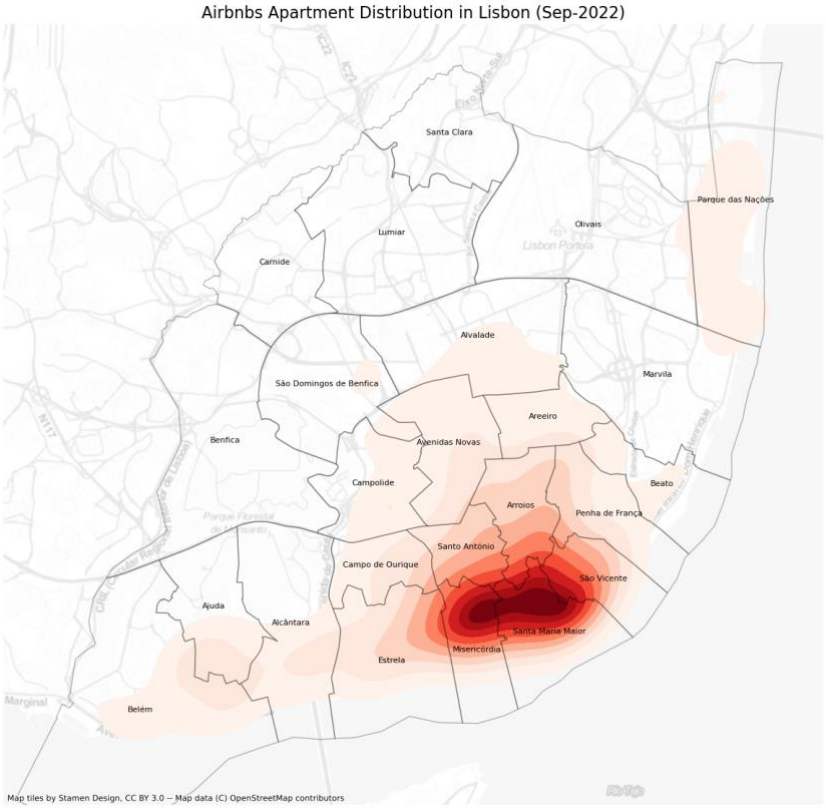

Figure 12: Apartment Density - KDE Plot (Sep-2022)

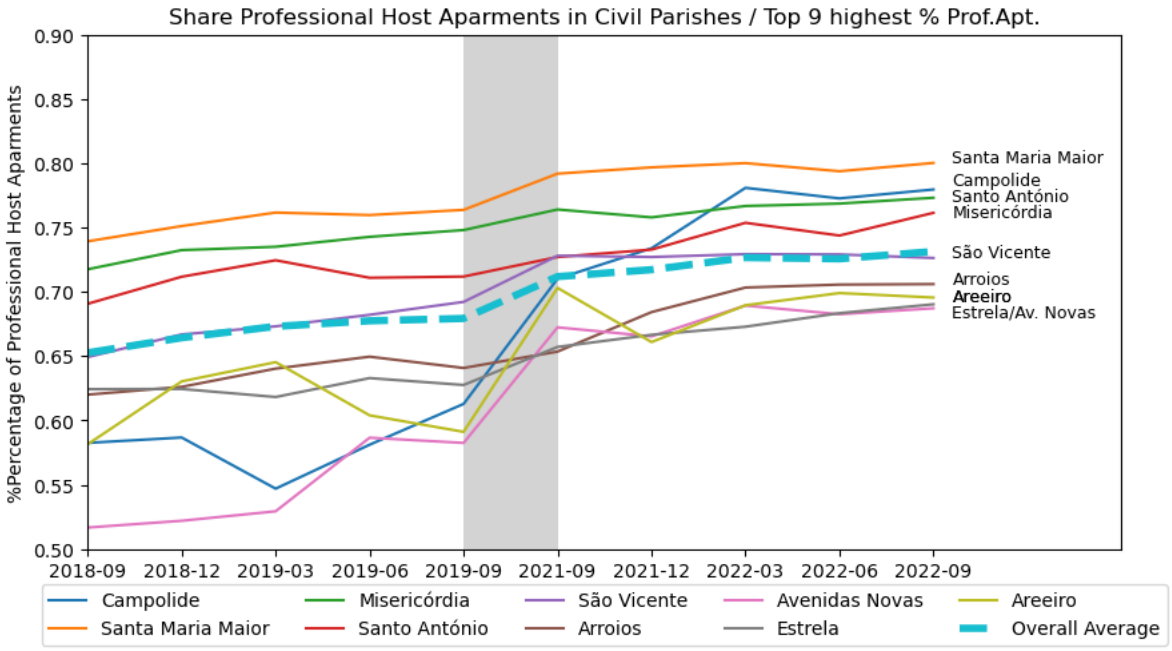

Figure 13: Share of professional listings per CP

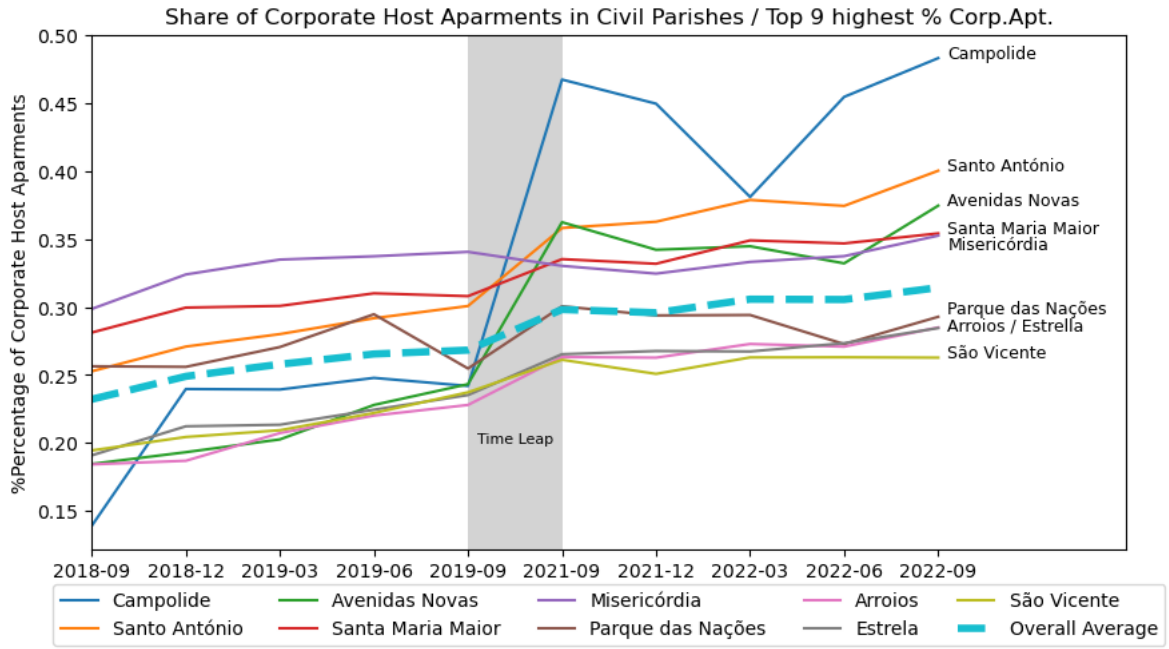

Figure 14: Share of corporate listings per CP

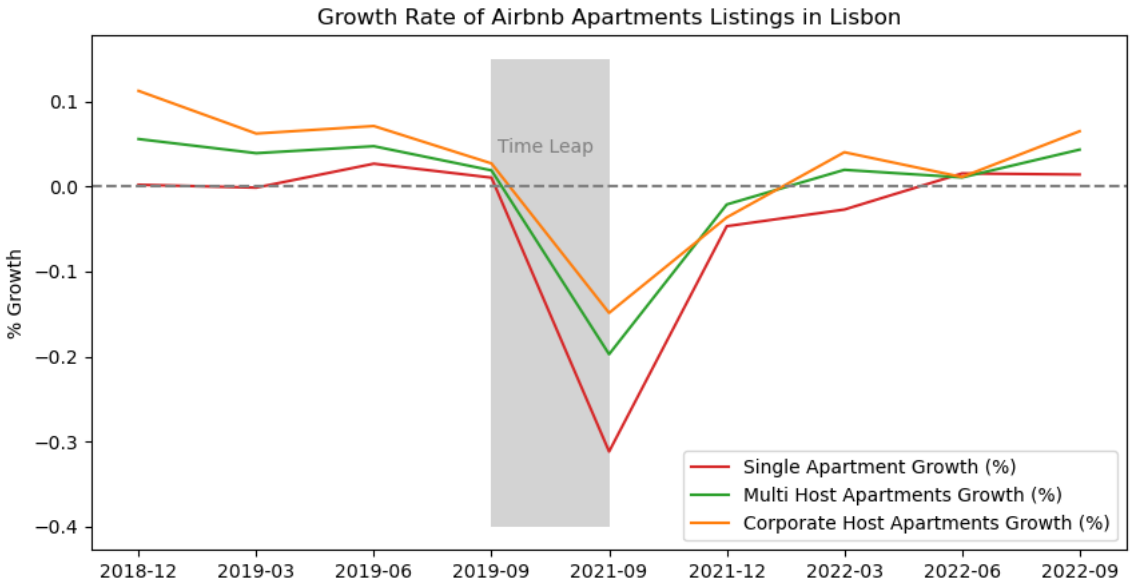

Figure 15: Growth Rates of Single, Professional and Corporate Listings

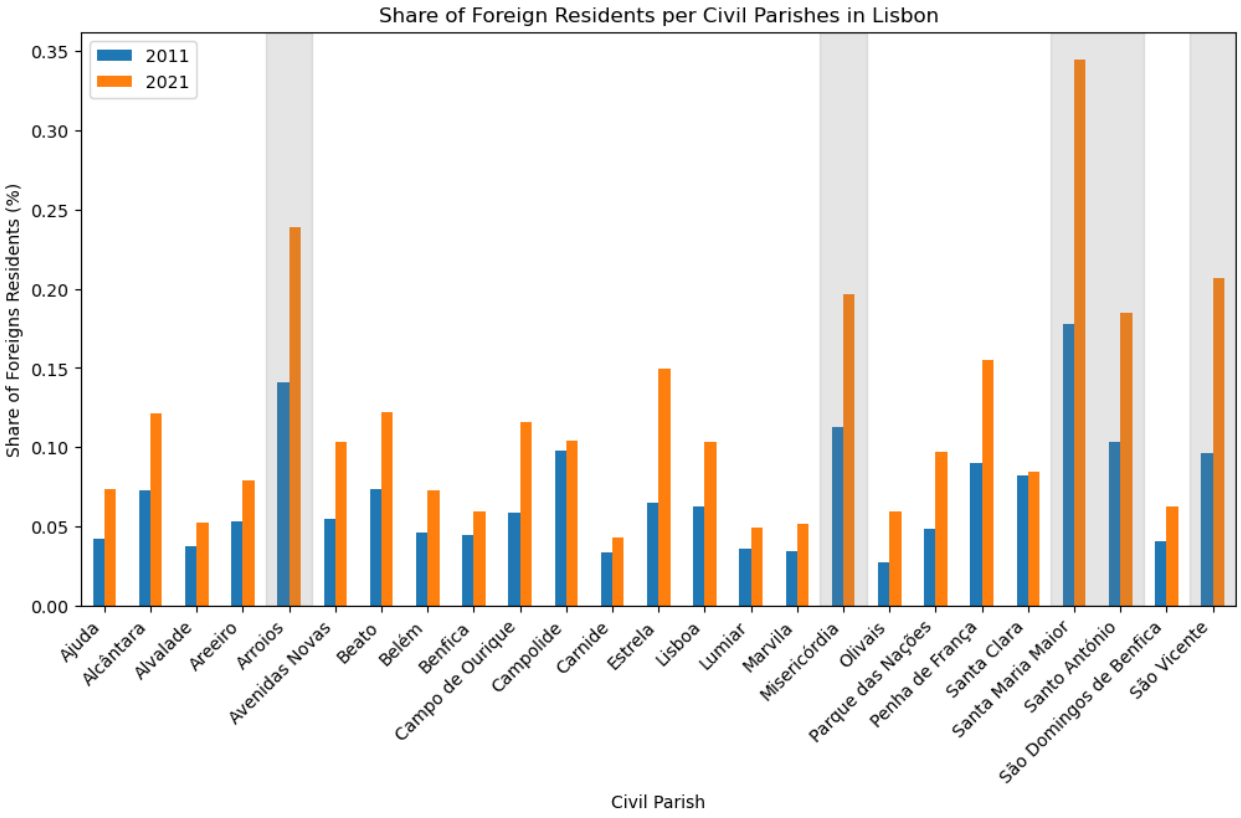

Figure 16: Share of foreign residents per Civil Parish

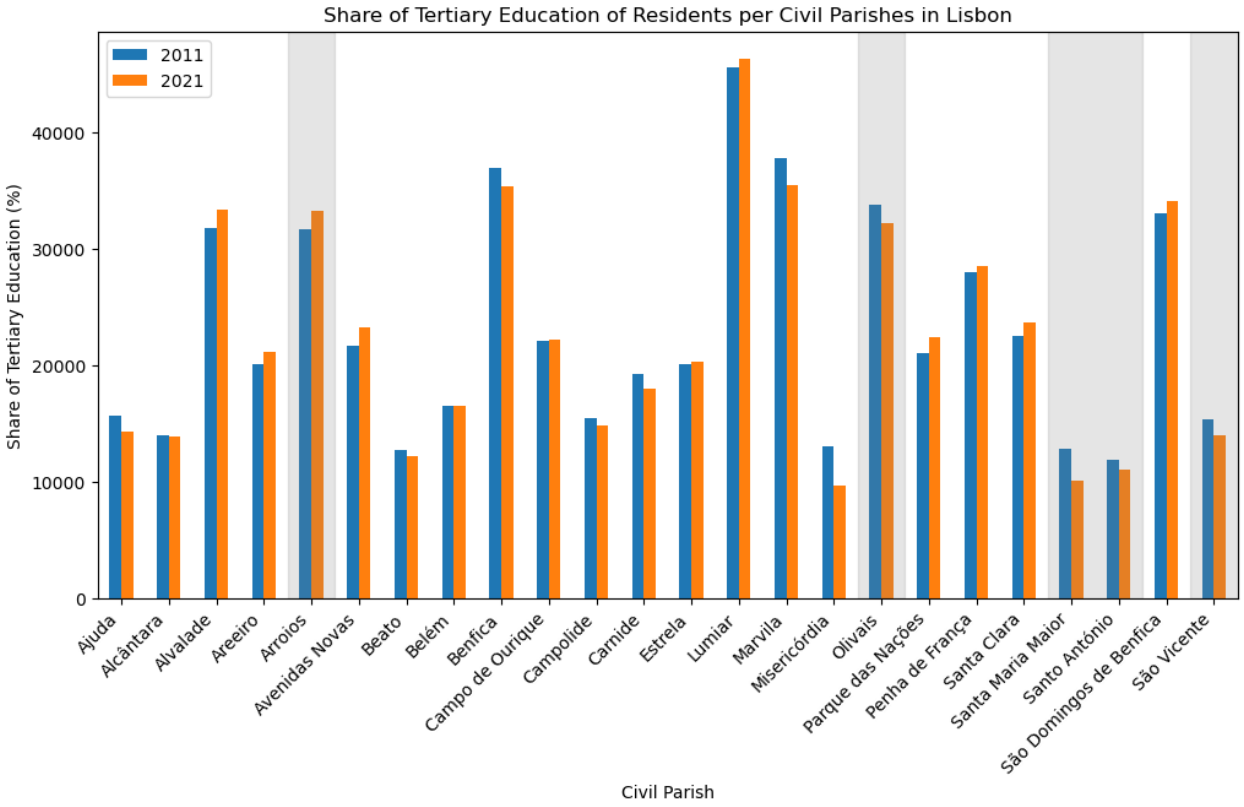

Figure 17: Share of Tertiary Education per Civil Parish

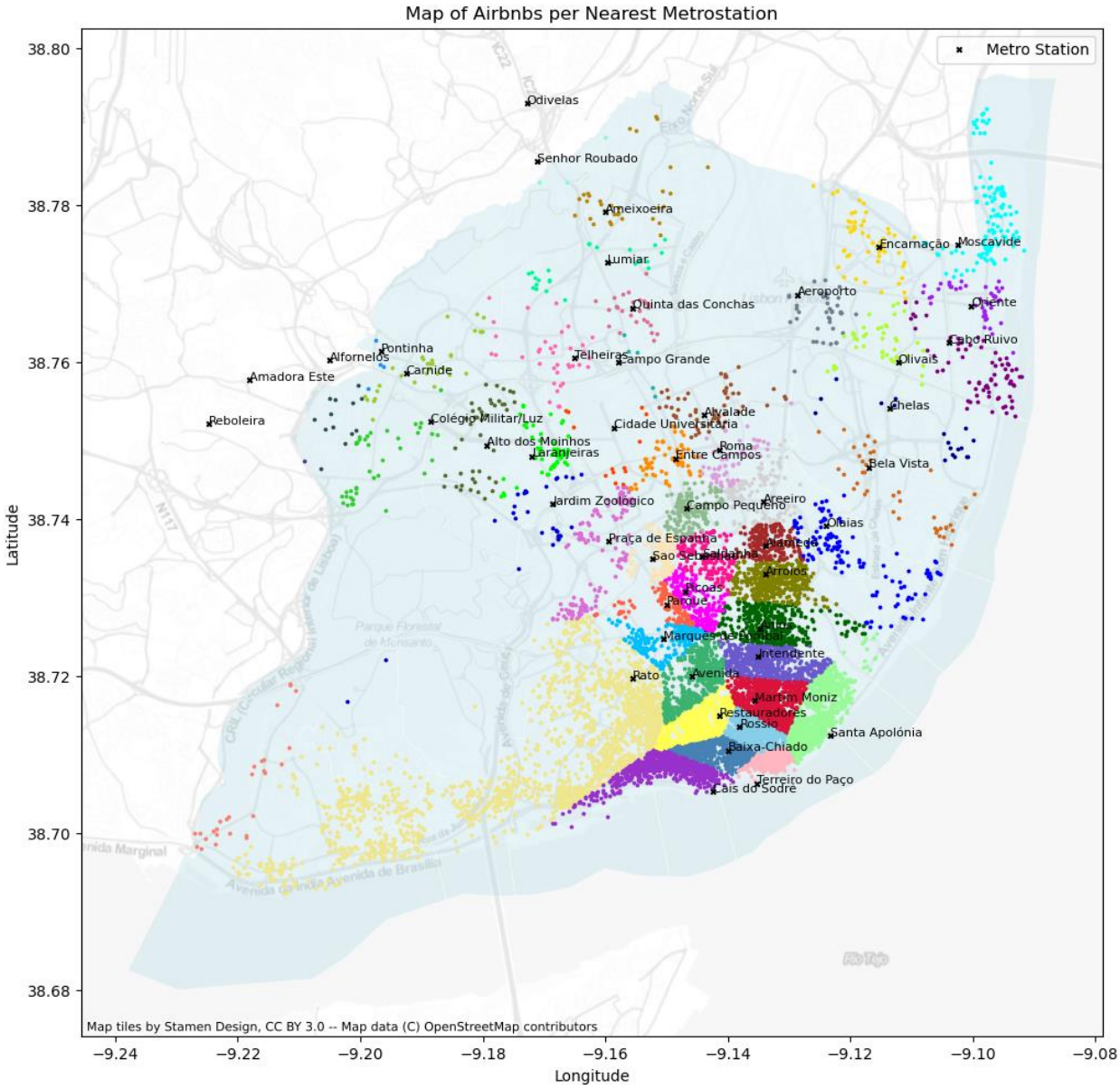

Figure 18: Airbnbs per Nearest Metrostation

Tables

Month	All	Entire home/ Apartment	Hotel room	Private room	Shared room
2018-09	16066	11967	0	3885	214
2018-12	16562	12410	0	3934	218
2019-03	16870	12726	0	3897	247
2019-06	17696	13242	0	4207	247
2019-09	18268	13455	473	4107	233
2021-09	13474	10306	239	2750	179
2021-12	12951	10011	218	2570	152
2022-03	12902	10074	208	2503	117
2022-06	13050	10193	185	2582	90
2022-09	13465	10552	177	2629	107

Table 3: Development of Listing Types

Year	2018	2019	2020	2021	2022*
Portugal Base 2018	100.00	100.30	100.17	101.11	108.62
Inflation Rate (YoY)	0.00%	0.30%	-0.13%	0.94%	7.43%

Table 4: Inflation Rates

Month	Delisted	Enlisted	Delta	Total	% turnover
2018-09	0	16066	16066	16066	-
2019-09	3452	5817	2365	18431	20%
2021-09	8115	3670	-4445	13986	50%
2022-09	3547	3026	-521	13465	26%

Table 5: Listing Turn over

Civil Parish	2018-09	2019-09	2021-09	2022-09
Ajuda	114	144	104	154
Alcântara	210	248	158	189
Alvalade	143	147	102	100
Areeiro	141	159	128	115
Arroios	1232	1395	1022	1116
Avenidas Novas	298	333	287	275
Beato	60	67	60	67
Belém	241	277	209	227
Benfica	51	44	26	29
Campo de Ourique	294	294	205	216
Campolide	115	124	107	118
Carnide	32	34	29	22
Estrela	812	897	671	717
Lumiar	91	103	61	58
Marvila	45	57	52	57
Misericórdia	2408	2628	1950	1949
Olivais	74	96	84	72
Parque das Nações	273	314	193	222
Penha de França	275	344	253	273
Santa Clara	7	8	7	6
Santa Maria Maior	2866	3260	2673	2739
Santo António	1009	1104	821	847
São Domingos de Benfica	81	101	74	63
São Vicente	1095	1277	1030	921

Table 6: Airbnb Apartments per Civil Parish

Civil Parish	2018-09	2019-09	2021-09	2022-09
Ajuda	39.58	50.00	36.11	53.47
Alcântara	41.42	48.92	31.16	37.28
Alvalade	26.78	27.53	19.10	18.73
Areeiro	81.03	91.38	73.56	66.09
Arroios	578.40	654.93	479.81	523.94
Avenidas Novas	99.67	111.37	95.99	91.97
Beato	24.39	27.24	24.39	27.24
Belém	23.11	26.56	20.04	21.76
Benfica	6.35	5.48	3.24	3.61
Campo de Ourique	178.18	178.18	124.24	130.91
Campolide	41.52	44.77	38.63	42.60
Carnide	8.67	9.21	7.86	5.96
Estrela	176.52	195.00	145.87	155.87
Lumiar	13.85	15.68	9.28	8.83
Marvila	6.32	8.01	7.30	8.01
Misericórdia	1099.54	1200.00	890.41	889.95
Olivais	9.15	11.87	10.38	8.90
Parque das Nações	50.18	57.72	35.48	40.81
Penha de França	101.48	126.94	93.36	100.74
Santa Clara	2.08	2.38	2.08	1.79
Santa Maria Maior	952.16	1083.06	888.04	909.97
Santo António	677.18	740.94	551.01	568.46
São Domingos de Benfica	18.88	23.54	17.25	14.69
São Vicente	550.25	641.71	517.59	462.81

Table 7: Airbnb Apartments per Square Kilometer

Civil Parish	AL / Conventional Dwelling (%)
Ajuda	3%
Alcântara	5%
Alvalade	2%
Areeiro	3%
Arroios	14%
Avenidas Novas	7%
Beato	1%
Belém	4%
Benfica	0%
Campo de Ourique	4%
Campolide	2%
Carnide	0%
Estrela	11%
Lumiar	1%
Marvila	0%
Misericórdia	39%
Olivais	1%
Parque das Nações	4%
Penha de França	4%
Santa Clara	0%
Santa Maria Maior	52%
Santo António	26%
São Domingos de Benfica	1%
São Vicente	16%

Source: 2nd supplement to the municipal report CML no.1469 (2022)

Table 8: Share of Alojamento Local (AL) per Conventional Dwellings

Month	Total Listings	Single Listings	Multi Listings	Corporate Listings
2018-09	11967	4157	7810	2778
2018-12	12410	4165	8245	3090
2019-03	12726	4159	8567	3282
2019-06	13242	4270	8972	3515
2019-09	13455	4314	9141	3610
2021-09	10306	2969	7337	3073
2021-12	10011	2830	7181	2961
2022-03	10074	2753	7321	3080
2022-06	10193	2795	7398	3114
2022-09	10552	2834	7718	3316

Table 9: Listing Professionalization

Month	% Single Listings	% Multi Listings	% Corporate Listings
2018-09	34.74%	65.26%	23.21%
2018-12	33.56%	66.44%	24.90%
2019-03	32.68%	67.32%	25.79%
2019-06	32.25%	67.75%	26.54%
2019-09	32.06%	67.94%	26.83%
2021-09	28.81%	71.19%	29.82%
2021-12	28.27%	71.73%	29.58%
2022-03	27.33%	72.67%	30.57%
2022-06	27.42%	72.58%	30.55%
2022-09	26.86%	73.14%	31.43%

Table 10: Listing Professionalization (Share)

Month	Single Listings	Multi Listings	Corporate Listings
2018-09	-	-	-
2018-12	0.2%	5.6%	11.2%
2019-03	-0.1%	3.9%	6.2%
2019-06	2.7%	4.7%	7.1%
2019-09	1.0%	1.9%	2.7%
2021-09	-31.2%	-19.7%	-14.9%
2021-12	-4.7%	-2.1%	-3.6%
2022-03	-2.7%	1.9%	4.0%
2022-06	1.5%	1.1%	1.1%
2022-09	1.4%	4.3%	6.5%

Table 11: Growth Rates of Host Listing Types

Civil Parish	2018-09	2019-09	2021-09	2022-09
Ajuda	43.86%	56.25%	57.69%	68.18%
Alcântara	48.10%	53.23%	62.03%	61.90%
Alvalade	41.96%	45.58%	44.12%	46.00%
Areeiro	58.16%	59.12%	70.31%	69.57%
Arroios	62.01%	64.09%	65.36%	70.61%
Avenidas Novas	51.68%	58.26%	67.25%	68.73%
Beato	55.00%	59.70%	60.00%	61.19%
Belém	58.09%	61.37%	61.24%	65.20%
Benfica	47.06%	43.18%	42.31%	48.28%
Campo de Ourique	50.34%	51.36%	59.02%	62.50%
Campolide	58.26%	61.29%	71.03%	77.97%
Carnide	37.50%	47.06%	62.07%	59.09%
Estrela	62.44%	62.76%	65.72%	69.04%
Lumiar	45.05%	48.54%	39.34%	31.03%
Marvila	35.56%	43.86%	46.15%	64.91%
Misericórdia	71.76%	74.81%	76.41%	77.32%
Olivais	52.70%	53.13%	66.67%	65.28%
Parque das Nações	56.41%	53.18%	53.89%	59.01%
Penha de França	44.36%	51.16%	55.34%	60.07%
Santa Clara	42.86%	37.50%	42.86%	33.33%
Santa Maria Maior	73.94%	76.38%	79.20%	80.03%
Santo António	69.08%	71.20%	72.72%	76.15%
São Domingos de Benfica	46.91%	45.54%	63.51%	68.25%
São Vicente	64.93%	69.22%	72.82%	72.64%

Table 12: Share of Professional Listings in Civil Parishes

Civil Parish	2018-09	2019-09	2021-09	2022-09
Ajuda	13.16%	13.89%	17.31%	19.48%
Alcântara	17.14%	21.37%	26.58%	25.93%
Alvalade	6.29%	5.44%	7.84%	15.00%
Areeiro	9.93%	16.35%	17.19%	18.26%
Arroios	18.43%	22.80%	26.32%	28.49%
Avenidas Novas	18.46%	24.32%	36.24%	37.45%
Beato	28.33%	31.34%	33.33%	14.93%
Belém	18.26%	15.88%	23.92%	24.67%
Benfica	5.88%	4.55%	7.69%	17.24%
Campo de Ourique	18.71%	19.39%	21.46%	21.76%
Campolide	13.91%	24.19%	46.73%	48.31%
Carnide	25.00%	23.53%	27.59%	18.18%
Estrela	19.09%	23.52%	26.53%	28.45%
Lumiar	16.48%	23.30%	9.84%	13.79%
Marvila	8.89%	15.79%	11.54%	12.28%
Misericórdia	29.86%	34.06%	33.03%	35.25%
Olivais	8.11%	12.50%	10.71%	9.72%
Parque das Nações	25.64%	25.48%	30.05%	29.28%
Penha de França	8.73%	15.70%	22.53%	20.51%
Santa Clara	14.29%	12.50%	0.00%	0.00%
Santa Maria Maior	28.12%	30.80%	33.52%	35.41%
Santo António	25.27%	30.07%	35.81%	40.02%
São Domingos de Benfica	13.58%	16.83%	25.68%	25.40%
São Vicente	19.45%	23.73%	26.12%	26.28%

Table 13: Share of Corporate Listings in Civil Parishes

Civil Parish	2018-09	2019-09	2021-09	2022-09
Ajuda	€ 69.12	€ 72.84	€ 87.48	€ 103.14
Alcântara	€ 76.72	€ 80.35	€ 80.37	€ 102.21
Alvalade	€ 79.00	€ 85.10	€ 100.50	€ 111.91
Areeiro	€ 90.74	€ 92.82	€ 98.74	€ 115.79
Arroios	€ 84.94	€ 88.01	€ 95.59	€ 123.95
Avenidas Novas	€ 99.67	€ 106.33	€ 113.34	€ 139.60
Beato	€ 61.48	€ 63.90	€ 80.03	€ 101.46
Belém	€ 83.81	€ 77.87	€ 89.75	€ 106.84
Benfica	€ 76.38	€ 74.48	€ 68.20	€ 98.67
Campo de Ourique	€ 81.13	€ 87.17	€ 89.74	€ 118.55
Campolide	€ 82.61	€ 81.88	€ 83.65	€ 105.16
Carnide	€ 101.30	€ 81.69	€ 76.39	€ 92.23
Estrela	€ 82.30	€ 83.97	€ 88.03	€ 117.77
Lumiar	€ 79.79	€ 82.40	€ 103.53	€ 116.87
Marvila	€ 75.73	€ 75.10	€ 95.75	€ 135.77
Misericórdia	€ 89.96	€ 91.52	€ 101.25	€ 132.54
Olivais	€ 74.50	€ 79.70	€ 82.05	€ 88.98
Parque das Nações	€ 106.79	€ 109.39	€ 120.90	€ 144.60
Penha de França	€ 72.72	€ 73.93	€ 76.56	€ 99.63
Santa Clara	€ 59.00	€ 84.32	€ 171.24	€ 194.26
Santa Maria Maior	€ 85.35	€ 90.02	€ 101.46	€ 133.13
Santo António	€ 93.98	€ 97.09	€ 109.02	€ 137.60
São Domingos de Benfica	€ 93.85	€ 87.65	€ 117.52	€ 138.94
São Vicente	€ 79.05	€ 80.66	€ 90.59	€ 110.08

Table 14: Average Listing Prices per Civil Parish

Civil Parish	2018-09	2019-09	2021-09	2022-09
Ajuda	-	5.37%	20.11%	17.89%
Alcântara	-	4.74%	0.03%	27.17%
Alvalade	-	7.72%	18.10%	11.36%
Areeiro	-	2.30%	6.37%	17.27%
Arroios	-	3.62%	8.62%	29.66%
Avenidas Novas	-	6.67%	6.59%	23.17%
Beato	-	3.93%	25.24%	26.79%
Belém	-	-7.09%	15.26%	19.04%
Benfica	-	-2.49%	-8.43%	44.68%
Campo de Ourique	-	7.44%	2.95%	32.11%
Campolide	-	-0.89%	2.16%	25.72%
Carnide	-	-19.36%	-6.48%	20.73%
Estrela	-	2.03%	4.84%	33.77%
Lumiar	-	3.26%	25.65%	12.89%
Marvila	-	-0.83%	27.49%	41.79%
Misericórdia	-	1.74%	10.63%	30.91%
Olivais	-	6.98%	2.95%	8.45%
Parque das Nações	-	2.44%	10.52%	19.60%
Penha de França	-	1.67%	3.55%	30.14%
Santa Clara	-	42.91%	103.08%	13.44%
Santa Maria Maior	-	5.47%	12.70%	31.22%
Santo António	-	3.31%	12.28%	26.21%
São Domingos de Benfica	-	-6.61%	34.08%	18.23%
São Vicente	-	2.04%	12.30%	21.52%

Table 15: Price Increases based on Average Prices per CP

Period	statistic	pvalue
Sep-2018	0.754599929	0.0000
Sep-2019	0.775397778	0.0000
Sep-2021	0.652166307	0.0000
Sep-2022	0.712302446	0.0000

Table 16: Shapiro-Wilk Test (Price)

Price Increase	statistic	p-value
Sep-2018 to Sep-2019	81697982.5	3.020E-10
Sep-2019 to Sep-2021	73580746.5	2.885E-27
Sep-2021 to Sep-2022	74301577.5	0.000E+00

Table 17: Mann-Whitney-U Test

Variable	price_base18
price_base18	100.00%
accommodates	48.34%
bathrooms	50.11%
bedrooms	46.88%
beds	45.37%
minimum_nights	-4.13%
number_of_reviews	-12.21%
calculated_host_listings_count	5.97%
host_is_superhost	1.27%
host_has_profile_pic	-0.02%
instant_bookable	4.11%
metrostations_in500m	11.61%
nearest_metrostation_meter	-6.54%
historic_center	5.01%
2022	17.59%
hcenter*2022	16.24%
MultiHost	8.91%
MultiHost*2022	18.39%
CorpHost	14.58%
CorpHost*2022	19.43%

Table 18: Correlation Table for Price_Base18