

# **AIRBNB AND THE CITY: EXPLORING CAUSAL RELATIONSHIPS BETWEEN SHORT-TERM RENTALS AND HOUSING MARKET IN VIENNA**

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## Author's Declaration

I, the undersigned, Mikhail Martianov, candidate for the MA degree in Economics declare herewith that the present thesis titled “*Airbnb and the City: Exploring Causal Relationships Between Short-Term Rentals and Housing Market in Vienna*” is exclusively my own work, based on my research and only such external information as properly credited in notes and bibliography.

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Vienna, 10 June 2025

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*Airbnb and the City:*

*Exploring Causal Relationships Between Short-Term Rentals and Housing Market in Vienna*

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<sup>1</sup>Icon by Font Awesome: <https://fontawesome.com/>

# Abstract

This master's thesis investigates the causal impact of short-term rentals (STRs), particularly through platforms like Airbnb, on Vienna's housing market, with a specific focus on the effects of a restrictive STR policy implemented on July 1, 2024. A Difference-in-Differences (DiD) methodology is applied, treating Vienna as the intervention group and other major Austrian cities: Graz, Linz, and Salzburg – as controls. The analysis reveals that the 2024 policy led to a significant decline in Vienna's Airbnb market, with total listings and availability decreasing by 7 to 20 percentage points from Q1 2024 to Q1 2025. As the result, housing prices in Vienna did not increase by approximately 5% relative to the control cities, indicating that the policy effectively prevented expected price growth. The policy's impact was found to be consistent across different apartment sizes, but there was some evidence of a more pronounced effect in central districts, although this was not statistically significant in all model specifications.

# Table of Contents

|                                                      |            |
|------------------------------------------------------|------------|
| <b>Abstract</b>                                      | <b>iii</b> |
| <b>1 Introduction</b>                                | <b>1</b>   |
| <b>2 Literature Review</b>                           | <b>4</b>   |
| 2.1 General Airbnb Activity . . . . .                | 4          |
| 2.2 Effects on LTR and Housing Prices . . . . .      | 5          |
| 2.3 Regulations and their effects . . . . .          | 5          |
| 2.4 Literature Gap . . . . .                         | 6          |
| <b>3 Policy Framework</b>                            | <b>8</b>   |
| 3.1 Summary of changes . . . . .                     | 8          |
| 3.2 Previous Regulations . . . . .                   | 9          |
| 3.3 New Policy: July 1, 2024 . . . . .               | 10         |
| <b>4 Methodology</b>                                 | <b>11</b>  |
| 4.1 Data . . . . .                                   | 11         |
| 4.2 Airbnb . . . . .                                 | 13         |
| 4.2.1 Market Overview: before July 1, 2024 . . . . . | 13         |
| 4.2.2 Declining Symptoms . . . . .                   | 13         |
| 4.2.3 Airbnb in Prague . . . . .                     | 17         |
| 4.3 Empirical Strategy . . . . .                     | 19         |
| 4.3.1 Difference-in-Differences approach . . . . .   | 19         |
| 4.3.2 Main Specification . . . . .                   | 20         |

|          |                              |           |
|----------|------------------------------|-----------|
| 4.3.3    | Assumptions test . . . . .   | 21        |
| <b>5</b> | <b>Results</b>               | <b>24</b> |
| 5.1      | Empirical Findings . . . . . | 24        |
| <b>6</b> | <b>Conclusion</b>            | <b>27</b> |

# List of Figures

|     |                                                              |    |
|-----|--------------------------------------------------------------|----|
| 4.1 | Airbnb dynamics in Vienna . . . . .                          | 15 |
| 4.2 | Changes in listings Q1 - Q2 2024 vs Q1 2025 . . . . .        | 16 |
| 4.3 | Relative changes in Airbnb activities by districts . . . . . | 16 |
| 4.4 | Airbnb dynamics in Prague . . . . .                          | 18 |
| 4.5 | Parallel trends test . . . . .                               | 22 |
| 4.6 | Placebo test . . . . .                                       | 23 |

# List of Tables

|     |                                                                     |    |
|-----|---------------------------------------------------------------------|----|
| 3.1 | Comparison of STR policy changes . . . . .                          | 8  |
| 4.1 | Airbnb dynamics in Vienna . . . . .                                 | 14 |
| 4.2 | Airbnb dynamics in Prague . . . . .                                 | 18 |
| 5.1 | Impact of Vienna's Housing Policy on Prices . . . . .               | 24 |
| 5.2 | Impact of the Housing Policy on Prices in Vienna's Center . . . . . | 26 |



# Chapter 1

## Introduction

The rapid expansion of short-term rentals (STRs) through platforms like Airbnb has reshaped urban housing markets globally (Wachsmuth & Weisler, 2018), raising significant concerns about their impact on housing affordability and availability (Barron et al., 2020). In Vienna, a city renowned for its cultural heritage and status as a major tourist destination, the proliferation of STRs has intensified competition for residential properties, potentially contributing to rising rents and a reduction in long-term housing stock (Horn & Merante, 2017). This phenomenon has sparked debates among policymakers, residents, and researchers about the balance between tourism-driven economic benefits and the preservation of affordable housing for local communities (Gurran & Phibbs, 2017). This thesis seeks to address a critical gap in the literature by examining the causal relationship between STRs and Vienna's housing market, with a particular focus on the effects of a restrictive STR policy implemented on July 1, 2024. By analyzing this policy's impact, the study aims to provide evidence-based insights into how regulatory interventions can mitigate the pressures exerted by STRs on urban housing markets.

Prior to July 1, 2024, Vienna's regulatory framework for STRs was relatively permissive, particularly outside designated residential zones, where property owners faced no restrictions on short-term letting. This leniency facilitated the growth of platforms like Airbnb, which saw an estimated 11,000 to 14,000 active listings in 2023, contributing to significant tourism revenue but also straining housing availability<sup>1</sup>. Recognizing these challenges, the Vienna City Council introduced stricter regulations through the Building Code Amendment 2023(*Bauord-*

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<sup>1</sup>Retrieved from <https://airbtics.com/annual-airbnb-revenue-in-vienna-austria/>

*nungsnovelle 2023*<sup>2</sup>), effective July 1, 2024. The new policy limits non-commercial STRs to 90 days per calendar year, requires exemption permits for longer rentals under stringent conditions, and mandates data-sharing with platforms to enhance enforcement. This regulatory shift provides a natural experiment to assess the policy's effectiveness in reducing STR activity and alleviating housing market pressures, offering valuable lessons for other tourist-heavy cities.

To evaluate the policy's impact, this study employs a Difference-in-Differences (DiD) methodology, a robust quasi-experimental approach widely used in policy evaluation. The analysis draws on two primary data sources: Inside Airbnb, which provides quarterly data on STR listings in Vienna from Q1 2024 to Q1 2025, and Data Sciences Service GMBH (DSS), which supplies housing price and transaction data across Vienna, Graz, Linz, and Salzburg from Q1 2023 to Q1 2025. Vienna serves as the treatment group, while the other Austrian cities, which share similar economic and demographic characteristics but lack comparable STR restrictions, act as controls. The DiD model incorporates fixed effects for districts or cities and controls for variables such as apartment size and location to isolate the policy's causal effect on housing prices. The methodology also includes tests for key DiD assumptions, such as parallel trends and no anticipation, to ensure the validity of the findings (Card & Krueger, 1994).

Preliminary results indicate that the 2024 policy significantly altered Vienna's STR landscape. From Q1 2024 to Q1 2025, Airbnb listings and availability in Vienna declined by 7 to 20 percentage points, contrasting with steady growth in Prague, a comparable city without similar restrictions. Concurrently, housing prices in Vienna decreased by approximately 5.2% to 5.9% relative to the control cities, suggesting that the policy effectively curbed expected price increases that would have aligned with trends in other Austrian cities. This reduction translates to a mitigation of an approximate 5% price increase, highlighting the policy's success in addressing housing affordability concerns. Notably, the policy's impact was consistent across apartments of different sizes, indicating a broad-based effect across Vienna's housing market.

Further analysis explored whether the policy's effects varied by location, particularly in Vienna's central districts (1–9), which are prime areas for STR activity due to their proximity to tourist attractions (Garcia-López et al., 2020). The results suggest a potentially stronger price

<sup>2</sup>[https://www.ris.bka.gv.at/Dokumente/LgblAuth/LGBLA\\_WI\\_20231213\\_37/LGBLA\\_WI\\_20231213\\_37.html](https://www.ris.bka.gv.at/Dokumente/LgblAuth/LGBLA_WI_20231213_37/LGBLA_WI_20231213_37.html)

reduction in these central areas, with an additional 3.2% decrease compared to outer districts, though this finding was not consistently statistically significant across all model specifications. This variability underscores the need for cautious interpretation and suggests that more granular data could clarify the policy's localized impacts. The absence of significant size-driven effects further reinforces the policy's uniform applicability, ensuring that both small and large apartments benefit from reduced price pressures.

These findings highlight the potential of restrictive STR policies to alleviate housing market pressures in cities with high tourism demand. By limiting the conversion of residential properties into tourist accommodations, the policy helps preserve housing stock for long-term residents, thereby enhancing affordability. However, the study acknowledges limitations, particularly the reliance on aggregated data, which may obscure nuanced effects at the individual property level. Future research utilizing transaction-level data could provide deeper insights into the policy's micro-level impacts and further validate the findings. The results contribute to the broader discourse on STR regulation, offering policymakers evidence to inform strategies that balance tourism benefits with housing needs.

The thesis is structured as follows: Chapter 2 reviews the existing literature on the impacts of STRs on urban housing markets, situating this study within the broader academic context. Chapter 3 provides a detailed institutional background, outlining Vienna's STR regulations before and after July 1, 2024. Chapter 4 describes the data sources, empirical strategy, and assumption tests employed in the analysis. Chapter 5 presents the detailed results, including the policy's effect on housing prices. Finally, Chapter 6 discusses the implications of these findings and identifies avenues for future research.

# Chapter 2

## Literature Review

In this chapter, we provide an extensive review of the literature on the STR market and its impact on urban research and policy debates.

### 2.1 General Airbnb Activity

Airbnb activity in cities tends to concentrate in specific urban areas, particularly those with high tourist appeal and amenity value. Listings often cluster in central districts and neighborhoods rich in cultural, entertainment, and commercial offerings. For example, in London, Airbnb listings are heavily concentrated in the city center and areas with vibrant cultural scenes (Quattrone et al., 2016). Similarly, in Barcelona, listings dominate tourist-heavy districts like the Gothic Quarter and El Raval (Gutiérrez et al., 2017). These patterns highlight Airbnb's deep connection to tourism, as the platform primarily serves short-term visitors seeking unique, local experiences (Guttentag, 2015). This tourism link can intensify impacts on cities, sometimes contributing to overtourism and housing affordability challenges, as observed in Venice (Dodds & Butler, 2019).

Districts most affected by Airbnb typically blend residential and commercial properties, offering good public transport access and abundant amenities. In New York City, neighborhoods like Williamsburg and the Lower East Side—known for nightlife, cultural attractions, and dining—are key Airbnb hotspots (Wachsmuth & Weisler, 2018). These areas boast high walkability and proximity to tourist landmarks, making them ideal for visitors. Pricing is driven

primarily by location, with listings in central or tourist-centric zones fetching higher rates. Listing quality, including amenities and host reputation, also plays a major role, alongside seasonal demand spikes during peak tourist periods or major events. In Canadian cities, for instance, listings with higher ratings and more reviews command premium prices. (Gibbs et al., 2018).

## 2.2 Effects on LTR and Housing Prices

Short-term rentals (STR) influence long-term rentals (LTR) and housing prices by decreasing the supply of affordable LTR units and increasing overall housing costs. When property owners shift from LTR to STR, often lured by higher profits from platforms like Airbnb, the availability of long-term housing shrinks, tightening the rental market. This conversion drives up rents as demand outpaces supply. Simultaneously, STR activity boosts housing prices, particularly in high-demand areas, as investors purchase properties for short-term use, reducing the stock available for purchase or long-term lease. Studies consistently link these trends to urban and tourist-centric regions where STR prevalence is highest, amplifying affordability challenges for residents.

Specific evidence underscores these effects across diverse geographies. In Boston, (Horn & Merante, 2017) found that a 1 standard deviation increase in Airbnb listings pushes LTR rents higher by 0.4%. Nationally in the U.S., (Barron et al., 2020) calculated that a 1% increase in Airbnb listings raised rents by 0.018% and home prices by 0.026%. In New York City, (Wachsmuth & Weisler, 2018) estimated that Airbnb removed up to 13,500 LTR units. Meanwhile, in Barcelona (Garcia-López et al., 2020) noted that STR activity in high-density areas increased housing prices by 3.7% and rents by 7%. These findings highlight STR's role in reshaping housing markets, often at the expense of long-term residents.

## 2.3 Regulations and their effects

Short-term rental (STR) regulations have emerged globally as cities grapple with the impacts of platforms like Airbnb on housing and local communities. In Europe, Amsterdam has adopted a "bed and breakfast" permit system paired with a 30-night annual cap to control STR prolifera-

tion, aiming to protect residential housing stock (Nieuwland & van Melik, 2020). Barcelona has taken a stricter stance, enforcing licensing requirements and zoning restrictions that ban STR in specific areas, alongside mandatory host registration to curb illegal rentals (Garcia-López et al., 2020). Berlin once implemented a near-total STR ban in 2016, which it later relaxed into a regulated system with registration and usage caps (Schäfer & Braun, 2016). Beyond Europe, San Francisco in the US introduced a pioneering 90-day limit for entire-home STRs and required hosts to register, seeking to balance tourism with resident needs (Lee, 2016). Similarly, London in the UK restricts STR to 90 nights annually, with additional planning permission required for extended use, reflecting a tailored approach to managing tourism's economic upside against housing pressures (Quattrone et al., 2016).

The outcomes of these regulations reveal a mixed picture, heavily influenced by enforcement and local dynamics. In Berlin, research (Duso et al., 2020) indicates that STR restrictions have lowered rents in areas with high rental activity, hinting at improved affordability. San Francisco saw a drop in Airbnb listings following its rules, though weak enforcement has muted effects on housing costs (Lee, 2016). Barcelona's crackdown reduced illegal listings, yet housing prices have shown little change, suggesting deeper market forces at work (Garcia-López et al., 2020). Amsterdam's cap has similarly cut listing numbers, but its impact on housing affordability awaits further study (City of Amsterdam, 2019). These examples underscore that while STR regulations can temper the platform's growth and ease some housing strain, their effectiveness hinges on robust implementation and the unique economic context of each city.

## 2.4 Literature Gap

This thesis addresses a notable gap in the research on short-term rentals (STRs) and their impact on housing markets by focusing on Vienna, a city that has been underexplored in this context. While existing studies have investigated STR effects in various global cities, Vienna's unique historical, cultural, and regulatory landscape makes it a distinctive case warranting specific attention. The research concentrates on price effects, examining how STRs influence housing costs in a city with a robust rental market and significant tourism appeal. This emphasis is crit-

ical, as rising prices driven by STRs can affect affordability and access for long-term residents, a pressing issue in urban housing debates. By analyzing these dynamics, the thesis not only fills the research void for Vienna but also enriches the broader understanding of how STRs shape housing markets, offering valuable insights for policymakers navigating the challenges of the sharing economy.

# Chapter 3

## Policy Framework

In this chapter, we provide a detailed historical overview of the restrictive policy against STR implemented by Vienna’s authorities. We first give a short comparison of crucial changes in laws that make our quasi-experimental design possible to test, and further elaborate each of the parts in detail.

### 3.1 Summary of changes

In summary, Table 3.1 represent a significant tightening of the rules for short-term tourist rentals in Vienna. While allowing for limited home-sharing, the new legal framework imposes considerable restrictions on more commercially oriented short-term letting, aiming to preserve residential housing stock while still allowing for some flexibility for residents to rent out their own homes on a limited basis.

| Aspect                 | Before July 1, 2024                                           | After July 1, 2024                                                                    |
|------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Geography              | Residential zones only                                        | The whole city                                                                        |
| Commercial Rentals     | Prohibited in residential zones; unrestricted elsewhere       | Limited to 90 days/year, permit required for longer rentals                           |
| Non-Commercial Rentals | Allowed in residential zones, no day limit                    | Limited to 90 days/year, host must maintain primary residence                         |
| Permit Requirements    | None for non-residential zones, not required for home-sharing | Exemption permit for rentals > 90 days                                                |
| Tax Obligations        | 3.2% Vienna City Tax                                          | 3.2% Vienna City Tax                                                                  |
| Enforcement            | Inconsistent, complaint-based                                 | Enhanced via platform data-sharing, fines up to €50,000 or imprisonment up to 2 weeks |

Table 3.1: Comparison of STR policy changes



## 3.2 Previous Regulations

Before July 1, 2024, the regulatory environment for short-term rentals in Vienna was characterized by a distinction based on zoning. Since 2018, Vienna's regulations on short-term rentals aimed to preserve residential housing, particularly in areas zoned for residential use (Wohnzonen), as defined under §7a of the Building Code<sup>1</sup>. In these zones, commercial short-term rentals—defined as renting entire flats for touristic purposes without the host residing on-site—were prohibited. This restriction sought to prevent the conversion of residential properties into tourist accommodations, which reduced housing stock and increased rental prices. Non-commercial short-term rentals, often referred to as home-sharing, were permitted in residential zones. However, the concept of "home-sharing," where individuals occasionally rented out their primary private residence or parts thereof while their own residential use predominated, was generally considered permissible even within these residential zones, although a precise legal definition of "home-sharing" remained somewhat ambiguous and subject to interpretation based on the predominance of the host's own residential use.

Outside residential zones, no specific restrictions applied, enabling property owners to rent out flats for short-term use without limitations. Nevertheless, all providers of short-term accommodation, regardless of location or the nature of the rental, were obligated to comply with the Vienna Tourism Promotion Act. Hosts were required to pay the Vienna City Tax (Ortstaxe), calculated at 3.2% of the accommodation charge.

Hosts were responsible for ensuring they complied with all applicable tax laws, including income tax on rental earnings and VAT if applicable, in addition to the Ortstaxe. While online platforms facilitated many rentals, the responsibility for adhering to local regulations lay with the host. However, enforcement was inconsistent, and many properties continued to be listed on platforms like Airbnb, exacerbating housing market pressures. A 2021 lawsuit further prohibited subletting city-owned apartments (Gemeindebau) on such platforms, reflecting early efforts to curb short-term rentals.

<sup>1</sup><https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrW&Gesetzesnummer=20000006>

### 3.3 New Policy: July 1, 2024

On November 23, 2023, the Vienna State Parliament passed the Building Code Amendment 2023, effective July 1, 2024, introducing stricter, city-wide regulations to address the housing shortage intensified by short-term rentals. These rules eliminate the distinction between residential and non-residential zones, applying uniformly across Vienna.

Key provisions include 90-Day Limit for Non-Commercial Rentals. Hosts may rent out their flats for touristic purposes for up to 90 days per calendar year without a permit, provided they maintain the property as their primary residence and do not permanently relinquish occupancy. This aligns with the concept of home-sharing, where the flat remains primarily residential. Hosts must pay the 3.2% Vienna City Tax on accommodation charges.

For rentals intended to exceed 90 days per year, or for those not meeting the "host-in-residence" criterion, an exceptional permit (Ausnahmebewilligung) from the municipal authorities (specifically MA 37, the Building Police) is required. The conditions for obtaining such a permit are notably strict and include:

1. The property must not be in a residential zone, grassland, or allotment garden.
2. The property must not have received housing subsidies for construction.
3. No more than 50% of the building's units can be used for commercial short-term rentals.
4. If the building has multiple owners (co-ownership), the written consent of all other co-owners is generally required.
5. Permits are valid for up to five years.

There are several new compliance and enforcement conditions too. Hosts must register their properties with local authorities. Short-term rental platforms, such as Airbnb, are required to share data with authorities to ensure compliance. Violations, such as listing properties without permits, are classified as administrative offenses under §135 (6a) of the Building Code, with penalties including fines up to €50,000 or imprisonment for up to two weeks.

# Chapter 4

## Methodology

In this chapter, we provide an extensive overview of the data description, research design, and empirical strategy used in the thesis.

### 4.1 Data

This study relies on two primary data sources: Inside Airbnb and Data Sciences Service GMBH (DSS). Inside Airbnb is a publicly accessible platform that provides quarterly data on Airbnb listings from thousands of cities worldwide. This data is gathered through web scraping of Airbnb's platform and has been widely utilized in academic research (Barron et al., 2020). It offers comprehensive statistics and descriptions of listings, including property details, host information, and pricing metrics, establishing itself as a credible and reliable resource. In contrast, DSS is a private real estate consulting firm with a focus on the Austrian housing market. Their expertise includes the collection of purchase contract data, automated property valuation, and statistical forecasting of housing trends. DSS has a strong track record, having contributed to numerous scientific projects, collaborated with prestigious universities (e.g., Vienna University of Economics and Business), and participated in public initiatives, such as property market review reports with the Austrian National Bank. The established reputations of both Inside Airbnb and DSS affirm their suitability and validity as data providers for this study.

The Inside Airbnb dataset includes five consecutive quarters of short-term rental listings in Vienna, Austria, beginning with the first quarter of 2024. Unfortunately, data from earlier

periods, which could enhance the longitudinal scope of this research, are not directly accessible from the Inside Airbnb server and require a formal purchase request. While data for the first quarter of 2023 was sourced from open repositories, its application in this study is limited due to the absence of corresponding data from adjacent quarters, hindering a robust time-series analysis.

The Airbnb dataset provides detailed insights into short-term rental listings in Vienna, covering the following aspects:

- General listing details: Unique identifiers, listing names, property types, and geographic coordinates.
- Host-related features: Number of listings per host, review details, and superhost status.
- Pricing and availability: Rental rates and booking availability over time.
- Geographical descriptions: Neighborhood classifications, average pricing, and availability metrics.

Each quarterly dataset contains over 13,000 observations across 75 variables. For further exploration, the data is available on the Inside Airbnb website<sup>1</sup>. A detailed exploratory analysis of this dataset will be presented in the subsequent sections of this chapter.

The DSS dataset provides information on mean and median prices, as well as transaction volumes, spanning the first quarter of 2023 to the first quarter of 2025. This data is segmented into three apartment size categories: small (less than 60 square meters), medium (61–120 square meters), and large (over 120 square meters). Geographically, it covers all districts of Vienna, as well as the major Austrian cities of Linz, Graz, and Salzburg. The dataset contains 683 observations in total. Due to its proprietary nature and a non-disclosure agreement, the raw data cannot be shared publicly. However, selected descriptive statistics derived from this dataset will be discussed in the following sections of this thesis.

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<sup>1</sup><http://insideairbnb.com>

## 4.2 Airbnb

### 4.2.1 Market Overview: before July 1, 2024

Prior to the introduction of significant policy changes on July 1, 2024, Vienna's Airbnb market exhibited robust growth and dynamism, as indicated by various market analytics. Data from platforms like AirDNA (and analyses derived from it, such as by AirROI) and Airbtics for the period leading up to early 2024, showed a substantial number of active listings, with one pre-regulation snapshot indicating around 11,000 to 14,000 listings. This growth was accompanied by strong revenue trends, with year-over-year revenue growth reported in the range of 20% (e.g., AirROI for pre-2024 period) and average annual host incomes reaching figures such as €24,000 in 2023 (Airbtics). The market was characterized by a high prevalence of "Entire Home/Apartment" listings, constituting nearly 90% of the offerings, with one-bedroom apartments being the most common type, catering often to couples or solo travelers, and a significant portion of listings managed by professional property managers. Seasonal effects were significant, with summer months and December seeing increased demand, while business travelers and students maintained steady off-peak activity. Listings were concentrated in popular districts, contributing to the market's dynamic nature before the policy change.

### 4.2.2 Declining Symptoms

To rigorously assess the impact of the recently implemented restrictive policy on the short-term rental (STR) market in Vienna, this study will employ several selected proxy metrics. These indicators are designed to capture shifts in market dynamics and economic activity from both the supply (host) and demand (guest) perspectives. The chosen metrics are as follows:

**Total Number of Listings:** This fundamental metric directly reflects the overall scale of the STR supply. A significant change post-policy implementation would indicate an expansion or contraction of the market.

1. **Number of Actively Available Listings:** Measured for defined future periods (e.g., availability within the next 30, 60, or 90 days), this metric gauges the current and immediately

| variable              | 2024 Q1 | 2024 Q2 | 2024 Q3 | 2024 Q4 | 2025 Q1 |
|-----------------------|---------|---------|---------|---------|---------|
| n of listings         | 14930   | 14715   | 14396   | 14618   | 13790   |
| n avail l30d          | 9830    | 9955    | 9280    | 9648    | 7876    |
| n avail l60d          | 10411   | 10585   | 9877    | 10188   | 8369    |
| n avail l90d          | 10693   | 10894   | 10120   | 10430   | 8642    |
| n of unique hosts     | 7091    | 7054    | 6831    | 6742    | 6403    |
| host is superhost     | 3786    | 3829    | 3464    | 3402    | 3278    |
| n of reviews l30d     | 10371   | 14496   | 15299   | 12538   | 8210    |
| rel avail 30          | 0.6584  | 0.6765  | 0.6446  | 0.6600  | 0.5711  |
| rel avail 60          | 0.6973  | 0.7193  | 0.6861  | 0.6969  | 0.6069  |
| rel avail 90          | 0.7162  | 0.7403  | 0.7030  | 0.7135  | 0.6267  |
| rel n of reviews l30d | 0.6946  | 0.9851  | 1.0627  | 0.8577  | 0.5954  |

Table 4.1: Airbnb dynamics in Vienna

forthcoming supply, offering insights into host intentions and compliance with potential usage limitations.

2. Volume of Reviews: The number of reviews accrued over specific recent periods (e.g., past 30, 60, or 90 days) serves as a robust proxy for the actual number of completed stays and, consequently, the level of guest activity and booking success.
3. Number of Unique Hosts: Tracking changes in the count of distinct hosts will illuminate the policy's effect on the breadth of market participation, indicating whether hosts are exiting or entering the market.
4. Number of Superhosts: Monitoring the population of Superhosts, who meet specific performance criteria, can reveal how the regulatory changes affect experienced and high-quality hosts, and their ability to maintain service standards or operational viability.
5. Relative Availability Rate: Calculated as the proportion of total listings actively advertised as available for booking, this metric provides insight into the intensity of use of the existing STR stock and may reflect adjustments in host rental strategies in response to the new regulations.

Following Figure 4.1 and Table 4.1, the Airbnb market in Vienna exhibited a general decline in activity from the first quarter of 2024 through the first quarter of 2025, with notable

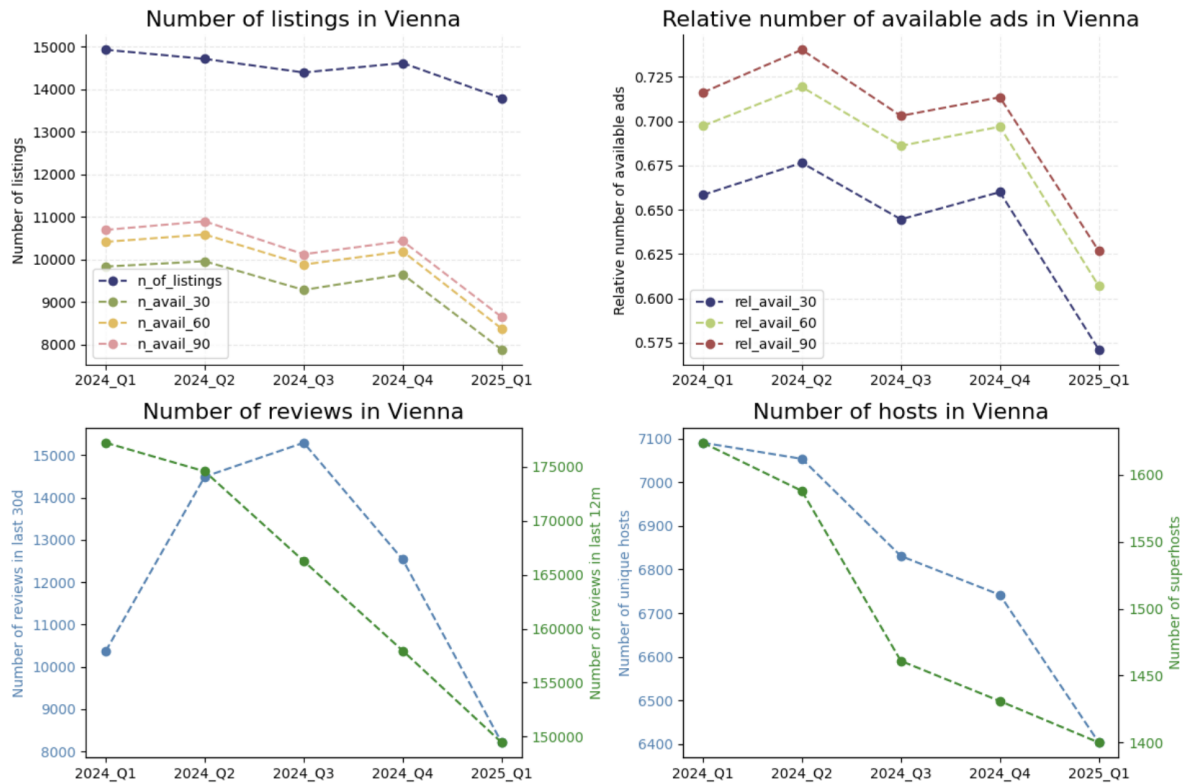


Figure 4.1: Airbnb dynamics in Vienna

fluctuations during the intervening period. The number of listings decreased from 14,930 in Q1 2024 to 13,790 in Q1 2025, while the number of unique hosts and superhosts steadily declined, falling from 7,091 and 3,786, respectively, to 6,403 and 3,278 over the same period. Availability metrics, including listings available in the last 30, 60, and 90 days, initially increased from Q1 to Q2 2024, peaked around mid-year, and then experienced a sharp drop by Q1 2025. Similarly, review activity surged to a peak of 15,299 reviews in Q3 2024 before decreasing significantly to 8,210 in Q1 2025. Relative availability and review metrics mirrored this pattern, with mid-year increases followed by substantial declines. These trends suggest that while seasonal demand may have temporarily boosted activity in mid-2024, the overall trajectory reflects a contraction in Vienna's short-term rental market, particularly evident in the reduced engagement and participation by hosts and guests alike by early 2025.

An analysis of the changes in Airbnb metrics across Vienna's districts between the first quarter of 2024 and the first quarter of 2025, as depicted in the provided Heatmap 4.3, reveals predominantly declining trends in short-term rental activity, consistent with the broader city-wide observations. Most districts experienced a year-over-year reduction across the majority

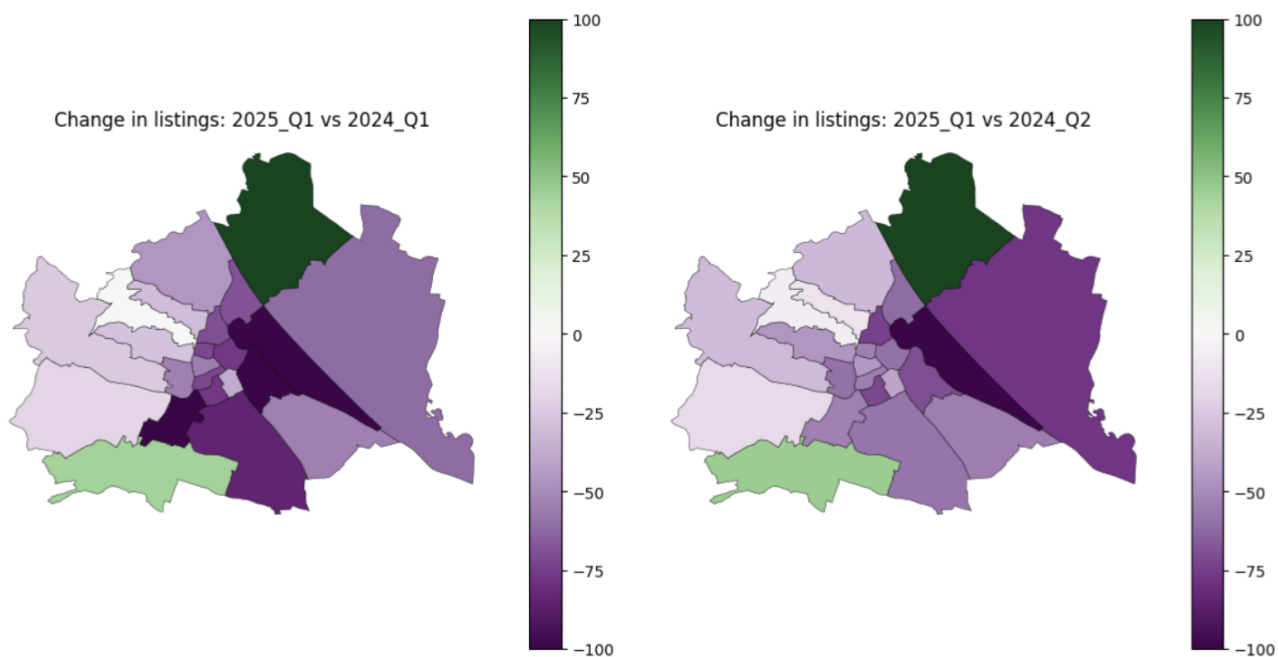


Figure 4.2: Changes in listings Q1 - Q2 2024 vs Q1 2025

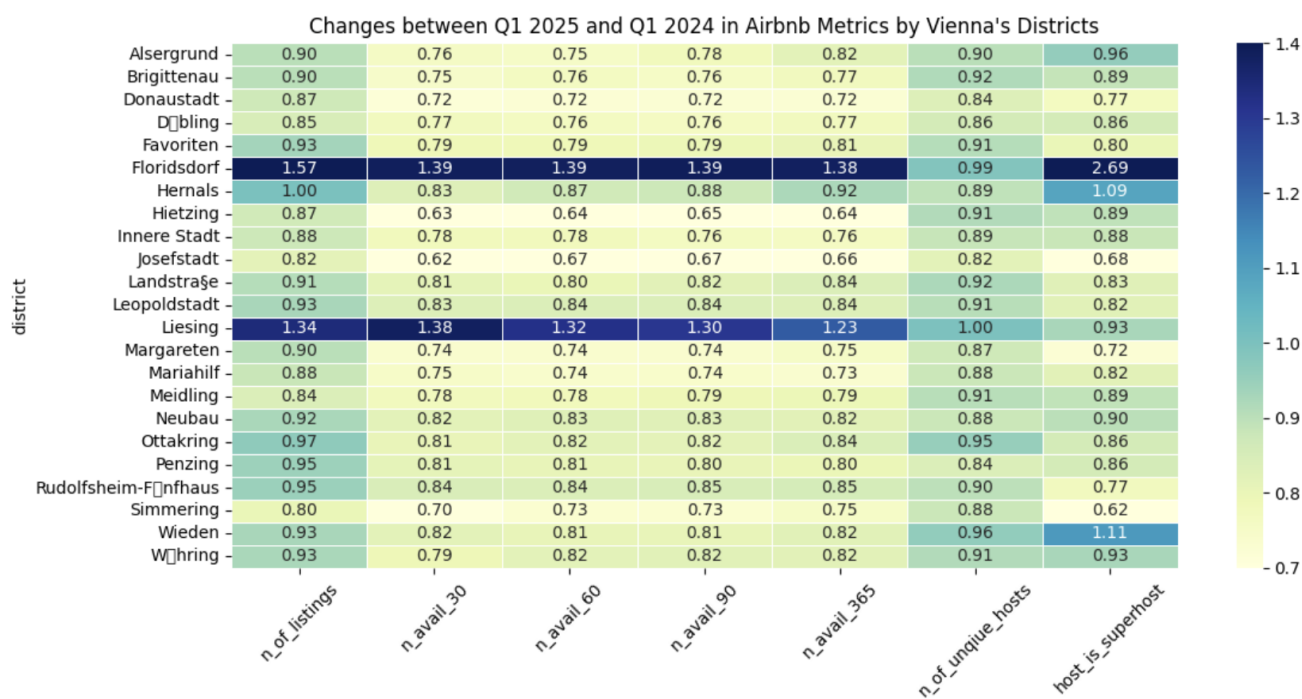


Figure 4.3: Relative changes in Airbnb activities by districts



of tracked indicators, suggesting a widespread contraction.

Specifically, the number of listings (Figure 4.2) and the number of unique hosts (Figure 4.3) generally decreased in most districts, with ratios frequently falling between 0.80 and 0.95 of the Q1 2024 figures. This indicates a reduction in both the available properties and the pool of active hosts. The decline was even more pronounced for availability metrics. The number of superhosts also followed a general downward trend in most areas, with many districts showing ratios below 1.00, although with more variability; for instance, Simmering and Josefstadt exhibited notable decreases (ratios of 0.62 and 0.68 respectively), while Wieden showed an increase (1.11).

However, some districts presented exceptions to this overarching pattern of decline. Floridsdorf, in particular, displayed significant year-over-year increases across nearly all metrics, with the number of listings showing a ratio of 1.57 and the superhost count an exceptional 2.69. Liesing also demonstrated growth in listings (1.34) and availability figures. Hernals showed stability or slight increases in listings (1.00) and an increase in superhosts (1.09), distinguishing these areas from the more common trend of contraction observed elsewhere in the city during this period.

### 4.2.3 Airbnb in Prague

As there is no direct counterfactual to Vienna in Austria, we use Prague for analysis of Airbnb trends. Vienna and Prague are highly comparable Central European capitals, with populations of approximately 2 million and 1.4 million respectively. They also share a comparable urban scale. Economically, both cities are significant drivers within their nations, indicating robust development. Culturally and touristically, they are nearly identical in appeal, drawing millions of international visitors annually, making them relevant counterfactuals for assessing market dynamics influenced by regulatory shifts.

Overall, the Table 4.2 and Figure 4.4 detailing Airbnb activity in Prague from 2024 Q1 to 2025 Q1 reveal a robust growth trend across multiple metrics. Listings increased steadily from 8366 to 10108, while available listings also increased consistently. Unique hosts grew over time, and superhosts and reviews over the last 30 days fluctuated but generally trended upward.

| date                  | 2024 Q1 | 2024 Q2 | 2024 Q3 | 2024 Q4 | 2025 Q1 |
|-----------------------|---------|---------|---------|---------|---------|
| n of listings         | 8366    | 9066    | 9460    | 9929    | 10108   |
| n avail 30            | 7276    | 7980    | 7962    | 8642    | 8319    |
| n avail 60            | 7531    | 8363    | 8206    | 8850    | 8558    |
| n avail 90            | 7643    | 8473    | 8337    | 8942    | 8696    |
| n of unqiue hosts     | 2728    | 3015    | 3150    | 3266    | 3284    |
| host is superhost     | 3616    | 3683    | 3872    | 4080    | 4307    |
| n of reviews l30d     | 12443   | 16089   | 14833   | 15000   | 12343   |
| rel avail 30          | 0.87    | 0.88    | 0.84    | 0.87    | 0.82    |
| rel avail 60          | 0.90    | 0.92    | 0.87    | 0.89    | 0.85    |
| rel avail 90          | 0.91    | 0.93    | 0.88    | 0.90    | 0.86    |
| rel n of reviews l30d | 1.49    | 1.77    | 1.57    | 1.51    | 1.22    |

Table 4.2: Airbnb dynamics in Prague

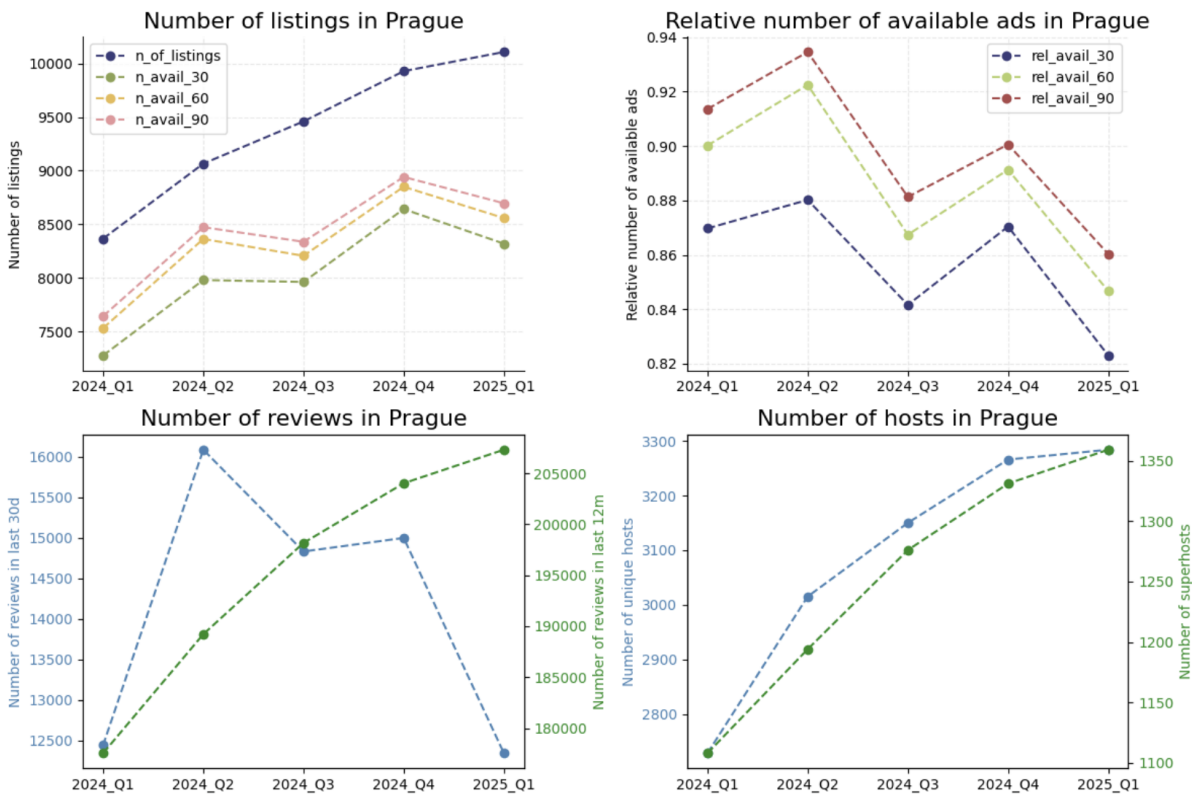


Figure 4.4: Airbnb dynamics in Prague

Relative availability remained mostly stable between 0.87 and 0.93, and relative reviews decreased slightly from 1.49 to 1.22. However, these coefficients could be explained by seasonal component and continuous growth of total number of listings. This steady expansion in Prague, a city comparable to Vienna in population and cultural-touristic appeal, occurs in the absence of restrictive policies.

To conclude, we find persuasive proofs of the decline in Airbnb activity in Vienna after restrictive policy was implemented. Despite the impossibility of controlling for annual trends and extracting seasonal components, an extensive review of analytical platforms and comparison for a counterfactual support our hypothesis about decrease in STR listings since July 1, 2024.

## **4.3 Empirical Strategy**

### **4.3.1 Difference-in-Differences approach**

To evaluate the causal impact of the short-term rental policy implemented in Vienna on July 1, 2024, this study employs the Difference-in-Differences (DiD) approach. The DiD framework is particularly suitable for analyzing the effects of policy interventions, as it controls for both time-invariant differences between groups and common time trends, thereby isolating the policy's effect on outcomes such as the number of Airbnb listings or housing prices in Vienna.

The treatment group comprises observations from Vienna, where the policy was enacted. The control group includes Graz, Linz, and Salzburg, the next three largest cities in Austria, which did not experience the same policy change. Despite disparities in population and geographic size, this selection is justified for several reasons. Firstly, these cities are significant economic and cultural centers within their respective provinces, mirroring Vienna's role as a hub. Secondly, their population and economic characteristics, such as GDP per capita, purchasing power, average wages, and pension levels, are comparable to Vienna, particularly when Vienna's data is aggregated to the city level or considered at a district-level granularity com-

parable to these cities<sup>2 3</sup>. This similarity supports the validity of the control group for DiD analysis. To further ensure robustness, we will verify the parallel trends assumption by examining pre-policy trends in outcome variables across both groups, ensuring that Vienna and the control cities followed similar trajectories before the policy intervention.

### 4.3.2 Main Specification

For the main specification, we employ an enhanced DiD model with fixed effects to account for unobserved heterogeneity across cities and time periods. The model is specified as follows:

$$\ln(Y_{it}) = \alpha_i + \delta_t + \beta \cdot (\text{Vienna}_i \times \text{Post}_t) + \gamma \cdot X_{it} + \varepsilon_{it} \quad (4.1)$$

where  $Y_{it}$  represents the outcome variable (median housing prices per square meter) for city  $i$  in quarter  $t$ ;  $\text{Vienna}_i$  is a dummy variable equal to 1 if the city is Vienna and 0 otherwise;  $\text{Post}_t$  is a dummy variable equal to 1 for quarters after the policy implementation (Q3 2024 onward) and 0 before;  $\alpha_i$  are city fixed effects to control for time-invariant city-specific (district-specific) characteristics;  $\delta_t$  are quarter fixed effects to account for common time shocks;  $X_{it}$  includes control variables such as category size, Vienna's center etc.; and  $\varepsilon_{it}$  is the error term. The coefficient  $\beta$  is the DiD estimator, capturing the average treatment effect of the policy on Vienna relative to the control cities.

To examine supplementary hypotheses concerning the differential effects of the policy based on apartment size and proximity to the city center, we estimate additional regression models that incorporate interaction terms for these characteristics. The specifications are as follows:

$$\begin{aligned} \ln(Y_{it}) = & \alpha_i + \delta_t + \beta_1 \cdot (\text{Vienna}_i \times \text{Post}_t) + \beta_2 \cdot (\text{Vienna}_i \times \text{Post}_t \times \text{Small}_i) \\ & + \beta_3 \cdot (\text{Vienna}_i \times \text{Post}_t \times \text{Medium}_i) + \gamma \cdot X_{it} + \varepsilon_{it} \end{aligned} \quad (4.2)$$

<sup>2</sup>Population: <https://www.migration.gv.at/en/living-and-working-in-austria/austria-at-a-glance/geography-and-population/>

<sup>3</sup>GRP: <https://www.statistik.at/en/statistics/national-economy-and-public-finance/national-accounts/regional-accounts>

$$\ln(Y_{it}) = \alpha_i + \delta_t + \beta_1 \cdot (\text{Vienna}_i \times \text{Post}_t) + \beta_2 \cdot (\text{Vienna}_i \times \text{Post}_t \times \text{Center}_i) + \gamma \cdot X_{it} + \varepsilon_{it} \quad (4.3)$$

In these models, the coefficients of interest are those associated with the interaction terms, as they capture the heterogeneous treatment effects across distinct subcategories of apartments. The interpretations of these coefficients are detailed below:

- **Location Effects:** In Equation 4.3, the coefficient  $\beta_2$  represents the differential impact of the policy on apartments located in Vienna's central districts (districts 1–9) compared to those in the outer districts. A statistically significant  $\beta_2$  would suggest that the policy's effect on the housing market varies depending on an apartment's proximity to the city center.
- **Size Effects:** In Equation 4.2, the coefficients  $\beta_2$  and  $\beta_3$  measure the distinct policy effects for apartments of different sizes relative to a baseline category (e.g., large apartments). Specifically:
  1.  $\beta_2$  indicates whether the treatment effect differs for small apartments (e.g., less than 60 square meters) compared to large apartments.
  2.  $\beta_3$  captures the same comparison for medium-sized apartments (e.g., 61–120 square meters).

These interaction terms enable us to evaluate whether the policy's influence on the housing market is moderated by apartment size or location, offering a more granular insight into its overall impact.

### 4.3.3 Assumptions test

The DiD method rests on two core assumptions: no anticipation and parallel trends. The no anticipation assumption asserts that the treatment group did not modify its behavior in expectation of the policy change. We assume this holds, as evidenced by the consistent growth in

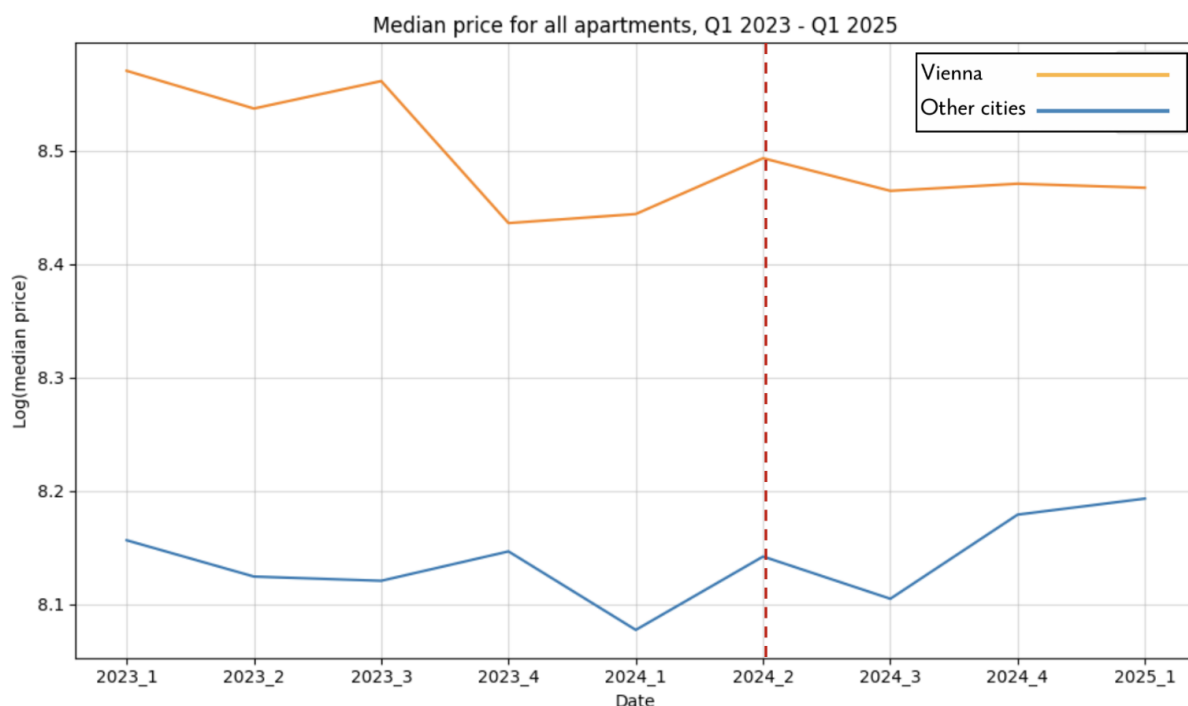


Figure 4.5: Parallel trends test

Vienna's Airbnb market prior to July 1, 2024, suggesting that landlords did not preemptively adjust their actions. The parallel trends assumption posits that, absent the treatment, the treatment and control groups would have exhibited similar trends over time. This assumption can be assessed through both visual inspection and formal statistical tests.

Visual examination on Figure 4.5 of the data offers moderate support for the parallel trends assumption. Between Q3 2023 and Q1 2024, median prices in the treatment and control groups diverged, moving in opposite directions. However, in other pre-policy periods, the trends appear more aligned, with both groups displaying a generally decreasing pattern since Q1 2023. This partial consistency provides tentative evidence for the assumption, though the divergence in specific quarters warrants further scrutiny.

To rigorously evaluate the parallel trends assumption, we conducted two variants of our main specification model. First, we implemented three separate placebo treatments, each applied to an individual quarter within the same period, Figure 4.6 (e.g., a treatment isolated to Q4 2023 using data restricted to that quarter). Second, we introduced a single "placebo" treatment spanning Q4 2023 to Q2 2024. Both approaches yield insignificant effects from the placebo interventions, lending support to the validity of the DiD framework. However, the estimated

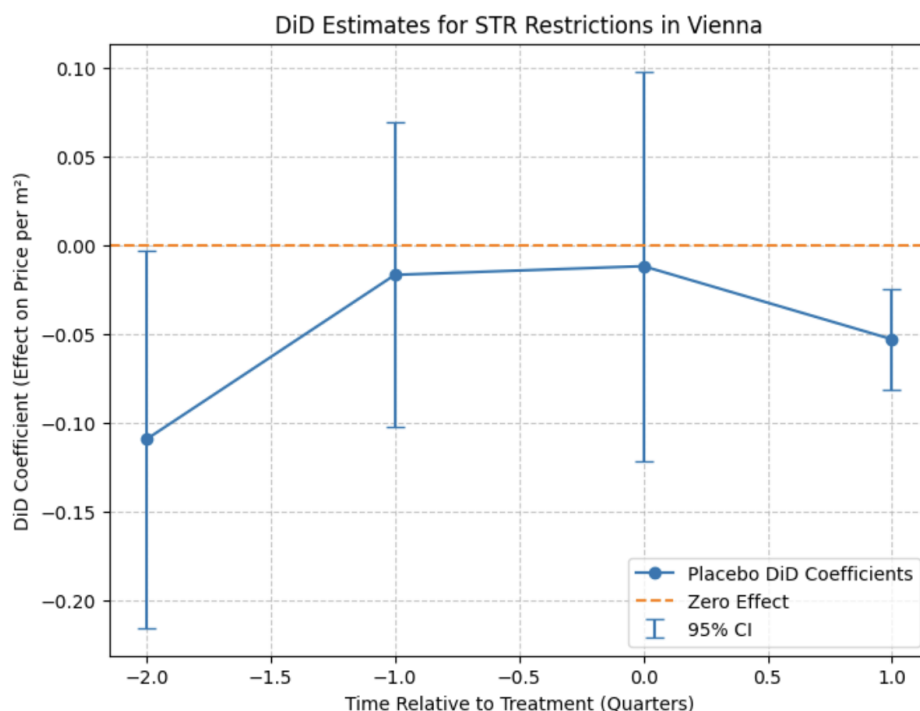


Figure 4.6: Placebo test

coefficients for these placebo treatments are comparable in magnitude and sign to those of the actual treatment. This similarity, coupled with the observed divergence in trends between Q3 2023 and Q1 2024, raises potential concerns about the robustness of our findings. These issues may be attributable to the limited number of observations in our dataset, which could constrain statistical power. Ideally, more granular micro-level data would enable additional robustness checks.

In summary, both visual and formal tests predominantly endorse the applicability of the DiD method in this analysis. Nonetheless, the minor deviations in pre-treatment trends between the groups could lead to a slight overestimation of the treatment effects. These findings underscore the importance of interpreting the results with caution and highlight the potential value of supplementary data for future validation.

# Chapter 5

## Results

In this chapter, we describe our main empirical findings on causal link between Airbnb activity and housing prices in Vienna.

### 5.1 Empirical Findings

|                               | (1)                    | (2)                    | (3)                         | (4)                  | (5)                  |
|-------------------------------|------------------------|------------------------|-----------------------------|----------------------|----------------------|
| <i>Vienna × Post</i>          | -0.0522***<br>(0.0161) | -0.0528***<br>(0.0144) | -0.0555*<br>(0.0310)        | -0.0544***<br>0.0044 | -0.0593***<br>0.0275 |
| <i>Vienna × Post × Small</i>  | –                      | –                      | 0.0148<br>(0.0454)          | –                    | 0.0180<br>(0.0462)   |
| <i>Vienna × Post × Medium</i> | –                      | –                      | -0.0067<br>(0.0361)         | –                    | -0.0035<br>(0.0360)  |
| medium size                   | No                     | Yes                    | Yes                         | Yes                  | Yes                  |
| small size                    | No                     | Yes                    | Yes                         | Yes                  | Yes                  |
| vienna center                 | No                     | No                     | No                          | Yes                  | Yes                  |
| FE                            | Districts              | Districts              | Districts                   | City                 | City                 |
| R <sup>2</sup>                | 0.0015                 | 0.2983                 | 0.2987                      | 0.3855               | 0.3856               |
| Observations                  | 683                    | 683                    | 683                         | 683                  | 683                  |
| <i>Note:</i>                  |                        |                        | *p<0.1; **p<0.05; ***p<0.01 |                      |                      |

Table 5.1: Impact of Vienna’s Housing Policy on Prices

Table 5.1 shows the impact of a housing policy introduced in Vienna on July 1, 2024, on housing prices, using other major Austrian cities as a comparison group. The main coefficient of interest is the "Vienna × Post" interaction term, which isolates the policy’s effect



post-implementation. The findings, derived from five distinct model specifications, consistently demonstrate the policy's success in moderating housing price growth in Vienna.

Across all model specifications, the "Vienna  $\times$  Post" coefficient is negative and statistically significant, with values ranging from -0.0522 to -0.0593. As the dependent variable is the logarithm of housing prices, these estimates translate to a relative reduction in Vienna's housing prices of approximately 5.2% to 5.9% compared to the counterfactual scenario absent the policy. This effect is measured relative to price trends in other Austrian cities, where housing costs continued to escalate. Consequently, the policy effectively mitigated an approximate 5% price increase in Vienna, underscoring its efficacy in alleviating housing market pressures.

To explore potential heterogeneity in the policy's impact across apartment sizes, interaction terms for small and medium-sized apartments added, following equation 4.2. The coefficients for these terms are both small and statistically insignificant (e.g., 0.0148 with a standard error of 0.0454 for small apartments), suggesting that the policy's effect does not vary by apartment size. This uniformity indicates that the policy's benefits extend consistently across Vienna's diverse housing stock, irrespective of unit size.

The robustness of the findings is evident in the stability of the "Vienna  $\times$  Post" coefficient across all model configurations. In the baseline specification (Column 1), which includes district fixed effects, the coefficient is -0.0522. In the most comprehensive model (Column 5), which controls for apartment size and location, it increases slightly to -0.0593. The explanatory power of the models improves with additional controls ( $R^2$  rises from 0.0015 to 0.3856), yet the policy effect remains consistent, reinforcing the reliability of the results.

The table 5.2 examines whether a policy had a stronger impact on housing prices in Vienna's central districts compared to outer areas, as captured by the "Vienna  $\times$  Post  $\times$  Center" interaction term. In the first specification (with district fixed effects), the coefficient for this term is -0.0346 but is not statistically significant. This suggests that there is no robust evidence of a differential policy effect in the center based on this model. In contrast, the second specification (with city fixed effects) shows a coefficient of -0.0324, which is statistically significant at the 1% level. This indicates that the policy led to an additional reduction in housing prices in Vienna's central districts compared to non-central areas.

|                               | (1)                         | (2)                    |
|-------------------------------|-----------------------------|------------------------|
| <i>Vienna × Post</i>          | -0.0390**<br>(0.0170)       | -0.0415***<br>(0.0044) |
| <i>Vienna × Post × Center</i> | -0.0346<br>(0.0273)         | -0.0324***<br>(0.0003) |
| medium size                   | Yes                         | Yes                    |
| small size                    | Yes                         | Yes                    |
| vienna center                 | No                          | Yes                    |
| FE                            | Districts                   | City                   |
| R <sup>2</sup>                | 0.2996                      | 0.3859                 |
| Observations                  | 683                         | 683                    |
| <i>Note:</i>                  | *p<0.1; **p<0.05; ***p<0.01 |                        |

Table 5.2: Impact of the Housing Policy on Prices in Vienna's Center

Economically, the total policy effect in the second specification for central apartments is the sum of the "Vienna × Post" coefficient (-0.0415) and the "Vienna × Post × Center" coefficient (-0.0324), resulting in a total effect of -0.0739. This is notably larger than the -0.0415 effect for non-central apartments, suggesting that the policy was more effective at curbing price growth in the city center, possibly due to greater short-term rental activity in these areas.

However, the inconsistency in statistical significance across the two specifications indicates that the evidence for a center-driven effect is not fully robust. For stronger and more conclusive evidence, further analysis using more robust variations on micro-level data, such as individual transaction records, would be beneficial. Such data could provide finer detail and better control for property-specific factors. Nevertheless, the results from the second specification are economically meaningful, suggesting that the policy had a valid and pronounced impact on housing prices in Vienna's central districts.

# Chapter 6

## Conclusion

This thesis explores the impact of a restrictive short-term rental (STR) policy implemented by Vienna's authorities on the city's housing market, with a specific focus on the policy change introduced on July 1, 2024. The analysis draws on data from Inside Airbnb and Data Sciences Service GMBH (DSS), revealing a notable year-over-year decline in Vienna's Airbnb market. Specifically, total listings and available listings decreased by 7 to 20 percentage points, indicating a substantial contraction in the STR sector following the policy's enactment. Although the study could not fully account for seasonal variations due to data limitations, supportive evidence emerges from a comparison with Prague, a city with comparable tourism dynamics but no equivalent STR restrictions. This comparative approach strengthens the analysis by helping to isolate the policy's effects from broader market trends, providing a clearer picture of its influence on Vienna's housing landscape.

To evaluate the policy's effect on housing prices, a Difference-in-Differences (DiD) methodology was employed, with Vienna designated as the treatment group and other major Austrian cities: Linz, Graz, and Salzburg –serving as the control group. The DiD analysis indicates that the STR policy resulted in a relative reduction in Vienna's housing prices ranging from 5.2% to 5.9% compared to the control cities, demonstrating its effectiveness in moderating price growth. Additional hypotheses concerning size- and center-driven effects were also examined. The findings reveal no significant variation in the policy's impact across different apartment sizes, suggesting a uniform effect throughout the housing market. In contrast, a stronger effect

is observed in Vienna's central districts, where an additional price reduction of approximately 3.2% is noted, though this result lacks consistent statistical significance across all model specifications, indicating some uncertainty in its robustness.

The study is not without its limitations, primarily stemming from the reliance on aggregated data and the inability to fully adjust for seasonal fluctuations due to constraints in the available datasets. Furthermore, the mixed significance of the center-driven effect underscores the need for more detailed, micro-level data, such as individual transaction records – to enhance the precision of the findings and better account for property-specific factors. Looking ahead, future research could build on this work by incorporating such granular data, enabling a more nuanced exploration of the policy's heterogeneous impacts across various property types and locations. Despite these challenges, the thesis offers compelling evidence that Vienna's restrictive STR policy successfully curbed housing price increases, providing valuable contributions to the broader discourse on regulating short-term rentals in urban housing markets.

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