The virus that devastated tourism: the impact of covid-19 on the housing market*

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Abstract

In this paper, we estimate the impact of the sudden and sharp decrease in tourism caused by the covid-19 pandemic on housing rental and sales in Lisbon, a tourist-intensive capital with a high density of short-term rental properties. We use a panel that spans the 24 civil parishes between the third quarter of 2018 and the third quarter of 2020. We estimate difference-in-differences specifications, with both a binary treatment and a treatment intensity relying on the pre-pandemic intensity of short-term rentals in the civil parishes. Our results are robust to an instrumental variable based on the density of museums that deals with selection into treatment concerns, and to the inclusion of the second largest city of the country. We show that in the long-term rental market, prices decrease 4.1%, while quantities increase 20% in the treated areas *vis-à-vis* comparison ones. We also find evidence of an incremental negative impact on sale prices of 4.8% in treated areas, with no effect on quantities. We further analyze heterogeneous effects based on dwellings' type, and conclude that the bulk of the impact is concentrated on two-bedroom apartments.

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1 Introduction

In an attempt to control the spread of the SARS-CoV-2 virus, governments around the world have imposed lockdowns and travel restrictions starting in January 2020, which have ravaged the global tourism and hospitality markets.[1] This almost sudden stop is particularly striking in economies that rely a lot on tourism. According to the OECD, in 2018, Portugal ranked first in the contribution of tourism to the country's economy, with 12.5% of its GDP directly or indirectly linked to this sector. The hotel and short-term rental sector in Portugal hosted 10.5 million guests in 2020, down from 26 million in 2019. The number of overnight stays went down to its 1993 level, mostly driven by a 75% contraction in the stays of foreign tourists, according to Statistics Portugal.

The short-term rental market in Portugal witnessed a boom following the enactment of a new regulation in 2014, which greatly simplified the registration process (Decree-law 128/2014). The country saw an almost three-fold increase in the number of overnight stays in short-term rental properties, from 3.6 to 10.2 million between 2013 and 2019. Overnight stays by foreign tourists in all the hospitality sector almost doubled in the same period (from 8.6 to 16.4 million). To counteract rapid increases in real estate prices, the municipality of Lisbon introduced a ban on new short-term rental registries in some neighborhoods, in 2018, which it extended in 2019. The municipality of Porto followed suit in 2019.

There is by now a sizeable literature discussing the links between this type of rentals and housing prices.[2] In a related paper, Gonçalves et al. (2020) exploit the 2018 and 2019 bans on new short-term rental registries through a difference-in-differences specification, and estimate the consequences on registries, Airbnb prices and quantities, number of transactions and housing prices, at the neighborhood level, which decreased 8.6% after the suspension became biding.[3] To the best of our knowledge, the only analysis of the the effect of the

[1] For the negative effects of the pandemic on travelling see, e.g., Lee and Chen (2020) and Coibion et al. (2020).

[2] Glaeser et al. (2020b) develop a model for the US market showing that welfare-reducing gentrification can happen because less profitable stores that generate more consumer surplus are replaced by more profitable ones that create less surplus, and through a shift from tradable to non-tradable goods, which lead to the closure of local businesses.

[3] Franco et al. (2019) analyse the impact of short-term rental density on the earlier period of 2011–2016 and

pandemic on real estate is Liu and Su (2020), who finds that covid-19 reduced demand for housing in neighborhoods with high population density in the US, with previous high home prices experiencing a larger decline.[4]

As a response to the sharp decrease in the demand for short-term rental from tourists, landlords may decide to rent their properties in the long-term rental market or, possibly, sell the property.[5] Following the outbreak of the pandemic, rents in Lisbon have contracted 11.1% in the third quarter of 2020 when compared to the same period of 2019. The pandemic has many effects on economic activity besides the sudden stop in tourism.[6] In a recent policy brief, Bloom and Ramani (2021) coined the term *donut effect* to refer to this reallocation of demand away from city centers toward city suburbs in the US. Our research question is then: how much of this drop in rents can be explained by the shock to the short-term rental market? And what are the effects on housing sales?

In this paper, we exploit the sudden and sharp decrease in tourism caused by the pandemic to address two complementary research questions. Firstly, we provide an estimate of the impact of the covid-19 crisis on the housing market in a capital city with high density of short-term rental properties. Secondly, this provides us with a natural identification strategy to obtain causal estimates of the impact of the short-term rental market on the long-term rental and sale markets. We use the pre-pandemic intensity of short-term rentals in different civil parishes as a measure of the intensity of the shock.

We combine administrative data on short-term rental registries, together with quarterly

document significant price increases in the historical areas of Lisbon and Porto.

[4] Our paper is also related to the growing literature on the effects of the pandemic. For Portugal, Carvalho et al. (2020) design a difference-in-differences event study to evaluate changes in Portuguese consumers' behavior following the pandemic, documenting a contraction on overall consumption levels, particularly affecting urban and central municipalities, as well as leisure and tourism activities.

[5] According to Turner et al. (2014), the short-term rental market can decrease the real estate market through *negative externalities* such as increased congestion, and increase it through a *demand side efficient use* and *housing supply effects*.

[6] Its potential to transform the urban landscape has been documented, e.g., by Althoff et al. (2020), Delventhal and Parkhomenko (2020) and Delventhal et al. (2020), based on how homeworking creates migration away from city centers, with fading local commerce and restaurants, eventually leading to a sale price decrease in core areas of the city. In addition, the role of mobility restrictions in limiting covid-19 spread in New York, as well as the determinants of the differential exposure to the disease, are studied by Glaeser et al. (2020a) and Almagro and Orane-Hutchinson (2020), respectively.

data for Lisbon and Porto housing markets, namely, rental and sale prices, as well as on the number of dwellings for rental and for sale, to analyze the short-term impact of the pandemic. We then implement a difference-in-differences specification with a binary treatment specification that uses the civil parishes targeted by the partial bans implemented by the municipality of Lisbon in 2018 and 2019 as the treated units. We complement this analysis with a continuous treatment intensity. For robustness, we include the civil parishes of Porto (and exploit the respective 2019 ban) in some specifications.

Finally, in order to address possible endogeneity concerns of the intensity of short-term rentals, we provide an instrumental variable specification that uses the intensity of museums to instrument the short-term rental intensity in each parish.

We provide the following estimates for the very short-run impact of the pandemic. Firstly, we estimate a decrease in rental prices in Lisbon's most touristic civic parishes of 4.1% and an increase of around 20% in the number of apartments for rental, *vis-à-vis* comparison parishes. The preferred estimate for the impact of high density of short-term rentals on the rental price represents more than one third of the overall impact on rents observed in the period. These magnitudes are significant and robust across all estimations and suggest a strong supply side effect of landlords reallocating their properties to the long-term rental market. Secondly, we find a statistically significant decrease in sale prices of between 4.8% and 7.6% in treated civil parishes, but no statistical significant effect on quantities, when compared to the remaining civil parishes. This suggests a demand shift that decreased the negotiated prices. Fourthly, we analyze of heterogeneous effects, that are particularly concentrated in one- and two-bedroom apartments in the rental market, suggesting a strong preference for this type of dwellings in the short-term rental market.

On top of being one of the first papers to analyze the impact of covid-19 on the real estate market, we also contribute to a growing literature on the effects of short-term rentals. Sheppard et al. (2016) applies matched difference-in-differences estimates to different New York city rental market zones, to show that Airbnb intensity increases prices. Barron et al.

(2018) use an instrumental variable based on google trends to infer causality between rising rents and Airbnb activity driven by a housing supply reallocation from the long- to the short-term rental market. Using quasi-experimental evidence from the Los Angeles' Home Sharing Ordinances market, Koster et al. (2018) combine a spatial regression discontinuity design with difference-in-differences to document that ordinances reduce Airbnb listings by 50% and house prices by 3%. Garcia-López et al. (2019) use an instrument variable to estimate an average rent increase of 7% in the most Airbnb-dense regions of Barcelona.[7] Almagro and Domínguez-Iino (2019), find that short-term rental platforms had a significant impact on rents, amenities, and within-city migration in Amsterdam.[8] The distributional impact of these platforms on the housing market is also studied by Calder-Wang (2019). She argues that the gains from the host channel do not compensate the losses from renters in New York City, especially for those who prefer housing and location amenities that are most desirable to tourists. Finally, Duso et al. (2020) employ an instrumental variable approach using two policy changes that restricted the registration of short-term rentals in Berlin and find that both availability and the number of listings dropped significantly, with heterogeneous effects across districts and between listings with different characteristics.

This paper is organized as follows. Section 2 presents a brief institutional background, whilst Section 3 describes the empirical strategy and presents descriptive statistics. Finally, Section 4 reports the analysis of main results, and Section 5 a summary of conclusions and implications of the paper.

2 Institutional Background

The decree-law 128/2014 created a straightforward online registration process for short-term rental properties. The license is available immediately and is a necessary step for the

[7] They instrument short-term rental intensity with an interaction between space-invariant proximity to Barcelona's touristic amenities and time-variant google searches of Airbnb Barcelona.

[8] The authors set up a structural model of residential choice with heterogeneous households and address residential sorting and inequality.

landlord to post her property on Airbnb and other home sharing platforms. Non-compliance entails a fine; moreover, platforms cooperate with the government by actively checking the licence number. Safety regulations are verified through random checks by the competent authority, *Turismo de Portugal*. Importantly, the license belongs to the individual, i.e., it expires when the property is sold. Moreover, the licence is free to acquire and hold. Therefore, one can own a property that is registered as short-term rental, while not actually renting it in any sharing platform, and retaining the licence for its positive option value. Moving back and forth between the residential rental market and the short-term one is costless.

The districts of Lisbon and Porto are responsible for 40% of the stock of 92 thousand short-term rental registries reached in 2019. Most of them are located in Lisbon, designated by the World Travel Awards as the world's leading city break in four consecutive years between 2017 and 2020. In 2019, Lisbon had 19,479 apartments registered as short-term rental properties, corresponding to almost 6% of the total dwellings.[9] The short-term rental boom coincided with a rapid increase in real estate prices, pricing out locals and pushing some of Lisbon's residents to the outskirts of the city.[10] Between 2017 and 2019, median rental prices grew 21.2% in Portugal, while Lisbon and Porto saw rents rising 23.9% and 31.9%, respectively. Moreover, as presented in Figure A1 in the Appendix, Lisbon's rental prices are well above the median of mainland Portugal.[11]

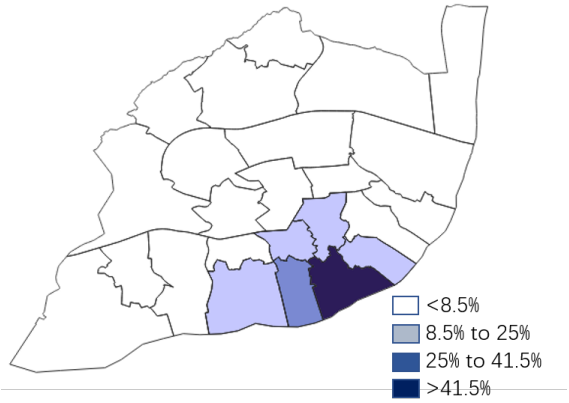
Short-term rental density is not homogeneous across the city, as can be seen on the city map in panel (a) of Figure 1, which depicts the city of Lisbon partitioned into its 24 civil parishes (*freguesias*), the lowest political unit in Portugal. The density of short-term rentals is the highest in historic downtown areas.

[9] See `https://travelbi.turismodeportugal.pt/pt-pt/Paginas/PowerBI/rnal-registo-nacional-de-alojamento-local.aspx`

[10] See `https://www.nytimes.com/2018/05/23/world/europe/lisbon-portugal-revival.html`

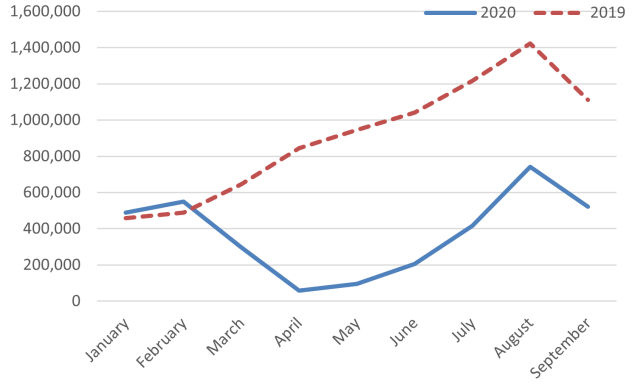
[11] During the same period, median sale prices in mainland Portugal grew 23.2%, 32.4% in Lisbon and 33.2% in Porto.

Figure 1: Short-term Rental Accomodations



(a) Density of Short-term Rental Accommodations

Source: RNAL



(b) Overnight Stays in Short-term Rental Accommodations in Portugal

Source: Statistics Portugal. This figure only includes short-term accommodations for more than 10 people.

In 2018, faced with the rising concerns over housing affordability, the municipality of Lisbon restricted new registries in areas with a ratio of short-term rentals to total property above 25%, named *Zonas Turísticas Homogénas*, which were then updated in 2019 to include additional neighborhoods (Proposal 204/CM/2019).[12] In 2019, Porto's municipality approved a similar legislation encompassing two civil parishes. We exploit these legislative changes in the identification strategy below (Edital NUD/260310/2019/CMP).

The first case of coronavirus in Portugal was reported on the 2nd of March, and, one week later, the WHO declared covid-19 as a pandemic. By the 18th of March, Portuguese authorities had declared the entire territory to be in a State of Emergency, imposing strict restrictions on the movement of people and closing schools and non-essential economic activities until May. As the number of new infections grew exponentially, and with countries adopting travel bans that restricted the inflow of foreigners, Portugal saw the number of foreign visitors decrease by 75%. The number of overnight stays in short-term rental accommodations also decreased considerably as can be seen in the panel (b) of Figure 1, where we contrast the number for 2019 (in red, dashed) and 2020 (in blue).

[12] These include *Baixa, Eixos Avenida da Liberdade, Avenida da República, Avenida Almirante Reis, Bairro Alto, Madragoa, Castelo, Alfama, Mouraria, Colina de Santana* (areas of absolute contention), and *Graça and Bairro das Colónias* (areas of relative contention).

In a survey conducted by ISCTE, a Lisbon-based university, between July and October, 40% of the 868 owners of short-term rentals report that revenues from renting these units represent over half of their income streams, and 17% were considering moving to the long-term rental market. Additionally, urban areas were the most affected by the covid-19 disruption of leisure activities, with Lisbon seeing revenue breaks of 93%, and Porto of 87%.[13] This disruption is also confirmed by Carvalho et al. (2020).

The Portuguese government has also implemented measures of financial relief to mitigate the economic fallout. Among these measures was the creation of a temporary moratorium on the repayments of capital and interest of rents, mortgages and commercial loans (at least) until September 2021. The suspension of residential and non-residential rental payments as well as of mortgage expenditures for households facing difficulties was approved in April and extended in the second semester (Decree-laws 4-C/2020 and 78-A/2020). This policy is likely to delay any impact of the crisis on the availability of housing units in the sale market.

3 Empirical Strategy

3.1 Data Sources

We combine data on short-term rental registries, rental prices and quantities, and sale prices and quantities. For simplicity, we refer to the residential rental market as "long-term", although we have no information on the duration of the contracts. Our unit of analysis is the civil parish, of which there are 24 in Lisbon and 7 in Porto. Civil parishes are fairly small units, with an average surface of 4.2 and 6 square kilometers, and 21 thousand and 31 thousand residents in 2019 in Lisbon and Porto, respectively.

The first administrative data source comes from the SIR platform, collected by *Confidencial Imobiliário* following a protocol established with the Municipalities of Lisbon and Porto. *Confidencial Imobiliário* is a Portuguese databank specialized in the real estate mar-

[13] See `https://expresso.pt/economia/2020-11-27-Covid-19.-Alojamento-local-com-quebras-de-faturacao-superiores-a-75-no-2.-trimestre` (in Portuguese)

ket whose data is used by private and public institutions such as the European Central Bank. This platform contains information on the prices observed in the rental and sale markets and allows one to break down prices of dwellings by zone and type of dwelling. We collected quarterly data on the number of apartments for rent and for sale, the average price, and the first and third quartile of the price distribution. The data covers the 31 civil parishes in Lisbon and Porto, between the third quarter of 2018 and the third quarter of 2020, i.e., it covers a total of 9 quarters. The data is disaggregated by type of dwelling, from one or less to three or more bedrooms.

For the short-term rental density per civil parish, we proceed as follows. We use the publicly available data on the National Short-Term Rental Registry (RNAL) to obtain the number of registered short-term rental properties in each civil parish in the fourth quarter of 2019, i.e., pre-treatment. In order to compute a measure of density, we need an estimate of the total number of dwellings per civil parish. The only parish level data on the number of dwellings is from census data, and the last available one is from 2011. We update it using yearly figures of construction and demolition of buildings in each civil parish, available from Statistics Portugal. Finally, we have to deal with the 2013 reorganization of civil parishes which, through a sequence of mergers and splits, transformed the city from its original map of 53 parishes into the current one with 24. We deal with the merged civil parishes by simply adding the dwellings.[14]

Finally, we collect a number of socio-economic and political indicators as pre-treatment characteristics from Marktest, a Portuguese subscription databank specialized in software development, research drafting and public data collection, and from publicly available data on the Lisbon's municipality website.

[14] For the one that was split (*Sta Maria dos Olivais*), we use the number of registered voters as a proxy for civil parishes' residents. We then apportion the number of dwellings in the original parish to the new, smaller ones, using the number of voters (Reorganização administrativa de Lisboa; Law 56/2012).

3.2 Methodology

We seek to test if civil parishes with a higher density of short-term rental properties are more hit by the pandemic than the remaining ones. In the rental market, this may happen via a supply side effect if the landlords relocate their properties to the long-term rental market. A potential demand side effect occurs if the residents seek to abandon the city centre because of changing preferences due to homeworking. In the real estate market, a supply side effect may occur if short-term rental landlords decide to sell their dwellings. As already discussed, it is unlikely that the crisis provoked by the pandemic will have effects on the real estate market through household defaults, given the moratorium policy. As regards demand side effects, there are several policy channels. The changing preferences argument that applies for the rental market applies to the sale one as well. On the other hand, the foregone expected profit from renting to tourists may decrease the demand for apartments.

We employ a difference-in-differences approach based on the exposure of each civil parish to short-term rentals to evaluate four outcome variables: *(i)* average rental price per square meter, *(ii)* average sale prices per square meter, *(iii)* number of dwellings available in the rental market and *(iv)* number of apartments for sale. Our baseline regressions only include civil parishes in Lisbon but we add civil parishes in Porto for robustness. We use two treatment definitions. The first assigns all the civil parishes that contain neighborhoods that are covered by the two (2018 and 2019) Lisbon bans and the 2019 Porto ban on new short-term rental licences to the treatment group. We also consider a continuous treatment alternative, where the treatment intensity is the density of short-term rentals in the last quarter of 2019. Panel (b) of Figure 1 displays a sharp drop in the number of tourists in March, coinciding with the onset of the pandemic in Portugal. Therefore, the treatment period begins in the first quarter of 2020.[15]

The main threat to our identification strategy is that the pandemic may affect the treated units differently than the control ones for reasons other than the short-term rental market.

[15] The first case in Europe was reported in France, on the 23rd of January.

For instance, it could be that the high-density parishes are also the ones that residents flee in face of the pandemic to less central or more rural areas where space constraints and congestion are less binding, as in the *donut effect* of Bloom and Ramani (2021). We circumvent this problem by instrumenting the density of short-term rentals with the density of museums in each civil parish. Additionally, quarter and civil parishes fixed effects are included in the regressions.

To construct the difference-in-differences estimator, the treated civil parishes are the *high short-term rental density* ones, and the comparison civil parishes are *low short-term rental density*. We assign civil parishes to the treatment group when they contain neighborhoods that are subject to the bans on short-term rental registries implemented in Lisbon and Porto in 2018 and 2019. Importantly, these restrictions were imposed at a smaller geographical scale than that of the civil parish (Gonçalves et al., 2020). We assume that a civil parish is treated if it contains at least one restricted area. Overall, this includes 7 civil parishes in Lisbon – *Misericórdia, Santa Maria Maior, Santo António, São Vicente, Arroios, Avenidas Novas* and *Estrela* – and 2 in Porto – *Bonfim* and *UF Centro Histórico do Porto*.

Two assumptions are necessary for inferring causality using difference-in-differences models: firstly, the absence of contemporary events that differently affected civil parishes with higher short-term rental density; secondly, the presence of parallel trends in the outcome variables prior the treatment period.

Regarding the former, it is safe to assume that there were no policies with differential impacts on civil parishes. Note that we rely on the large, world-wide, unexpected shock caused by the onset of the pandemic. Other contemporaneous events that potentially affect civil parishes differently would be second order in face of this large shock. Moreover, we are dealing with the very short-run effects: our analysis starts in the third quarter of 2018 and goes until the third quarter of 2020. In 2020, the municipal and the central governments have been occupied with policies to mitigate the effects of the pandemic. There were no urban or zoning policies implemented during this period that may have impacted civil parishes

differently.

We also provide a formal test of the parallel trends assumption. We carry out event study exercises to verify that, before the pandemic, the outcome variables followed parallel trends. As previously mentioned, the treatment period starts in the first quarter of 2020. Hence, the omitted quarter is the one immediately before. The event-study exercise is carried out using the following specification for civil parish p and quarter q:

$$\ln(y_{pq}) = \alpha_p \times \mathbb{1}_p + \lambda_q \times \mathbb{1}_q + \sum_{2018Q3 \leq q \leq 2019Q3} \delta_q \times hdens_p \times \mathbb{1}_q + \sum_{2020Q1 \leq q \leq 2020Q3} \delta_q \times hdens_p \times \mathbb{1}_q + \epsilon_{pq} \tag{1}$$

where y_{pq} is the outcome variable for civil parish p in quarter q, α_p and λ_q are civil parishes and quarter fixed effects, $\mathbb{1}_p$ and $\mathbb{1}_q$ are indicator variables of civil parish and quarter, and ϵ_{pq} is the error term. Finally, $hdens_p$ is the treatment indicator, i.e., it is equal to 1 for the civil parishes that contain areas that were covered by the bans on new short-term rental registries by the municipalities of Lisbon and Porto.

Our baseline difference-in-differences specification is given by the following equation:

$$\ln(y_{pq}) = \alpha_p \times \mathbb{1}_p + \lambda_q \times \mathbb{1}_q + \beta \, Post_q \times hdens_p + \epsilon_{pq} \tag{2}$$

where all variables are defined as in Equation (1) and $Post_q$ is equal to 1 in the treatment period, i.e., starting in the first quarter of 2020. The coefficient of interest, β, measures the differential impact of the pandemic on high versus low density areas, where high density areas are defined by the bans on short-term rentals implemented by the municipalities of Lisbon and Porto. The comparison group of civil parishes that do not include areas covered by the bans is not expected to suffer the effects of the pandemic on the short-term rental market.

We also implement an intensity of treatment specification, as follows:

$$\ln(y_{pq}) = \alpha_p \times \mathbb{1}_p + \lambda_q \times \mathbb{1}_q + \beta Post_q \times STRdensity_p + \epsilon_{pq} \tag{3}$$

where all variables are defined as in Equation (2) , and $STRdensity_p$ is equal to the density of short-term rentals, given by the ratio of short-term rental units to total number of dwellings in civil parish p in the last quarter of 2019. Thus, the coefficient β gives us an estimate of the impact of the pandemic when the intensity of treatment with short-term rental intensity increases by one per 100 dwellings.

On a last note, in all regressions, logarithms are used to ensure proper distribution of the dependent variable and standard errors are robust to account for heteroskedasticity.

Finally, we deal with concerns of endogenous intensity of treatment. As already discussed, the pandemic may drive housing prices in treated areas differently from comparison ones for reasons unrelated to the short-term rental market, if residents want to flee more central and congestioned areas. We address this issue with an instrumental variable approach. The instrument is computed as the number of museums per squared kilometer of each civil parish p, $museumdens_p$. Therefore, our IV analysis estimates the following equations:

$$STRdensity_p = \alpha_p \times \mathbb{1}_p + \lambda_q \times \mathbb{1}_q + \beta_1 museumdens_p + \epsilon_{pq} \tag{4}$$

$$\ln(y_{pq}) = \alpha_p \times \mathbb{1}_p + \lambda_q \times \mathbb{1}_q + \beta_1 Post_q \times \widehat{STRdensity}_p + \epsilon_{pq} \tag{5}$$

where all variables are defined as in Equation (2). Instrument validity relies the exclusion restriction, i.e., the density of museums can only affect the housing market through the impact on short-term rentals and not through a direct impact. This assumption would be challenged if residents are also attracted by the presence of museums in the surroundings of

their residence. We provide two arguments to sustain the validity of our instrument.

The first is based on survey data from Statistics Portugal. There are 64 museums in Lisbon in the period covered by our analysis. All of them were built well before our sample period, with just 4 inaugurated between 2013 and 2016. Data from Statistics Portugal shows that, in 2019, 53.6% of resident adults had not visited any museum during the previous year and that 52.3% of museums' visitors were foreigners.[16] Hence, it is unlikely that proximity to museums is an important factor when deciding residential location.[17]

The second is a more formal exercise, reminiscent of Garcia-López et al. (2019), and it consists in a Placebo event study where we compare the parishes with the highest museum density with the remaining ones to show that there were no differences in trends for sale prices before 2014, i.e., before the onset of the short-term rental market in Lisbon. It is shown in Figure A3 in the Appendix. Due to data availability, we use yearly data from 2009 to 2014 to compare the seven civil parishes with high density museums *vis-à-vis* the remaining areas in Lisbon. We do not find any difference in real estate prices for the two groups, both before and after 2012. This constitutes strong evidence that museum density does not predict different trajectories in sale prices in the period before short-term rentals.

3.3 Descriptive Statistics

Before proceeding to the regression results, the trends for the four outcome variables are presented in Figure A2 in the Appendix, where pre- and post-treatment periods are separated by the grey vertical line. In panels (a) and (b), one can immediately see a decrease in rental prices, especially in the second quarter of 2020, together with a spike in the number of apartments for rental in the long-term rental market. Panels (c) and (d) suggest a price decrease and quantity increase of much smaller magnitude in the sales market.

In Table 1, we report descriptive statistics of all the variables used in the the event studies, baseline regressions, and instrumental variable specification, that focus on the city

[16] Source: Inquérito à Educação e Formação de Adultos (IEFA).

[17] Results are robust when using the density of monuments as an instrument and are available upon request.

of Lisbon.[18]

Table A1 in the Appendix presents comparative statistics of the treatment and control groups in terms of several characteristics, namely: real estate, rental, and short-term rental markets, political preferences, socioeconomic and demographic characteristics, and amenities. Naturally, the short-term rental density differs between the two groups. The rental and sale markets also differ, both in terms of prices and quantities, with higher prices and more transactions and rentals in the treated parishes.[19] The other significant difference is the number of monuments and museums, i.e., tourist amenities, which we exploit in our instrumental variable strategy. In terms of political variables, the two groups are similar, safe for a small difference of four percentage points in the vote for the incumbent party of the mayor. Importantly, the population density and the share of highly educated residents are not statistically different across the two groups. Neither are proxies of economic activity such as the number of retailers and bank agencies. Moreover, bear in mind that all our regressions include civil-parish fixed effects which control for time invariant, unobserved factors.

[18] We only use Porto in some robustness specifications, which is why the data for Porto is not included in Table 1.

[19] The parallel trends assumption tested with the event study regressions defined in Equation (1) tests for pre-shock parallel growth rates, not levels.

Table 1: Descriptive Statistics on Sample Characteristics (for Lisbon)

	N	Mean	Stand Dev	Min	Max
Number of Civil Parishes	24	-	-	-	-
% Alignment	212	0.484	(0.064)	0.330	0.622
% Turnout	212	0.532	(0.045)	0.434	0.626
A.Rental Market					
Average Rental Price (€/m2)	212	13.31	(2.532)	5.2	19.2
Number of Apartments for Rental	216	70	(45.617)	9	204
B.Sales Market					
Average Sale Price (€/m2)	213	3640.59	(907.02)	1733	6368
Number of Apartments for Sale	216	373	(224.58)	58	910
C.Short-Term Rentals					
Density of Short-term Rental Accommodations	24	0.071	(0.111)	0.001	0.440
D. Museums					
Density of Museums	24	0.872	(1.312)	0	5.648

Notes: The upper panel refers to characteristics of political variables from the 2013 and 2017 elections, where % Alignment is the share of voters that voted on the Mayor's party and % Turnout is the percentage of people that did not vote, given by 1 minus the turnout rate. % Higher Education is the percentage of residents who have a higher educational degree. Panel *A. Rental Market* and Panel *B. Sale Market* present descriptive statistics for selected variables on the rental and housing markets, respectively, while panel *C. Short-term rentals* describes statistics for the data set from RNAL with information on short-term rental registries in Lisbon in 2019. Finally, Panel *D. Museums* shows statistics for Lisbon's museums in 2017.

4 Results

The main results of our empirical approach are presented in this section. Additionally, we exploit possible heterogeneous effects across samples.

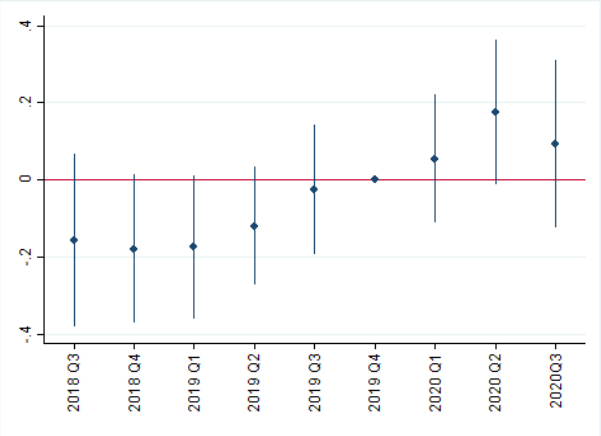
4.1 Rental Market

The first set of results assesses the impact of the Covid-19 pandemic on median rental prices per square meter and quantities for rental in each civil parish.

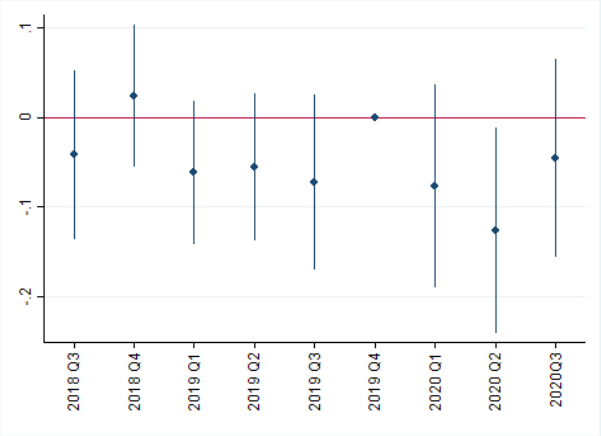
To verify the parallel trends assumption, we conduct event studies for Lisbon's civil parishes. Figure 2 plots the values of the binary coefficient $Post_q \times hdens_p$ and highlights that both rental prices in panel (a) and quantities in panel (b) followed parallel trends before the treatment. Moreover, in the third quarter of 2020, rental prices plummeted in high density civil parishes, although the spike in the number of apartments for rental is shortly below 20% but marginally not significant at the 5% level in the second quarter of 2020.

Figure 2: Event Studies

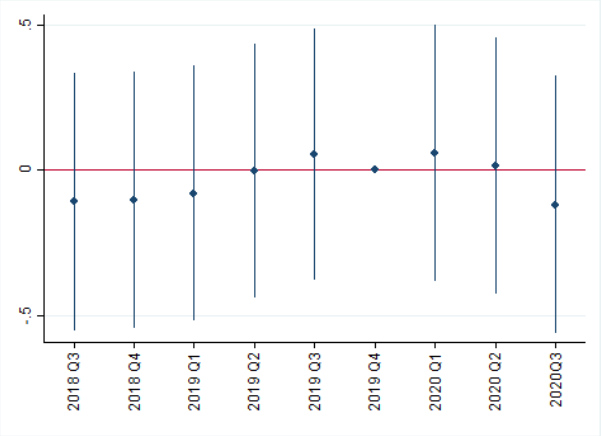
(a) ln(Rental Prices)



(b) ln(Quantities for Rental)



(c) ln(Sale Prices)



(d) ln(Quantities for Sale)

Notes: In Panel (a) N=216, in Panel (b) N=212, in panel (c) N=213 and in panel (d) N=212. The comparison group consists of the 17 low short-term rental density civil parishes. The regression includes quarter and civil parishes fixed effects. The treatment period starts in 2020Q1. 95% confidence intervals.

Table 2 shows estimates of Equation (2), Equation (3), and the Difference-in-differences instrumental variable specification spelled out in (4) and (5). For the sake of space, the first-stage regressions are reported in the Appendix Table A2.

Columns 1 to 5 show the results for the rental price. In column 1, the coefficient of $Post_q \times hdens_p$ indicates that rental prices in Lisbon's civil parishes included in suspension areas fell around 3.5% *vis-à-vis* the remaining civil parishes. This result is not robust when including Porto's civil parishes in Column 4. Column 2 reports the intensity of treatment coefficient. In order to compare it to the binary treatment one, we compute the average

treatment effect as follows: given that average short-term rental density in treated (resp., comparison) areas is 19% (resp., 2%), as indicated in Table A1, column 2 suggests that rental prices in Lisbon decreased 3.6% ($-0.214 \times (0.19 - 0.02)$) after the pandemic. This result is in line with the one obtained for the binary treatment. It is robust to the inclusion of Porto's civil parishes (in Column 5), although smaller in magnitude in this case. The instrumental variable estimate, presented in Column 3, is similar to the OLS one, although of a slightly higher magnitude (4.1% applied to the sample means). This a fairly sizeable result, recalling that the average rental price fall in Lisbon was 11.1%. The differential impact in treated areas, i.e., those with a high density of short-term rentals, represents more than one third of the overall impact.

We now turn to columns 6 to 10, i.e., the results on the quantity of dwellings for rental. The results show a consistent increase in the number of apartments available for rental in the traditional rental market, which ranges from a magnitude of 19.4% in the continuous treatment specification ($1.141 \times (19\% - 2\%)$) to 21.7% in the binary treatment one. The IV estimate lies between the two. Including Porto decreases the magnitude of the effect in the binary treatment case and increases it in the continuous treatment one, albeit slightly, and it does not change the significance.

Table 2: Difference in Differences - Rental Market

	Average Rental Prices					Quantities for Rental				
	Lisbon			+Porto		Lisbon			+Porto	
	DiD (1)	DiD (2)	DiD-IV (3)	DiD (4)	DiD (5)	DiD (6)	DiD (7)	DiD-IV (8)	DiD (9)	DiD (10)
$Post \cdot hdens$	-0.035*			-0.013		0.217***			0.186***	
	(0.020)			(0.021)		(0.048)			(0.056)	
$Post \cdot STRDensity$		-0.214**	-0.239**		-0.169*		1.141***	1.222***		1.175***
		(0.090)	(0.101)		(0.089)		(0.164)	(0.173)		(0.178)
Civil Parish FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	212	212	212	266	266	216	216	216	279	279
R-squared	0.780	0.783	0.783	0.864	0.866	0.962	0.965	0.965	0.948	0.951
KP 1st Stage F-stat			461.84					460.36		

Notes: The treated areas are *Avenidas Novas, Arroios, Estrela,Misericórdia, Santa Maria Maior, Santo António, São Vicente*, as well as *Bonfim and UF Centro Histórico do Porto* when including Porto's civil parishes in the regressions. Robust standard errors are depicted in parenthesis. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01. For more information on the DID-IV regressions see Table A2 in the Appendix.

To verify the existence of heterogenous effects, we re-estimate the difference-in-differences model for subsamples of dwellings according to their respective number of rooms. These regressions are estimated with a lower number of observations, because the data is censored when the number of observations in a triplet (dwelling type, civil parish, quarter) is below three. Therefore, one has to be cautious when interpreting the following results, which can be seen in Table A3 and Table A4 in the Appendix. The binary treatment specification suggests that the price effect was stronger and significant for two-room apartments (-6.2%). This is consistent with the findings by Gonçalves et al. (2020) who also show that these are the most attractive dwellings to be used as short-term rental properties. With the intensity of treatment specification, the effect is similar for three bedroom apartments. These effects are robust to the inclusion of Porto's parishes.

Turning to quantities, we find a higher increase in the smaller, one-bedroom apartments in treated areas *vis-à-vis* the comparison ones, consistent with the negative, albeit non-significant, price effect. We also find a positive impact on sales of two-bedroom apartments, which is significant in the intensity of treatment specification. There is no effect on bigger apartments.

All in all, our results lend strong support for a sizeable impact of the pandemic on the rental market of the most touristic areas of Lisbon. There is a strong supply side effect, with landlords relocating their properties to the long-term rental market. The pandemic has created incentives to dislodge apartments to traditional rental markets, curbing trends of rising rental prices. This is consistent with fact that it is costless for property owners to relocate their property to the long-term rental market, since the licence one obtains when registering an apartment in a peer-to-peer platform can be kept for free. As regards the demand side, the price decrease is consistent both with an increase or a decrease in the demand for long-term rental contracts. Our results reinforce the existing evidence about the impact of short-term rentals on the rental market for long-term residents.

4.2 Sales Market

In this section, we perform the same regressions as in Section 4.1 to evaluate the impact of the pandemic on the sales market. From the event study plots presented in Figure 2, we confirm that civil parishes were on the same trends for both sale prices (in panel c) and quantities (in panel d) before the pandemic, and we find a significant reduction in prices for 2020 Q2. For quantities, the market remains quite stable, at least in the short-run.

We now turn to the results of the regressions Equation (2), Equation (3), and the instrumental variable specification in (4) and (5) applied to house transactions. They are shown in Table 3.

Columns 1 to 5 present the results for prices. We find a statistically significant decrease in transaction prices in treated parishes *vis à vis* the comparison ones of 4.8%. The intensity of treatment applied to sample average yields a higher negative impact of 6.1% ($-0,356 \times (19\% - 2\%)$), and the IV estimate is even higher (7.6%), consistent with the result for rents. When we include Porto, the coefficients remain negative and statistically significant, with a stronger and more precise magnitude of the effect.

Turning to quantities, in columns 6 to 10, we find no statistically significant effects, except in the continuous treatment case when we include Porto civil parishes, albeit this result is only significant at the 10% level.

Table 3: Difference-in-Differences - Sales Market

	Average Sale Prices					Quantities for Sale				
	Lisbon			+Porto		Lisbon			+Porto	
	DiD (1)	DiD (2)	DiD-IV (3)	DiD (4)	DiD (5)	DiD (6)	DiD (7)	DiD-IV (8)	DiD (9)	DiD (10)
Post · hdens	-0.048*			-0.082***		0.024			-0.009	
	(0.0288)			(0.0247)		(0.0514)			(0.0500)	
Post · STRDensity		-0.356**	-0.444***		-0.432***		-0.123	-0.253		-0.292*
		(0.145)	(0.121)		(0.131)		(0.171)	(0.174)		(0.175)
Civil Parish FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	213	213	213	276	276	216	216	216	279	279
R-squared	0.925	0.928	0.928	0.948	0.949	0.935	0.935	0.935	0.922	0.923
KP 1st Stage F-stat			467.71					460.36		

Notes: The treated areas are *Avenidas Novas, Arroios, Estrela,Misericórdia, Santa Maria Maior, Santo António, São Vicente*, as well as *Bonfim and UF Centro Histórico do Porto* when including Porto's civil parishes in the regressions. Robust standard errors are depicted in parenthesis. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01. For more information on the DID-IV regressions see Table A5 in the Appendix.

We now report the heterogeneous effects, presented in Table A6 and Table A7 in the Appendix. The pricing effects are concentrated in two- and three-bedroom apartments. Regarding quantities for sale, we find modest evidence for increased sales of the same types of dwellings, with low statistical significance and not robust across specifications.

Despite a decrease in sale prices, the magnitude of changes in quantities for sale is low, suggesting that the sales market was less affected by the pandemic than the rental market.

This is consistent with a slight decrease in demand and no change in supply of houses for sale. Low interest rates and moratoriums have brought some financial relief and allowed property owners to hold on to their dwellings, which may explain the non-existent spike in units for sale.[20] Moreover, as we are estimating short run effects, the low magnitude of outcomes in the sale market is not surprising. These results reinforce the hypothesis that the most significant changes occurred in the rental market, due to a reallocation of dwellings back to the traditional and more long-term market. Data from RNAL reports listings in Lisbon fell from 19477 to 19356[21] , however, as hosts can keep the short-term licence while in the

[20] According to Bank of Portugal, interest rates on mortgage payments were 0.87% in October, a year on year fall of 0.15%, and there were 751725 moratoriums granted by the end of September, of which 42% were related to credit from housing contracts.

[21] See `https://travelbi.turismodeportugal.pt/pt-pt/Paginas/PowerBI/rnal-registo-nacional-de-alojamento-local.aspx`

long-term rental market, these values underestimate the full extent of housing reallocation.

5 Conclusions

In this paper, we analyze the effect of the sudden and large shock on the inflow of tourists caused by the unexpected onset of the SARS-CoV-2 pandemic in the city of Lisbon, the capital of Portugal. This is a natural setup to analyze the question for several reasons. Firstly, according to the OECD, in 2018, Portugal ranked first in terms of the contribution of tourism to the country's economy. Secondly, the tourism shock was overwhelming: the number of overnight stays went down to its 1993 level, mostly driven by a 75% contraction in the stays of foreign tourists when compared to 2019. Thirdly, Portugal, and Lisbon in particular, witnessed a rapid tourism boom, accompanied by a three-fold growth in short-term rental overnight stays, in the six years prior to the pandemic.

Our empirical strategy exploits the sudden and sharp decrease in tourism caused by the pandemic. We provide an estimate of the impact of the covid-19 crisis on the housing market in a capital city with high density of short-term rental properties. We thus have a natural identification strategy to obtain causal estimates of the impact of the short-term rental market on the rental and sale markets in a country capital very demanded by tourists. We use the pre-pandemic intensity of short-term rentals in different civil parishes as a measure of the intensity of the shock caused by the exogenous variation in the demand for short-term rentals.

Using difference-in-differences based on both binary treatment and treatment intensity, and complementing the analysis with an instrumental variable strategy, our empirical specification provides causal evidence of the effect of the pandemic on the rental market, particularly through its consequences on short-term rental units.

We use data on rents and transactions for the 24 civil parishes of the city of Lisbon between the third quarter of 2018 and the third quarter of 2020. We sometimes rely on comparable data for the 7 civil parishes of Porto, the second largest city in the country,

for robustness estimates. We use three difference-in-differences specifications. The first is a binary treatment where civil parishes are assigned to the treatment group when they contain areas that were subject to bans on new registries imposed by the municipalities of Lisbon and Porto in 2018 and 2019. The second uses the share of short term rental properties in the total number of dwellings in each civil parish as a measure of the intensity of treatment. Finally, we use the density of museums in each parish to instrument the intensity of short-term rental dwellings. Our main results are as follows. We find a consistent and sizeable impact on the rental market in Lisbon's most touristic areas. Rents decrease by 4.1% more in treated areas *vis-à-vis* comparison ones. We also document an increase of around 20% in the number of houses in the long-term rental market. This is convincing evidence that landlords reallocated their dwellings to the long-term rental market, which they can do at no cost given the Portuguese institutional setup. Regarding properties for sale, we find no statistical significant impact on the quantity of dwellings being offered in the market. Prices decrease between 4.8% and 7.6%, depending on the specifications. This is consistent with a demand side effect, with a shift in the demand for housing, possibly due to the loss in the potential income stream due to the shrinking tourism market.

The almost sudden stop of tourists creates heterogeneous wealth effects depending on one's position in the housing market. It is good news for tenants, particularly if the market is flexible enough to allow incumbents to change to new contracts. It also improves the housing affordability non-incumbent house owners. However, it represents a negative shock for incumbent house owners. One should bear in mind that we provide a very short-term analysis, just three quarters into the shock, and we do not observe important components of the rental contracts such as their duration. It may well happen that landlords are negotiating not too long contracts with tenants in the hope of reallocating the unit to the short-term market if and when tourists come back. This is an interesting avenue for future research.

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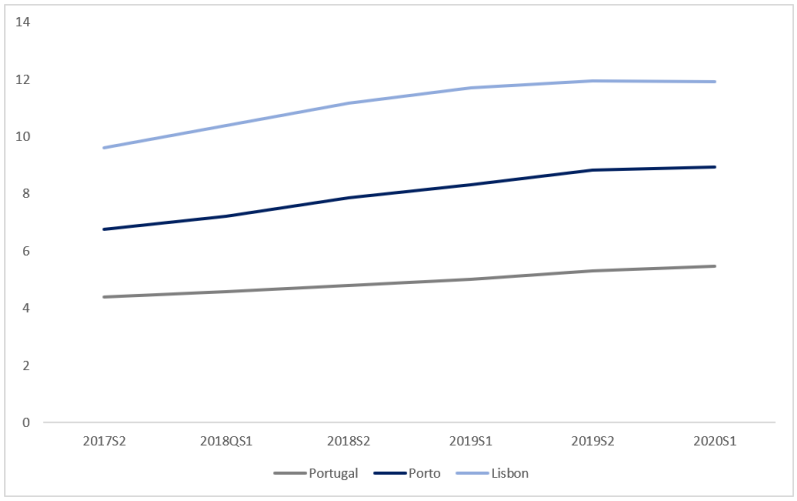
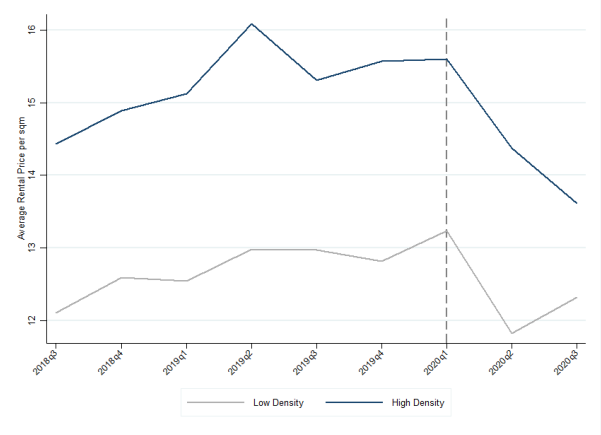
A Figures

Figure A1: Median Rental Price (€) per Square Meter

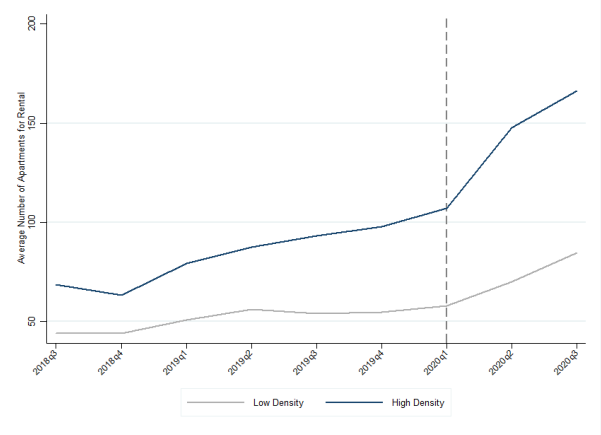


Source: National Statistics Institute

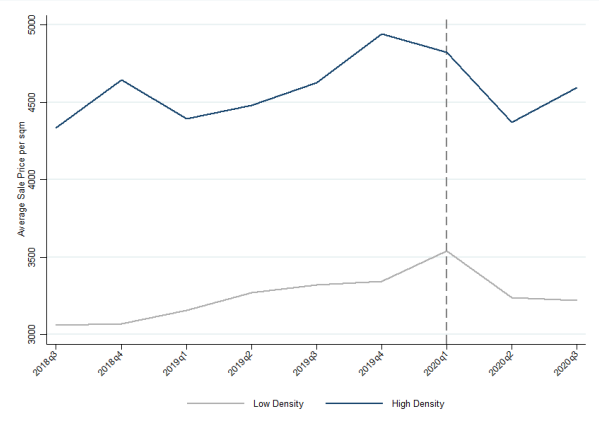
Figure A2: Trends for Outcome Variables



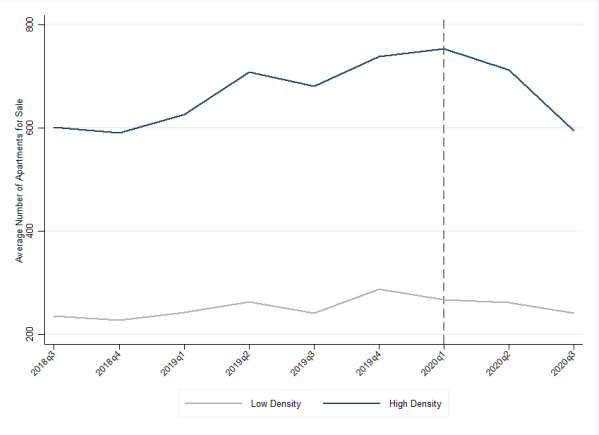
(a) Rental Prices



(b) Quantities for Rental



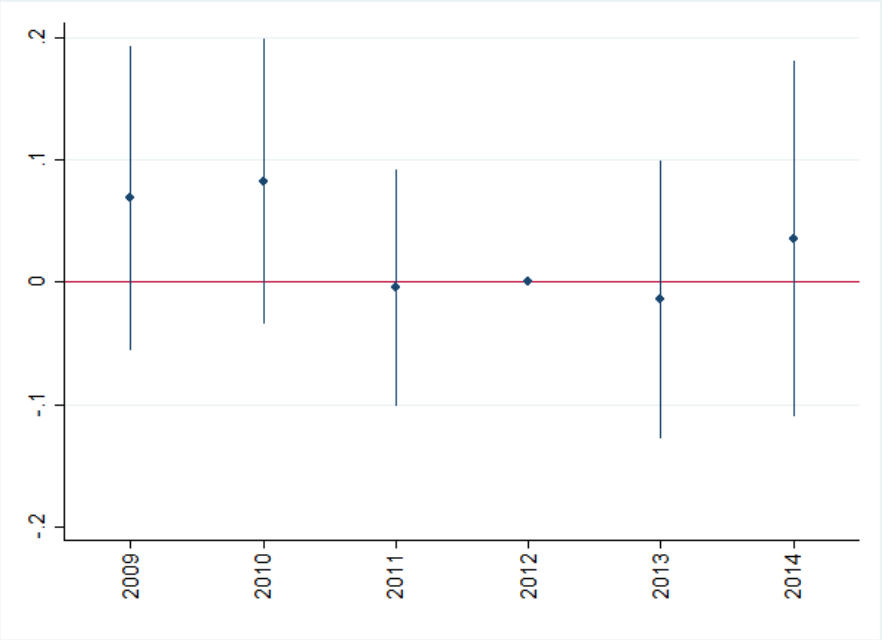
(c) Sale Prices



(d) Quantities for Sale

N= 212. High Density: *Avenidas Novas, Arroios, Estrela, Misericórdia, Santa Maria Maior, Santo António, São Vicente.*

Figure A3: Event study for the Density of Museums



Notes: N= 144. The treatment group consists of the 7 civil parishes with the highest density of museums - *Alcântara, Avenidas Novas, Estrela, Misericórdia, Santa Maria Maior, Santo António, and S.Vicente*. The regression includes year and civil parishes fixed effects. The "placebo" treatment period starts in 2013. We remove from this sample the two museums built after 2014. 95% confidence intervals computed with standard errors clustered by civil parish.

B Tables

Table A1: Balance Tests

	Pre-Treatment		
	High Density	Low Density	Difference
Number of Civil Parishes	7	17	-
% Alignment	0.46	0.50	-0.04**
			(0.017)
% Turnout	0.55	0.53	0.02
			(0.012)
% Higher Education	0.04	0.05	-0.01
			(0.01)
Population Density (Nº/km2)	7476.612	6231.389	1245.223
			(1493.976)
A.Rental Market			
Average Rental Price (€/m2)	15.24	12.66	2.576***
			(0.500)
Number of Apartments for Rental (per civil parish)	82	51	31**
			(13.380)
B.Sales Market			
Average Sale Price (€/m2)	4570.93	3202.44	1368.49***
			(305.353)
Number of Apartments for Sale (per civil parish)	658	250	408***
			(50.495)
C.Short-term Rentals			
Density of Short-term Rental Accommodations	0.19	0.02	0.176***
			(0.05)
D.Amenities			
Monuments	6	1	5**
			(2.184)
Museums	5	1	4*
			(1.919)
Prémio Valmor	14	10	4
			(4.836)
Retailers	9	8	1
			(3.101)
Banks	33	18	15
			(11.739)

Notes: The control group is composed by civil parishes in low density areas. % High Education is the percentage of citizens with higher education as given in the 2011 Census. *Retailers* includes stores as given by the law nº12/2004, such as supermarkets. *Prémio Valmor* is a Portuguese architectural award granted to buildings.

Table A2: Instrumental Variables Estimates - Rental Market

	Average Rental Prices		Quantities for Rental	
	First Stage	Second Stage	First Stage	Second Stage
museum dens	0.0751***		0.0749***	
	(0.00351)		(0.00351)	
$Post \cdot STRDensity$		-0.239**		1.222***
		(0.101)		(0.173)
Civil Parish FE	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES
Observations	212	212	216	216
R-squared	0.894	0.783	0.892	0.965
KP 1st Stage F-Stat	461.84		460.36	

Notes: Treated and control groups are defined as for the difference-in-differences specifications before. Robust standard errors are depicted in parenthesis. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A3: Heterogeneous Effects - ln(Rental Prices)

	Lisbon						+Porto					
	1 Room or Less		2 Rooms		3 Rooms		1 Room or Less		2 Rooms		3 Rooms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Posthdens	-0.0411		-0.0617**		-0.0137		-0.0259		-0.0668**		-0.0150	
	(0.0328)		(0.0304)		(0.0534)		(0.0346)		(0.0310)		(0.0509)	
$Post \cdot STRDensity$		-0.216		-0.369**		-0.437*		-0.216		-0.357**		-0.415*
		(0.174)		(0.176)		(0.197)		(0.172)		(0.169)		(0.206)
Civil Parish FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	142	142	163	163	86	86	174	174	189	189	95	95
R-squared	0.592	0.594	0.741	0.748	0.747	0.766	0.794	0.796	0.836	0.838	0.851	0.779

Notes: Treated and control groups are defined as for the difference-in-differences specifications before. Robust standard errors are depicted in parenthesis. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A4: Heterogeneous Effects - ln(Quantities for Rental)

	Lisbon						+Porto					
	1 Room or Less		2 Rooms		3 Rooms		1 Room or Less		2 Rooms		3 Rooms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Post \cdot hdens$	0.221**		0.043		0.056		0.228**		0.015		0.0306	
	(0.013)		(0.0777)		(0.09)		(0.085)		(0.0747)		(0.0924)	
$Post \cdot STRDensity$		1.344***		0.885***		0.0281		1.452***		0.684**		0.331
		(0.365)		(0.224)		(0.365)		(0.336)		(0.266)		(0.362)
Civil Parish FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	142	142	163	163	86	86	174	174	189	189	95	95
R-squared	0.874	0.870	0.888	0.894	0.891	0.891	0.885	0.878	0.901	0.903	0.896	0.896

Notes: Treated and control groups are defined as for the baseline difference-in-differences specifications before. Robust standard errors are depicted in parenthesis. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A5: Instrumental Variables Estimates - Sales Market

	Average Sale Prices		Quantities for Sale	
	First Stage	Second Stage	First Stage	Second Stage
museum dens	0.0756***		0.0749***	
	(0.00351)		(0.00351)	
$Post \cdot STRDensity$		-0.444***		-0.253
		(0.121)		(0.174)
Civil Parish FE	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES
Observations	213	213	216	216
R-squared	0.897	0.928	0.892	0.935
KP 1st Stage F-Stat	467.71		460.36	

Notes: Treatment and control groups are defined as in the difference-in-differences specifications. Robust standard errors are depicted in parenthesis. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A6: Heterogeneous Effects - ln(Sale Prices)

	Lisbon						+Porto					
	1 Room or Less		2 Rooms		3 Rooms		1 Room or Less		2 Rooms		3 Rooms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Post \cdot hdens$	-0.0160		-0.0905**		-0.111**		-0.00723		-0.104***		-0.137***	
	(0.0465)		(0.0514)		(0.0461)		(0.0436)		(0.0399)		(0.05)	
$Post \cdot STRDensity$		-0.236		-0.622***		-0.853***		-0.167		-0.684***		-0.968***
		(0.221)		(0.182)		(0.202)		(0.203)		(0.170)		(0.197)
Civil Parish FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations Observations	125	125	173	173	132	132	156	156	213	213	168	168
R-squared	0.860	0.863	0.872	0.883	0.882	0.892	0.900	0.901	0.924	0.929	0.923	0.928

Notes: Treated and control groups are defined as for the difference-in-differences specifications before. Robust standard errors are depicted in parenthesis. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A7: Heterogeneous Effects - ln(Quantities for Sale)

	Lisbon						+Porto					
	1 Room or Less		2 Rooms		3 Rooms		1 Room or Less		2 Rooms		3 Rooms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Post \cdot hdens$	-0.022		0.159*		0.208*		-0.011		0.101		0.060	
	(0.0946)		(0.081)		(0.092)		(0.086)		(0.082)		(0.096)	
$Post \cdot STRDensity$		-0.329		0.315		0.433		-0.418		0.023**		-0.0847
		(0.266)		(0.243)		(0.249)		(0.265)		(0.210)		(0.403)
Civil Parish FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	125	125	173	173	132	132	156	156	213	213	168	168
R-squared	0.948	0.930	0.888	0.892	0.830	0.864	0.955	0.955	0.872	0.871	0.828	0.828

Notes: Treated and control groups are defined as for the baseline difference-in-differences specifications before. Robust standard errors are depicted in parenthesis. Significance Levels: * p < 0.10, ** p < 0.05, *** p < 0.01.