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The COVID-19 Pandemic, Airbnb and Housing Market Dynamics in Warsaw

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Abstract: *In this study, we analyse the impact of COVID-19 on house rents and prices in Warsaw, the capital of Poland. Hedonic indexes indicate a slight increase in prices (ca. 1.2%) and a substantial drop in long-term rents (ca. -7.7%) between March 2020 and December 2020. The largest decline in rents occurred in centrally located neighbourhoods, which was largely due to the inflow of new housing supply from the short-term rental market (the Airbnb Warsaw market shrank by almost 30% in December 2020 y/y). Using hedonic methods, we show the effect of the shrinking Airbnb market on the drop in long-term rents. The study indicates the elasticity of rents with respect to Airbnb supply, with a 1% change in Airbnb listings leading to a 0.031% change in rents.*

Keywords: housing market; Airbnb; COVID-19.

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Introduction

The economic impact of the COVID-19 pandemic has been widely discussed in popular and social media; however, it has not been comprehensively investigated in the economic literature. In general, we hypothesised that the COVID-19 pandemic has a significant and negative impact on house rents due to a decrease in demand (higher unemployment rate, labour market uncertainty, lack of students) and an increase in supply (inflows from the short-term rental sector). The effect of the COVID-19 pandemic on house prices is not clear from the economic perspective for several reasons—both market and policy-related. Some factors may have a negative impact on house prices (decreased rental incomes, economic uncertainty), whereas others suggest the reverse effect (drop in interest rates). House prices tend to be sticky in the down-market as owners are reluctant to sell. Overall, the exact short-term net impact of the COVID-19 pandemic is yet to be thoroughly evaluated. To the best of our knowledge, this study is one of the first attempts to examine the relationship between Airbnb and long-term rent responses to the COVID-19 pandemic.

Literature review

Due to data limitations, few papers evaluate the consequences of pandemics on the housing market. An Italian study suggests that COVID-19 has had a significant impact on housing prices. Authors predict a 4–6% short-run price decrease from 2020 to 2021 (Del Giudice, De Paola and Del Giudice 2020). Early results from Marona and Tomal (2020) show several demand-side adjustments that have occurred due to COVID-19 in Poland. The linkages between pandemics, credit risk, and policies and mortgage lending have been discussed through the example of the Chinese housing market (Su, Cai, Qin, Tao and Umar 2021). Another recent study evaluated the links between monetary policy and house prices in 31 countries in the post-Covid era (Apergis 2021). The impact of COVID-19 on house prices has been reported in two recent studies. Using a quasi-experimental approach Qian, Qiu and Zhang (2021) found that house prices in China decreased by 2.5% in communities with confirmed COVID-19 cases. An Australian study indicates that the number of confirmed Covid-19 cases had a significant impact on housing returns. Housing returns were not affected by policy interventions (lockdown orders) (Hu, Lee and Zou 2021). Concerning the impact of the Covid-19 pandemic on long-term residential rental rates, researches that have been conducted indicate both no significant changes (Kadi, Schneider and Seidl 2020) but also sharp declines (Tomal and Marona 2021).

Many studies suggest that there is a substitution effect between short-term rental (for example, Airbnb) and the housing rental market (Benítez-Aurioles and Tussyadiah 2020). A US-based study revealed that Airbnb listings increase significantly with rents and house prices (Barron, Kung and Proserpio 2018). Other studies, conducted in Boston (Horn and Merante 2017), New York (Wachsmuth and Weisler 2018), San Francisco and Los Angeles (Lee 2016), confirmed also this connection between Airbnb and rents. The impact of short-term rental on housing rents and prices has been demonstrated based on empirical data from popular tourist destinations outside the US—Barcelona (Garcia-López, Jofre-Monseny, Martínez-Mazza and Segú 2020) and Taiwan (Chang 2020). The opposite effect should manifest when a share of short-term rental apartments increases the supply of rental housing. We investigated this effect using hedonic price models.

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Data and method

Data

In Poland, there are no official monthly statistics on housing prices and rents. The information on transactions in the Land Registry is delayed by around 6–8 months, rendering it impossible to pinpoint up-to-date changes in the Warsaw housing market. Moreover, rental agreements are confidential, and there is no available official information on actual rents that can be used in empirical research. Considering these limitations, we decided to use offers, which may be an adequate substitute when transaction data are not available (Anenberg and Laufer 2017; Lyons 2019). Despite potential caveats, using offer information allows us to obtain up-to-date results.

The data on asking prices (167,875 observations) and asking rents (112,963 observations) were collected for the purpose of our research from advertising portals every month from January 2017 to December 2020. A more detailed description of the dataset formation can be found in Trojanek (2021). The information on Airbnb was purchased from the AirDNA company (information on the monthly performance of 56,283 active apartments).

Method

The research strategy consists of the following steps. To estimate the indexes and elasticity of rents to Airbnb supply, we used the quantile regression proposed by Koenker and Bassett (Koenker and Bassett 1978), whereby it is possible to assess the various quantile functions of the conditional variable distribution. We decided to use symmetric (quantile 0.5) and asymmetric (quantiles 0.25 and 0.75) weighting. Monthly housing price and rent indexes in 2017–2020 were estimated using the time-dummy hedonic method with following the equation:

$$lnP = \beta_0 + \sum_{j=1}^{K} \beta_j C_j + \sum_{i=2}^{t} \gamma_i D_i + \varepsilon$$

where D_i is a zero-one time variable and C_j denotes the apartment's characteristics. To control for changes in the structure and quality of apartments for sale/rent in monthly periods and thereby determine the dynamics, we used information on the location (district), size, and age of apartments (set of variables $\boldsymbol{C}_j$).

The hedonic model (Lancaster 1966; Rosen 1974) was used to investigate the influence of Airbnb supply on long-term rents. The research was conducted for three periods: 2017–2020, before the lockdown (2017 to March 2020) and after (April 2020–December 2020). A regression analysis of the apartment's rent was conducted on a set of independent variables. We controlled for size, age, quality of the apartment, distance variables, time dummies, and Airbnb supply (monthly number of active apartments in the district). The Airbnb market is centralised in Warsaw; 90% of apartments are located in 7 districts, with 70% in Srodmiescie and Wola. These neighbourhoods were the basis for further investigation.

As a robustness check, to explore the phenomenon even further, we applied spatial econometrics. The plausible hypothesis was that rent dynamics differed significantly over space; thus, we investigated rent changes with a multiscale geographically weighted regression

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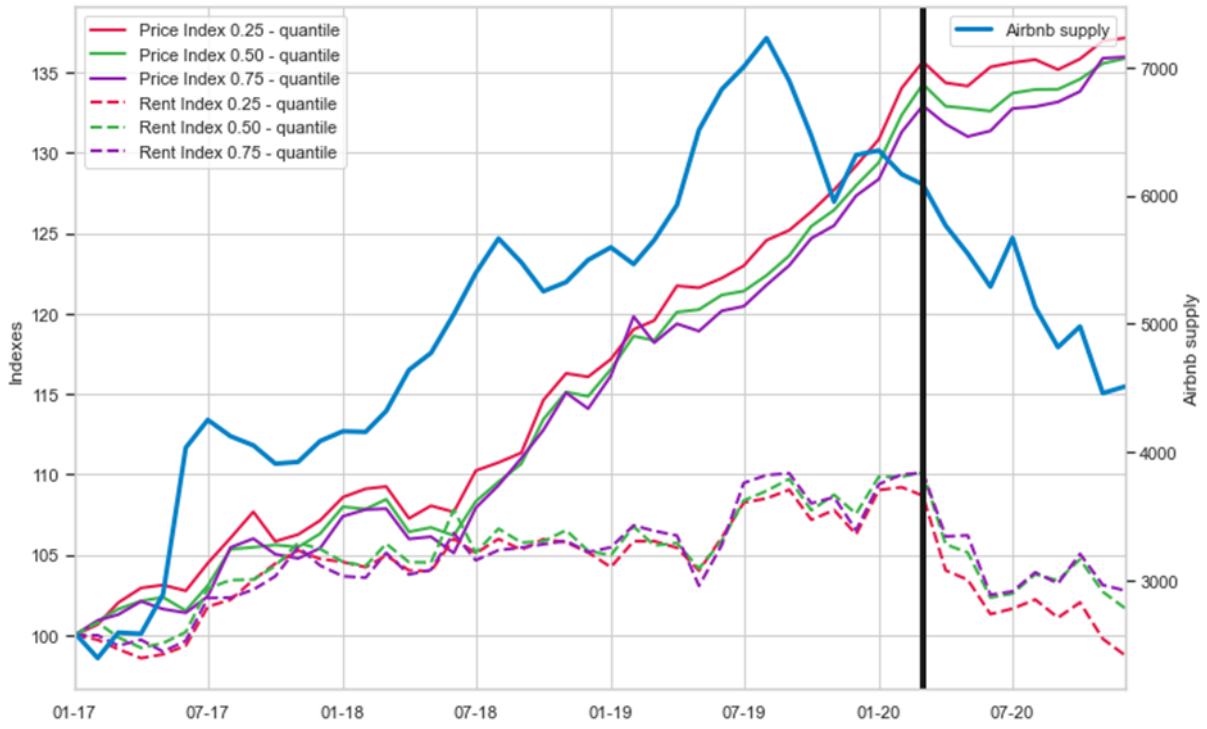
(MGWR) model (Fotheringham, Yang and Kang 2017). Based on the data from June 2019 to December 2020, we investigated the spatial distribution of rent changes, dividing the observation into two groups - before and after the lockdown. Using the estimated coefficients for each observation, we produced a map showing the spatial differentiation of rent changes in Warsaw. Additionally, a map of Airbnb market activity from 2019 to 2020 (the difference in the number of active apartments) was prepared using kernel density estimation.

Results and discussion

The first confirmed case of the SARS-CoV-2 infection in Poland was officially reported on 4 March 2020. By 31 December 2020, a total of 1,294,878 confirmed cases and 28,554 deaths had been reported (Hale, Webster, Petherick, Phillips and Kira 2020). COVID-19 related restrictions were introduced between 10-15 March 2020, which included the closing of schools and universities and a ban on international travel. Lockdown restrictions were tightened on 25 March (See Appendix A for details and a chronology).

We estimated the quantile hedonic regression models to construct quality-controlled housing rent and price indexes in Warsaw. The hedonic indexes and Airbnb supply are presented in Figure 1.

Figure 1: Quantile hedonic house price, rent indexes and Airbnb supply for Warsaw (Jan 2017–Dec 2020)



Note: The vertical line indicates the introduction of lockdown in Poland.

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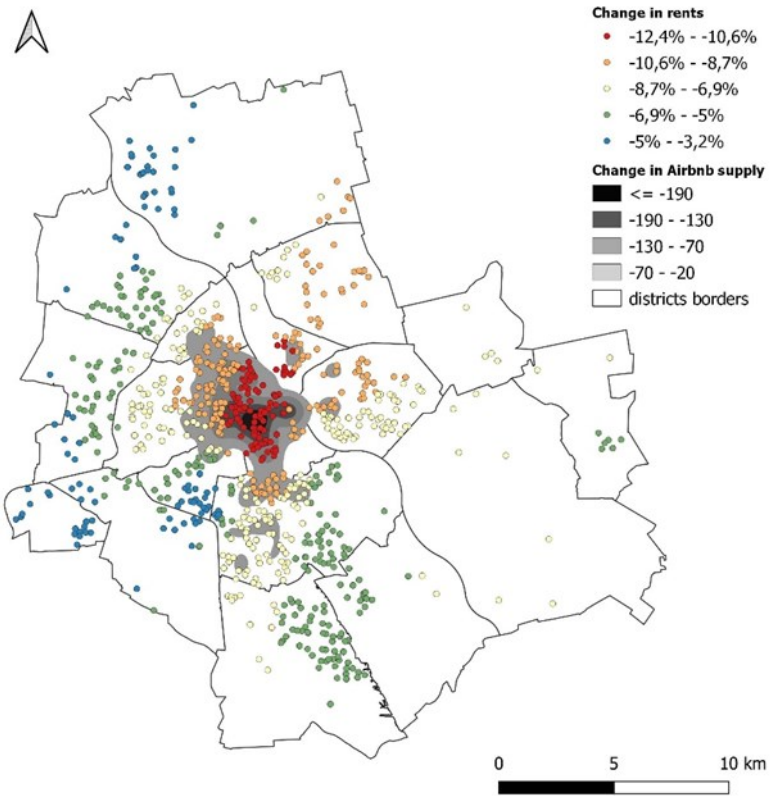
The empirical estimates indicate that house prices and rents increased at a different pace before lockdown. We observed a 10% rent increase from January 2017 to March 2020. The COVID-19 pandemic significantly affected the rental market. Throughout the nine months following the beginning of the lockdown in March 2020, rents in Warsaw decreased by 7–9%, depending on the quantile. Decreases were particularly strong in the 0.25 quantile. Compared to rents, house prices in Warsaw rose dynamically before the pandemic (by 34–35% from January 2017 to March 2020) and were significantly less affected by the COVID-19 lockdown. Initially, we observed a small adjustment at the beginning of the pandemic. In April and May 2020, house prices decreased by 1–2% but later continued to rise steadily for the remainder of 2020.

Since April 2020 the Polish rental market has been severely hit by the COVID-19 pandemic. The short-term rent decrease since the pandemic started can be partly attributed to supply adjustments. The inflow of apartment stock from the short-term rental sector has been heavily affected by various COVID-19-related restrictions imposed on domestic and international travel. The restrictions imposed on domestic and international tourism induced a massive withdrawal of apartments from the short-term market. Some of them have been adapted for long-term market purposes; others have been offered on a mid-term basis (agreements for around six months), suggesting landlords' intention to reintroduce the apartments into the short-term market as soon as the pandemic subsides. The Airbnb market shrank by almost 30% in December 2020 (y/y) to 4510 apartments in Warsaw. We produced a map of rent price changes for long-term rentals and a map of the spatial outflow of apartments from the Airbnb market during the COVID-19 restrictions (Fig 2).

Figure 2: Long-term rents and Airbnb supply changes from 2019 to 2020



Source: Authors.

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The drop in rents varied spatially. The largest declines occurred in areas with the greatest outflow of apartments from the Airbnb market. At the same time, the transition to remote learning encouraged students to stay in the family home and terminate any long-term rental agreement they had in the cities in which they had been studying before the pandemic. Those factors contributed to both an additional increase in supply on the long-term market, which may have contributed to the bigger decrease in apartments in the 0.25 quantile.
We studied the elasticity of rents with respect to Airbnb supply using a quantile hedonic regression model. The partial results (full results and description of variables in Table B1 and B2 of Appendix B) of the estimation are presented in Table 1.

The results of the estimates for 2017–2020 confirm the positive relationship between the rents and Airbnb supply. The study indicates that a 1% change in Airbnb listings leads to a 0.031% change in rents. It is worth noting that the elasticity (median quantile) was higher in the period of rent growth (before the pandemic)—about 0.0322 compared to the decreased figure of 0.0219.

Our research results provide preliminary conclusions on the impact of COVID-19 on the residential real estate market during the first months of the pandemic in Poland on the example of Warsaw. We found a significant decline in long-term rents in the rental market, which was undoubtedly influenced by many economic and social factors. However, this decline was exacerbated by the Airbnb market's collapse and an increase in the supply of apartments for rent. The result provides further support for the argument found in the literature that there is a relationship between short-term and long-term rental markets (Barron, Kung and Proserpio 2018; Benítez-Aurioles and Tussyadiah 2020; Horn and Merante 2017; Lee 2016). The study suggests that the impact is persistent not only in the growing economy but also during the recession. This is indicated by the spatial variation in rent declines (the most significant drop in central districts) and by the elasticity that was determined, which indicates a positive relationship between rents and Airbnb supply. Concerning housing prices, the results are not in line with previous studies (Qian, Qiu and Zhang 2021), as we did not see a decline. However, it should be noted that, compared to recent years, the increase slowed significantly.

Compared to other European countries, in Poland only limited housing policy measures were introduced to support tenants and owners and they focused mostly on mortgage forbearance (OECD 2020). On the other hand, the Monetary Policy Council decreased interest rates to a historical minimum, which provided a stimulus for housing investments by limiting mortgage costs. Moreover, the decrease in interest rates made housing investment even more attractive because it has been historically proven to be a good hedge against inflation. Nonetheless, the economic literature suggests that the impact of monetary policy depends on the housing cycle and is weaker when house prices are high (Bluwstein, Brzoza-Brzezina, Gelain and Kolasa 2020). Recent empirical evidence shows that the effects of monetary expansion during the Covid-19 pandemic were relatively limited (Apergis 2021). None of those measures is directly controlled within this particular study; however, investigating the effect of different housing policies on housing prices or rents and comparing European countries' outcomes is interesting for future research.

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Table 1: Partial estimation results

	January 2017—December 2020				January 2017—March 2020				April 2020—December 2020			
	0.25Q	**0.50Q**	**0.75Q**	**OLS**	**0.25Q**	**0.50Q**	**0.75Q**	**OLS**	**0.25Q**	**0.50Q**	**0.75Q**	**OLS**
lnairbnb	0.0303	0.0310	0.0244	0.0297	0.0308	0.0322	0.0247	0.0306	0.0183	0.0219	0.0233	0.0228
	(0.0015)	(0.0014)	(0.0016)	(0.0014)	(0.0016)	(0.0015)	(0.0018)	(0.0015)	(0.0046)	(0.0044)	(0.0046)	(0.0040)
characteristics controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
area effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
time effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	41246	41246	41246	41246	35824	35824	35824	35824	5422	5422	5422	5422
R2				0.8184				0.8170				0.8156

Source: Authors.

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Conclusion

There are few economic studies on the impact of pandemics on the housing market, and none has addressed the role of the short-term rental market. This paper helps fill this gap by investigating the dynamics of housing prices and rents in Warsaw before and during the Covid-19 pandemic. Using hedonic indexes, we found a slight increase in prices and a substantial drop in long-term rents between March 2020 and December 2020. The shrinking Airbnb market increased the supply in the long-term rental market, which at least partially explains the rent decrease. This is indicated by the spatial variation in rent declines and by the elasticity identified, which indicates a positive relationship between rents and Airbnb supply.

Funding

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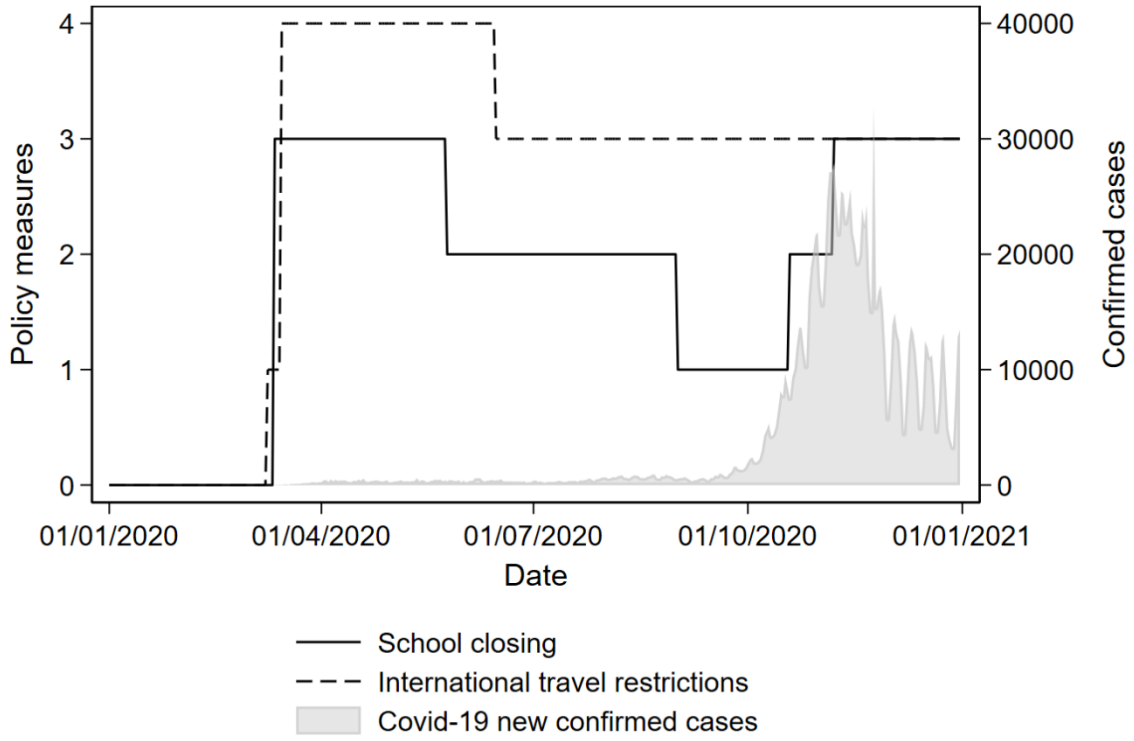
Appendix A

Figure A1: Covid-19 epidemics and lockdown restrictions in Poland



Note: School closing (Ordinal scale): 0 - no measures; 1 - recommend closing or all schools open with alterations; 2 - require closing (only some levels or categories); 3 - require closing all levels; International travel restrictions (for foreign travellers) (Ordinal scale): 0 - no restrictions; 1 - screening arrivals; 2 - quarantine arrivals from some or all regions; 3 - ban arrivals from some regions; 4 - ban on all regions or total border closure.

Source: Authors based on Hale et al. (2020).

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Appendix B

Table B1: Regression estimation results

	January 2017 - December 2020				January 2017- March 2020				April 2020 – December 2020			
	0.25Q	0.50Q	0.75Q	OLS	0.25Q	0.50Q	0.75Q	OLS	0.25Q	0.50Q	0.75Q	OLS
Const	7.0818	7.1488	7.3370	7.1012	7.0969	7.1538	7.3570	7.1158	7.0173	7.0874	7.1793	7.0122
	(0.0183)	(0.0163)	(0.0191)	(0.0161)	(0.0194)	(0.0172)	(0.0206)	(0.0172)	(0.0555)	(0.0510)	(0.0530)	(0.0468)
age	-0.0068	-0.0074	-0.0076	-0.0049	-0.0070	-0.0073	-0.0076	-0.0050	-0.0056	-0.0074	-0.0074	-0.0046
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
age2	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
area	0.0153	0.0167	0.0181	0.0172	0.0150	0.0165	0.0179	0.0169	0.0167	0.0180	0.0200	0.0188
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
lnairbnb	0.0303	0.0310	0.0244	0.0297	0.0308	0.0322	0.0247	0.0306	0.0183	0.0219	0.0233	0.0228
	(0.0015)	(0.0014)	(0.0016)	(0.0014)	(0.0016)	(0.0015)	(0.0018)	(0.0015)	(0.0046)	(0.0044)	(0.0046)	(0.0040)
lncc	-0.0800	-0.0960	-0.1305	-0.1125	-0.0799	-0.0944	-0.1302	-0.1111	-0.0894	-0.1088	-0.1359	-0.1232
	(0.0024)	(0.0021)	(0.0025)	(0.0021)	(0.0026)	(0.0023)	(0.0027)	(0.0023)	(0.0065)	(0.0060)	(0.0063)	(0.0055)
lnsubway	-0.0179	-0.0168	-0.0179	-0.0123	-0.0191	-0.0181	-0.0191	-0.0137	-0.0066	-0.0060	-0.0082	-0.0024
	(0.0014)	(0.0012)	(0.0012)	(0.0012)	(0.0015)	(0.0012)	(0.0013)	(0.0012)	(0.0043)	(0.0038)	(0.0036)	(0.0035)
lnuga	-0.0043	-0.0069	-0.0130	-0.0093	-0.0037	-0.0070	-0.0139	-0.0091	-0.0100	-0.0066	-0.0065	-0.0115
	(0.0012)	(0.0011)	(0.0012)	(0.0011)	(0.0013)	(0.0011)	(0.0013)	(0.0011)	(0.0035)	(0.0033)	(0.0033)	(0.0030)
quality	0.0456	0.0462	0.0417	0.0520	0.0458	0.0473	0.0427	0.0521	0.0469	0.0418	0.0340	0.0504
	(0.0015)	(0.0013)	(0.0016)	(0.0013)	(0.0016)	(0.0014)	(0.0018)	(0.0014)	(0.0041)	(0.0038)	(0.0038)	(0.0035)
q2	-0.0173	-0.0131	-0.0079	-0.0068	-0.0162	-0.0121	-0.0070	-0.0071				
	(0.0045)	(0.0041)	(0.0049)	(0.0040)	(0.0044)	(0.0040)	(0.0049)	(0.0040)				
q3	0.0417	0.0393	0.0488	0.0389	0.0412	0.0398	0.0505	0.0390				
	(0.0054)	(0.0049)	(0.0059)	(0.0049)	(0.0053)	(0.0048)	(0.0059)	(0.0048)				
q4	0.0408	0.0347	0.0344	0.0394	0.0402	0.0343	0.0356	0.0394				
	(0.0040)	(0.0037)	(0.0044)	(0.0036)	(0.0040)	(0.0036)	(0.0044)	(0.0036)				
q5	0.0275	0.0216	0.0269	0.0273	0.0264	0.0217	0.0264	0.0270				
	(0.0043)	(0.0040)	(0.0047)	(0.0039)	(0.0043)	(0.0039)	(0.0048)	(0.0039)				
q6	0.0102	-0.0021	0.0058	0.0079	0.0105	-0.0014	0.0051	0.0071				
	(0.0056)	(0.0051)	(0.0061)	(0.0051)	(0.0056)	(0.0051)	(0.0062)	(0.0050)				
q7	0.0346	0.0206	0.0212	0.0309	0.0345	0.0201	0.0210	0.0298				
	(0.0058)	(0.0053)	(0.0063)	(0.0052)	(0.0057)	(0.0052)	(0.0064)	(0.0052)				
q8	0.0390	0.0145	0.0062	0.0225	0.0389	0.0136	0.0056	0.0217				
	(0.0073)	(0.0066)	(0.0079)	(0.0066)	(0.0072)	(0.0066)	(0.0080)	(0.0065)				
q9	0.0324	0.0204	0.0163	0.0210	0.0309	0.0197	0.0151	0.0197				
	(0.0087)	(0.0080)	(0.0095)	(0.0079)	(0.0087)	(0.0079)	(0.0096)	(0.0078)				
q10	0.0253	0.0148	0.0021	0.0230	0.0245	0.0131	0.0042	0.0212				
	(0.0079)	(0.0073)	(0.0087)	(0.0072)	(0.0079)	(0.0072)	(0.0088)	(0.0072)				
q11	0.0418	0.0385	0.0394	0.0337	0.0400	0.0368	0.0380	0.0320				
	(0.0079)	(0.0072)	(0.0086)	(0.0071)	(0.0078)	(0.0071)	(0.0087)	(0.0071)				
q12	0.0283	0.0224	0.0206	0.0207	0.0276	0.0216	0.0194	0.0190				
	(0.0093)	(0.0085)	(0.0101)	(0.0084)	(0.0092)	(0.0083)	(0.0102)	(0.0083)				
q13	0.0437	0.0276	0.0218	0.0320	0.0419	0.0257	0.0227	0.0307				
	(0.0086)	(0.0078)	(0.0093)	(0.0077)	(0.0085)	(0.0077)	(0.0094)	(0.0077)				
q14	-0.0214	-0.0200	-0.0286	-0.0272								
	(0.0075)	(0.0068)	(0.0081)	(0.0068)								
q15	-0.0249	-0.0173	-0.0078	-0.0218					-0.0012	0.0072	0.0124	0.0055
	(0.0078)	(0.0071)	(0.0085)	(0.0070)					(0.0106)	(0.0100)	(0.0103)	(0.0091)
q16	-0.0381	-0.0208	-0.0042	-0.0185					-0.0207	0.0029	0.0199	0.0034
	(0.0050)	(0.0046)	(0.0055)	(0.0046)					(0.0094)	(0.0087)	(0.0088)	(0.0080)
N	41246	41246	41246	41246	35824	35824	35824	35824	5422	5422	5422	5422
R2				0.8184				0.8170				0.8156

Source: Authors.

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Table B2: A description of the variables

Symbol	Description
q1, …., q16	16-time dummy variables used in the global model. If the dwelling was sold in a given year-quarter, it takes the value 1; otherwise, it takes 0.
area	area of dwelling
age	age of the building in years
uga	distance to the nearest urban green area in metres
subway	distance to the nearest subway station
cc	distance to the city centre in metres
airbnb	monthly number of active apartments in the district in which the apartment was offered for long-term rent
quality	quality of the apartment (values 1-5)

Source: Authors.

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