



POZNAŃ UNIVERSITY  
OF ECONOMICS  
AND BUSINESS



# Constructing Hedonic House Price and Rent Indices for Poland using listings data from 1996-2024

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The National Science Centre of Poland partly supported this work  
under Grant number 2021/43/B/HS4/01213.

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## Transactions:

- most reliable indicator of a property's market value

*Problems* with transaction data from PPR (Property Price Register) in Poland :

- the time lag between the completion of transaction (notarial deed) and the date of entry into the property price register (e.g. Warsaw up to 6 months)
- the transaction price can be set several months before the transaction date (in case of new-builts for Warsaw average gap of 530 days between price agreement and transaction date...)
- insufficient property description for effective application of hedonic pricing models (e.g. no information on technology construction, quality of real estate)
- difficult to judge if transaction was on market conditions
- PPR does not include cooperative ownership property right which holds share of 20-25 % of secondary housing market (existing builts)

## Listings:

- Available online, detail description of property

## Problems:

- property listings may contain inaccurate information regarding virtually every aspect of the real estate (location, area, construction year,...)
- date problem (date of scrapping, date of modification, date of listing first time – which one to use?)
- the same property may be listed on multiple portals (sometimes with different list prices).
- a property may stay on a portal website for many weeks or months, with a list price that may change over time.
- there is no guarantee that the property will sell, particularly if the stated list price exceeds current market conditions

## The subject scope:

Dwellings' prices on the secondary housing market, involve both property rights and cooperative property rights for private accommodation. Only dwellings located in multifamily buildings were analysed.

## The time scope:

**1996 –2024**

## The spatial scope:

**Poland\***

- **HPI based on 28 cities** - Białystok, Bydgoszcz, Bytom, Chorzów, Częstochowa, Dąbrowa Górnicza, Gdańsk, Gdynia, Gliwice, Gorzów Wielkopolski, Katowice, Kielce, Kraków, Lublin, Łódź, Olsztyn, Opole, Poznań, Radom, Rzeszów, Sosnowiec, Szczecin, Toruń, Tychy, Warszawa, Wrocław, Zabrze and Zielona Góra
- **RPI based based on 9 cities** - Bydgoszcz, Gdańsk, Kraków, Lublin, Łódź, Poznań, Szczecin, Warszawa, Wrocław

Several researchers have speculated on the potential of using online list-data as a more timely alternative to transaction price indices:

Shimizu, C., Nishimura, K. G., and Watanabe, T. (2016). House prices at different stages of the buying/selling process. *Regional Science and Urban Economics*, 59(C):37–53.

Anenberg, E. and Laufer, S. (2017). A more timely house price index. *Review of Economics and Statistics*, 99(4):722–734.

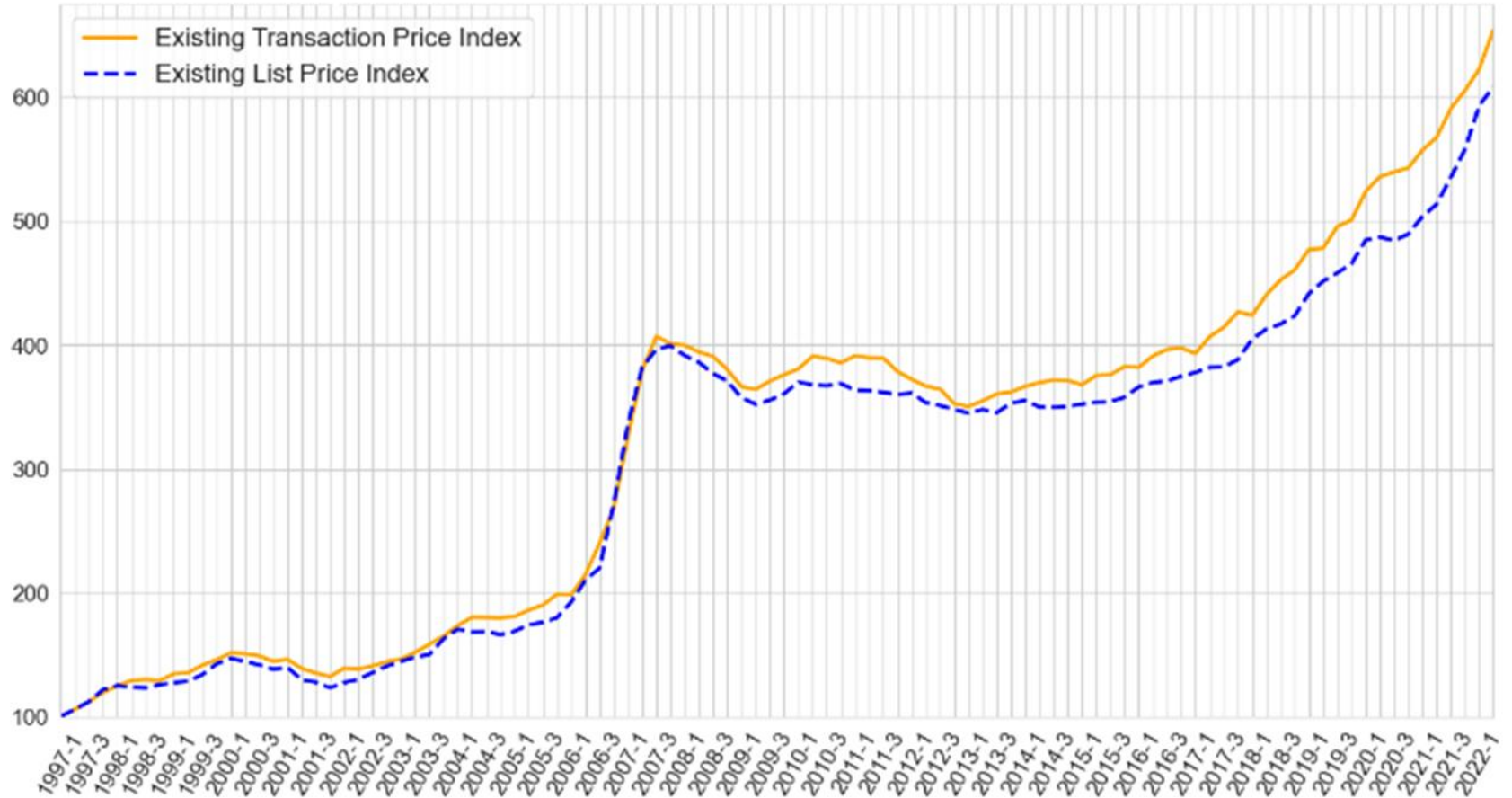
Lyons, R. C. (2019). Can list prices accurately capture housing price trends? Insights from extreme markets conditions. *Finance Research Letters*, 30:228–232.

Wang, X., Li, K., and Wu, J. (2020). House price index based on online listing information: The case of China. *Journal of Housing Economics*, 50(July):101715.

Kolbe, J., Schulz, R., Wersing, M., and Werwatz, A. (2021). Real estate listings and their usefulness for hedonic regressions. *Empirical Economics*, 61(6):3239–3269.

Trojanek, R; Hill, R.; Pfeifer, N.; Steurer, M. Warning (2022) : Improving the timeliness of house price indices using online listing data; Working Paper 2022.

## Poznan – Transaction and list price indices



# Data

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In Poland, the data on apartment prices are published by:

- the National Bank of Poland (NBP). Data from Q3 2006. Indices for provincial capital cities.
- the Central Statistical Office (CSO). Data from Q1 2015. Index for Poland from Q1 2010.

Research is based on 4 million **listings**.

Data used in this research:

- over 1.1 million listings for rent and almost 2.9 million listings for sale
- the data for 1996-2008 were obtained from archival advertisements (various local periodicals) in the form of photocopies, photographs or periodicals themselves, which were then mainly manually entered into the database (0.7 million for sale, 0.1 million for rent)
- the data from Q4 2008 have been collected from advertising portals (e.g. gratka.pl / otodom.pl) several times a quarter (2.2 million for sale, 1,0 million for rent)

## LISTINGS FOR SALE

ID	City (size)	1996	1997	1998	1999	2000-2024
1	Warsaw					
2	Krakow					
3	Lodz					
4	Wroclaw					
5	Poznan					
6	Gdańsk					
7	Szczecin					
8	Bydgoszcz					
9	Lublin					
10	Bialystok					
11	Katowice					
12	Gdynia					
13	Czestochowa					
14	Radom					
15	Torun					
16	Sosnowiec					
17	Kielce					
18	Rzeszow					
19	Gliwice					
20	Zabrze					
21	Olsztyn					
22	Bytom					
23	Zielona Gora					
24	Opole					
25	Tychy					
26	Gorzow Wielkopolski					
27	Dabrowa Gornicza					
28	Chorzow					

## LISTINGS FOR RENT

ID	City (size)	1996	1997-2008	2009-2024
1	Warsaw			
2	Krakow			
3	Lodz			
4	Wroclaw			
5	Poznan			
6	Gdańsk			
7	Szczecin			
8	Bydgoszcz			
9	Lublin			

According to the biggest advertisement websites of Poland's rental market – [www.otodom.pl](http://www.otodom.pl) and [www.gratka.pl](http://www.gratka.pl), about **70%** of all apartments offered for LTR are located in the selected cities.

In 2019, in the secondary market, **52%** of transactions took place in these cities.



# Data

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Data preparation:

- removing observations without address, price, area,
- adding the information on district/estate ; adding information based on previous data,
- removing duplicates (the last offer left in the dataset),
- removing outliers.

House Price/Rent Index methodology: Hedonic RTD

$$\ln p_{\tau n} = \sum_{c=1}^C \beta_c z_{\tau cn} + \sum_{s=t+1}^{t+m} \delta_s d_{\tau sn} + \varepsilon_{\tau n}$$

Variables used:

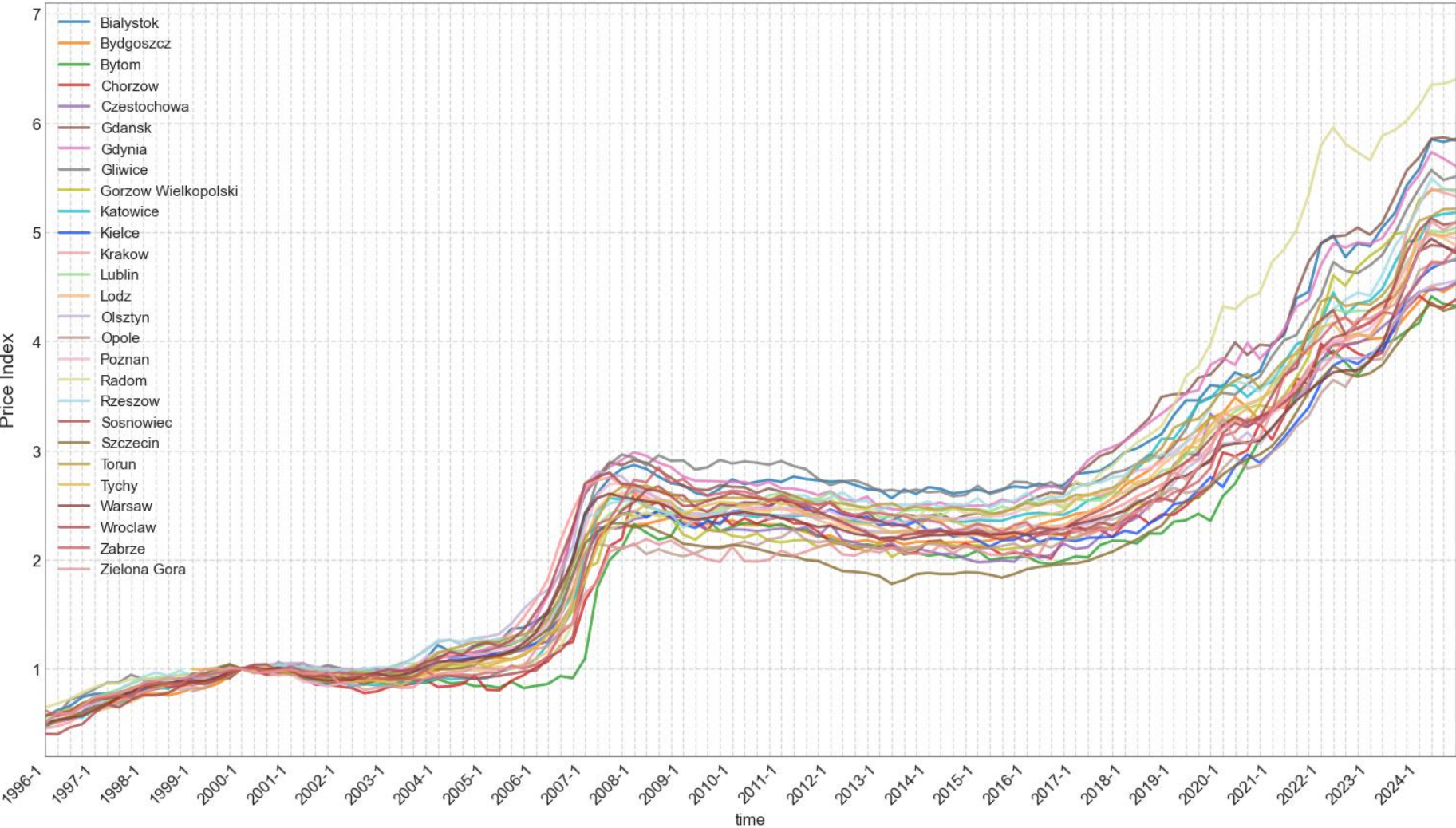
Offers from Q4 2008 – district/estate, area, age, technology, quality of the apartment

Offers up to Q4 2008 – district/estate, area



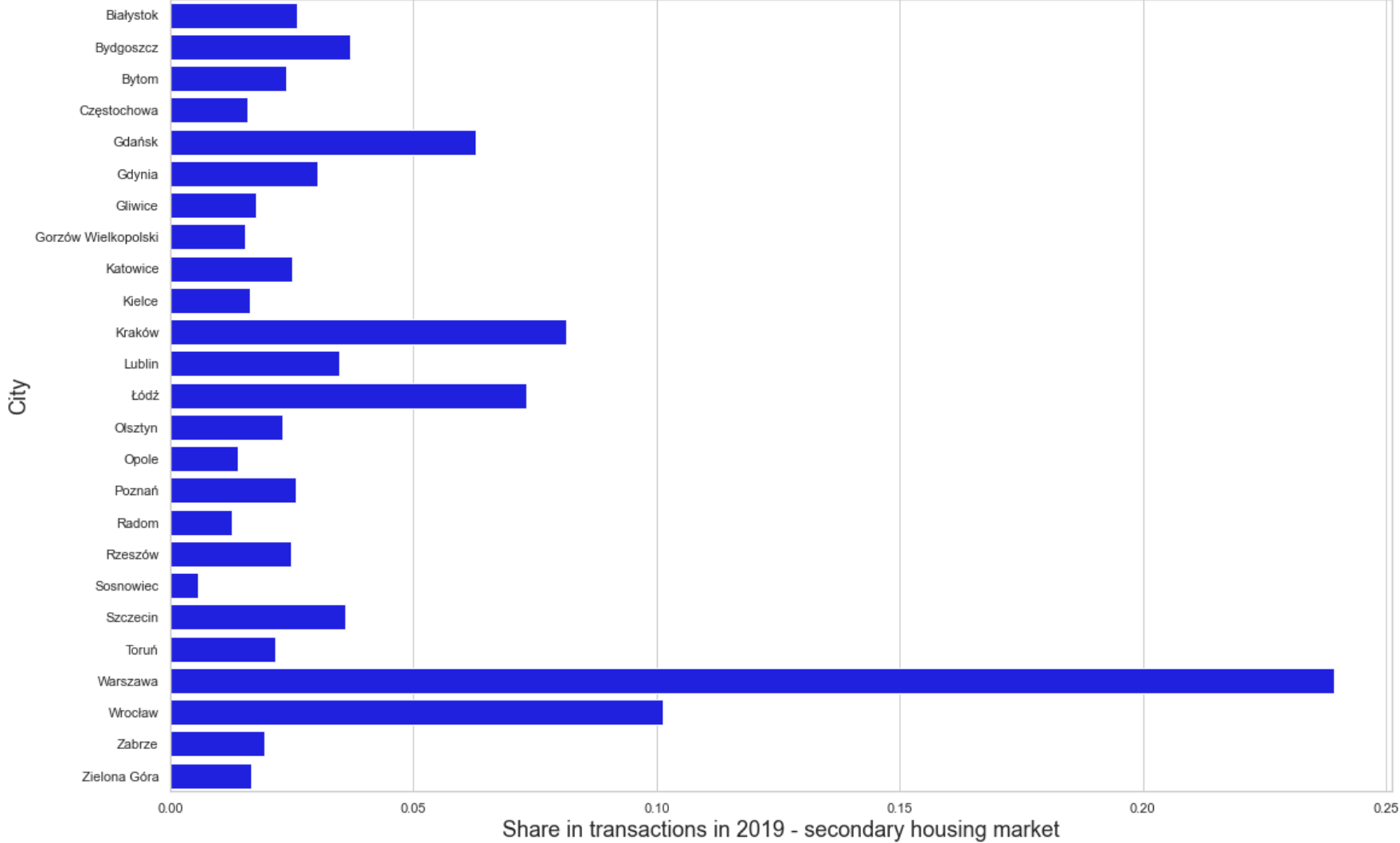
# Results

## Hedonic House Price Indices for Polish Cities Q1 1996 - Q4 2024 (Q1 2000 = 1)



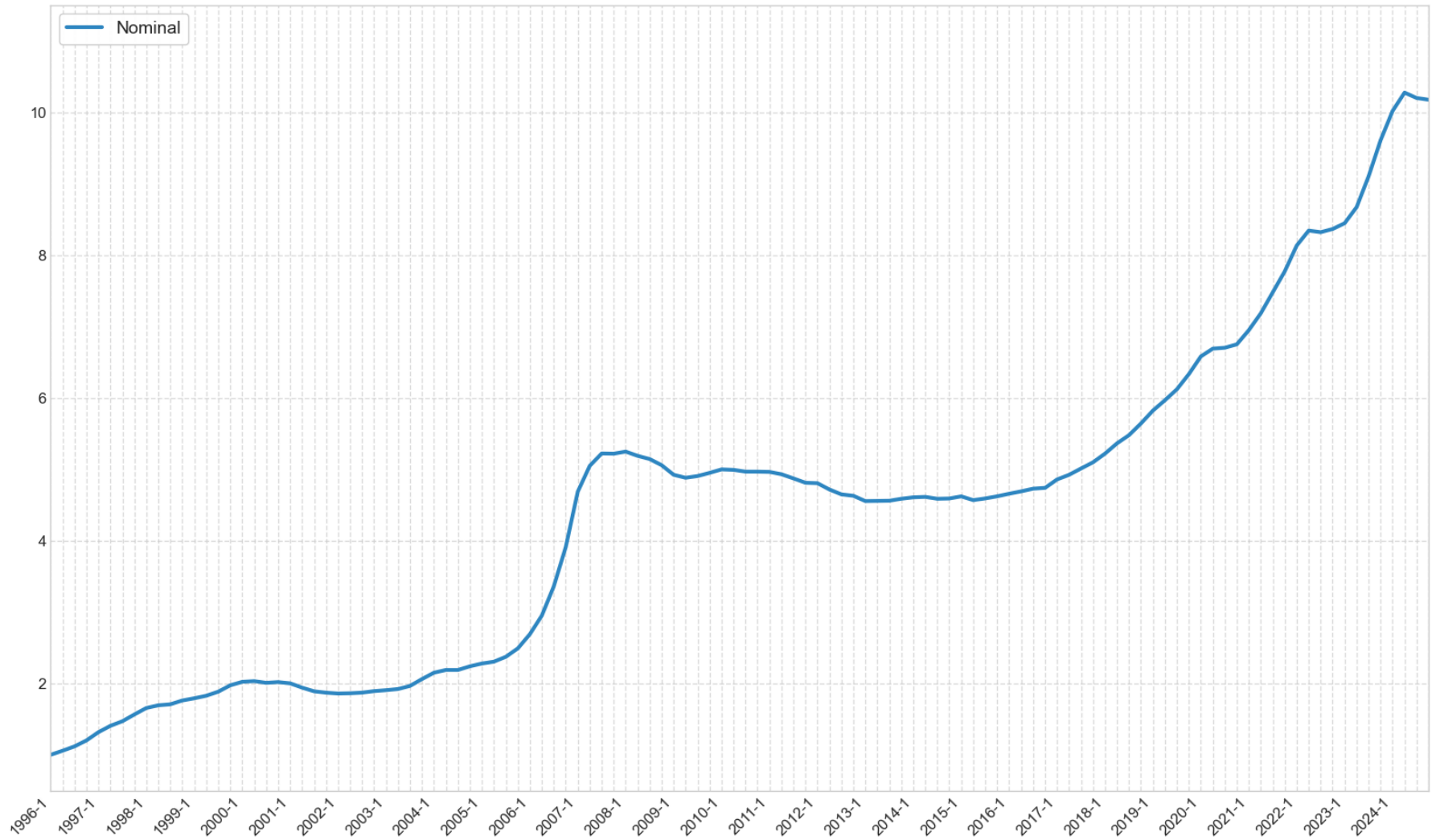
# Results

Weights based on number of transactions in 2019 secondary (full property ownership)



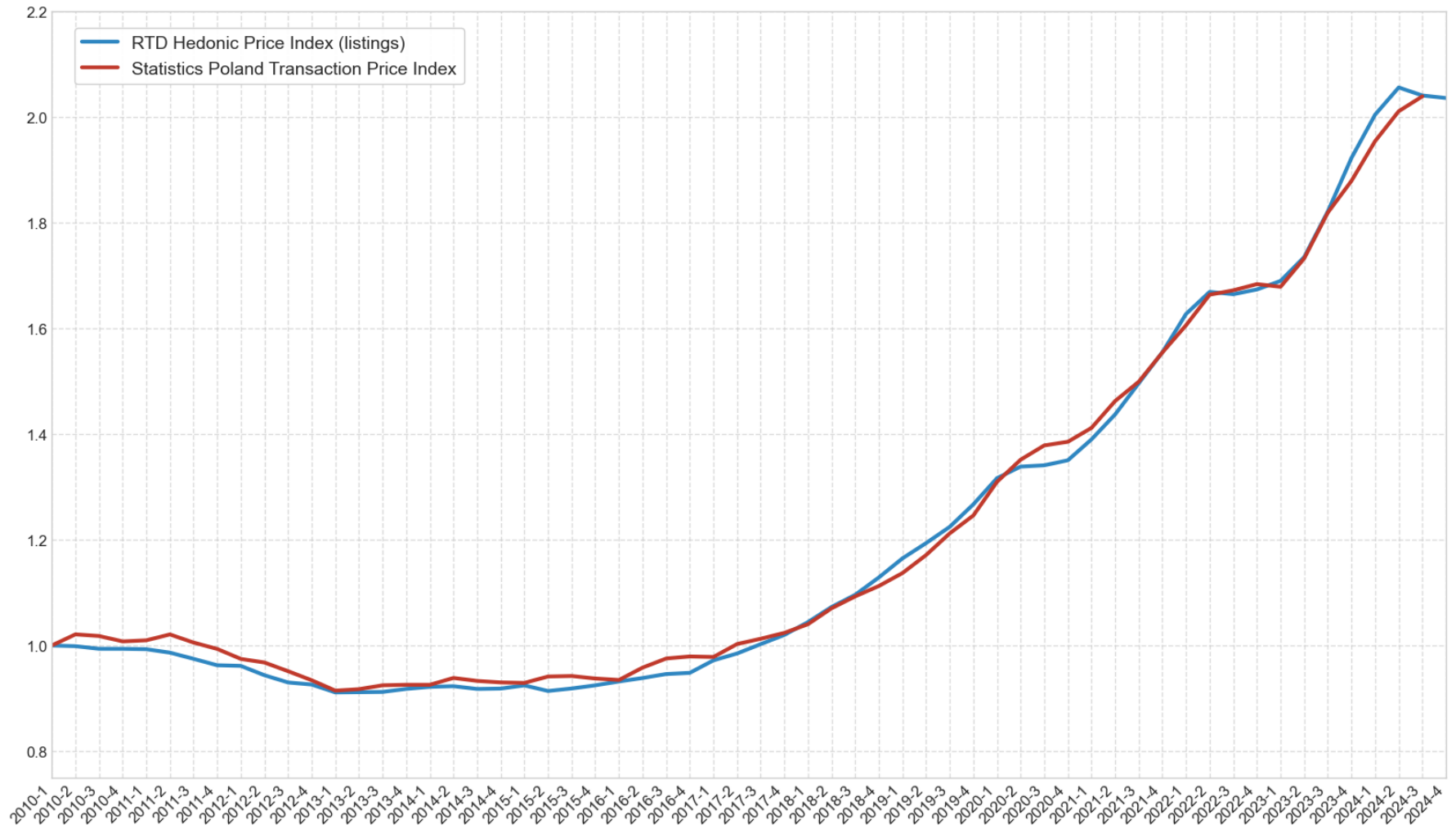
# Results

Nominal Hedonic House Price Index for Poland Q1 1996 - Q4 2024 (Q1 1996 = 1)



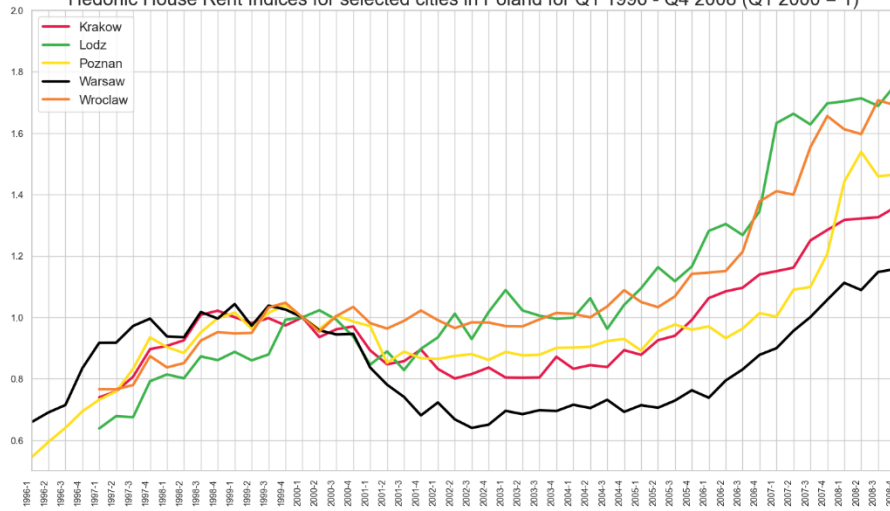
# Results

House Price Indices - RTD listings and Official (Statistics Poland) based on transactions Q1 2010 - Q4 2024 (Q1 2010 = 1)  
for secondary housing market

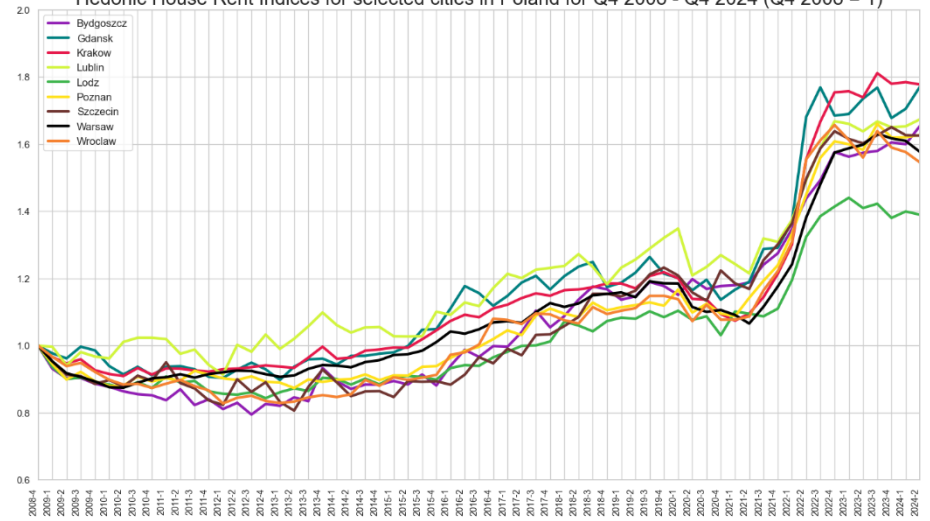


# Results

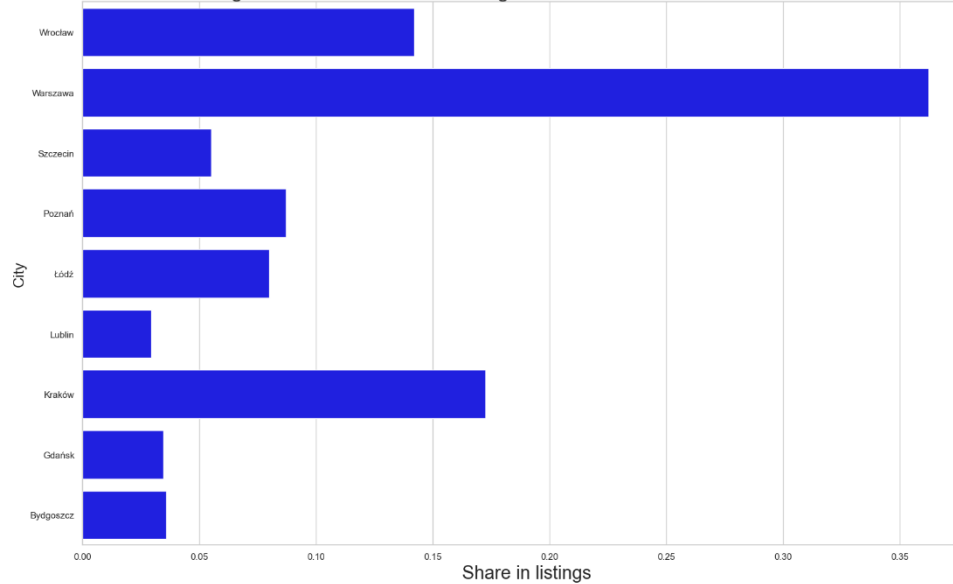
Hedonic House Rent Indices for selected cities in Poland for Q1 1996 - Q4 2008 (Q1 2000 = 1)



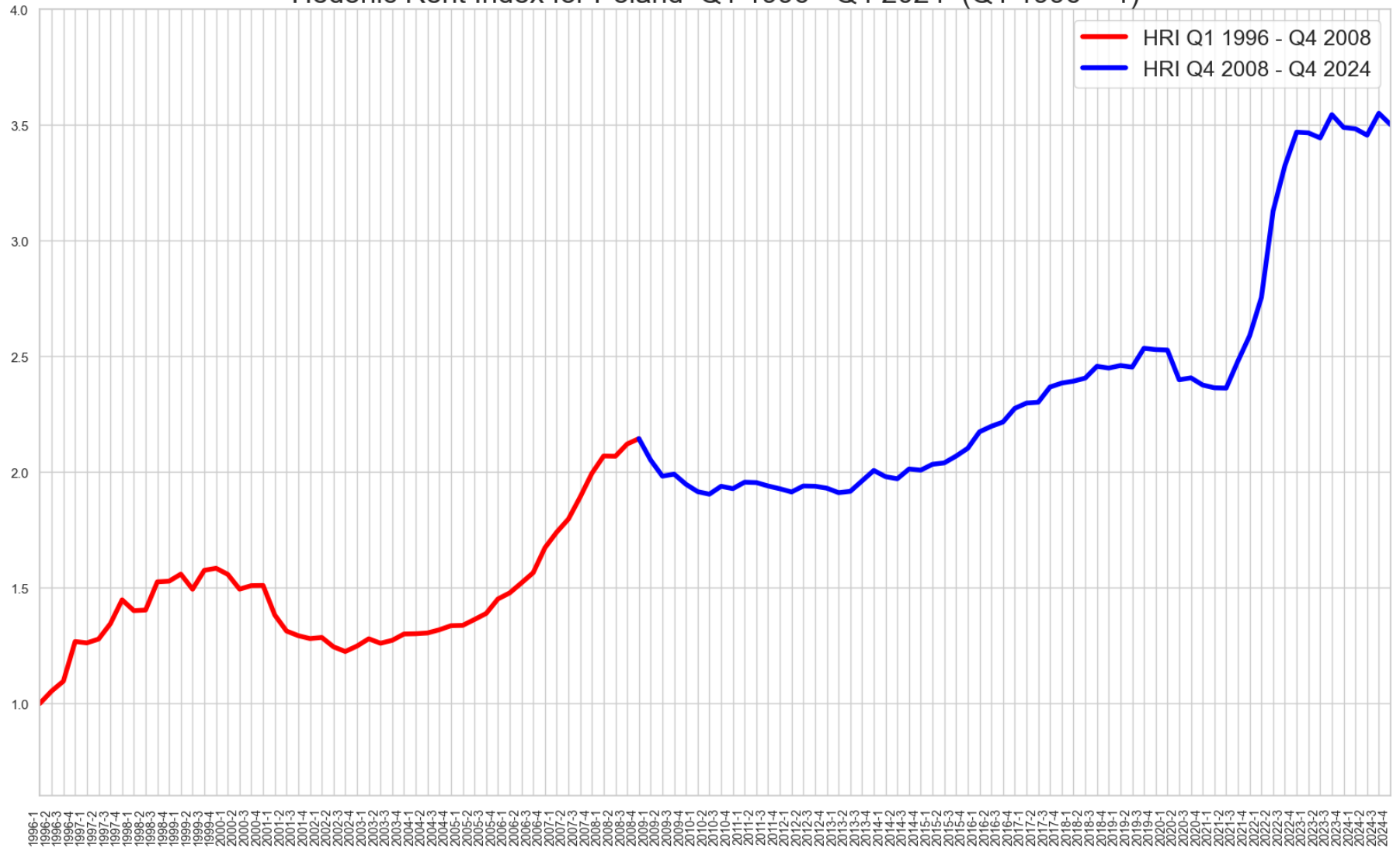
Hedonic House Rent Indices for selected cities in Poland for Q4 2008 - Q4 2024 (Q4 2008 = 1)



Weights based on number of listings in 2023 - Rent Price Index 2008-2024



Hedonic Rent Index for Poland Q1 1996 - Q4 2024 (Q1 1996 = 1)



- There are some differences between listing indices and CSO indices which can stem from: different approaches, different scope, and lag in obtaining the data from PPR.
- Listings data, despite their drawbacks, if properly prepared, may help construct price/rent indices on the residential market.
- Listings data allow for analysis of current changes in the housing market with almost no delay.





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