Detecting housing bubble in Poland: Investigation into two housing booms

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Research Article

Keywords: house price, housing bubble, incomes, Covid-19, War in Ukraine, gsadf

Posted Date: March 6th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2634869/v1

Abstract

The paper investigates the potential house price bubble in 18 provincial capital cities in Poland from 2000 to 2022. This is the first comprehensive effort to examine the house price exuberance throughout two housing market cycles (2000–2013 and 2014–2022, respectively). Additionally, we evaluate the risk of the housing bubble during a volatile era when the housing market in Poland was exposed to significant external shocks connected to COVID-19 and the War in Ukraine. During the 2006–2007 period, based on the price-to-income ratio, we observed explosive behaviour of house prices that is not justified by fundamentals in all cities examined. The length and precise timing of the bubble phases varied amongst regional cities. Despite this, the findings are consistent with earlier data from other nations, which adds credence to the idea that the 2007 housing bubble was a worldwide occurrence. Contrary to what is commonly believed and reported in the media, we have not seen any indications of irrational house price behaviour in Polish cities during the Covid-19 outbreak or the even more recent War in Ukraine. Contrary to the overwhelming evidence for the house price exuberance between 2006 and 2007, we conclude that there is no solid evidence of the existence of the housing bubble in recent years.

1. Introduction

The formation of housing market bubbles has been one of the hottest economic topics recently and, to a large extent, discussed globally. The problem's relevance has been acknowledged by scholars and empirically tracked worldwide, at least since seminal papers on the infamous housing bubble in the US that burst in 2008. As a result, the formation of housing bubbles has become a more and more global phenomenon. Yet, due to country-specific institutional framework and differing city-level fundamentals, neither housing market cycles nor the irrational exuberance related to house price dynamics is fully synchronised. Moreover, there is still a lot to learn about the formation of house price bubbles and the role of fundamentals.

The paper aims to investigate the potential housing bubbles in regional housing markets in Poland from 2000 to 2022. In particular, we assess the explosive behaviour of house prices related to fundamental economic variables. We use the new generation of recursive housing bubble test procedures developed by Phillips, Shi and Yu (Phillips et al., 2015).

The contribution of the paper is threefold. Firstly, we address the housing bubble formation by investigating the relation of house prices to two major fundamentals: household incomes and housing rents. To our best knowledge, most papers focus on one of those empirical relations, typically favouring the latter. Using different economic fundamentals to assess the possible bubble formation increases the robustness of the empirical findings. Secondly, it is the first rigorous attempt to investigate the possible bubble formation during two distinct housing market cycles (2000–2013 and 2014–2022, respectively). Recent growth in house prices has drawn the considerable attention of real estate consultants and analysts, who often compared the situation to the infamous housing crisis after 2008. Since most commentaries is based on anecdotal evidence and stylised facts, there is a noticeable gap in economic knowledge, especially considering the geographical context. Thirdly, we assess the risk of the housing bubble in Poland during a recent turbulent period when the housing market was subject to serious exogenous shocks related to Covid-19 and War in Ukraine. This is a particularly interesting study period to assess the risk of housing bubble formation, and it has not been done before.

The rest of the paper is organised as follows. The following section is devoted to the review of the relevant housing bubble literature. We focus on data collection and empirical procedure in the Methods and data section. The overview of econometric modelling results is provided and put in a broader perspective in the section Results and discussion. In the conclusion section, we briefly summarise our findings and present a promising outlook for further research.

2. Literature Review

The asset price bubbles or asset price exuberance has drawn considerable attention from scholars. Intriguing enough, the scientific interest in the formation of bubbles and the number of economic publications followed the price dynamics – most of the economic studies were done during booms when the risk of price exuberance was exceptionally high. Explosive house price dynamics may have triggered research on housing bubbles before the Global Financial Crisis of 2008; however, it was not the first real estate bubble. Recent studies document housing bubbles in the US in 19 and 20 centuries (Shiller, 2015) and land bubbles in 18 century (Glaeser, 2013). An intriguing empirical evidence comes from Amsterdam, where housing bubbles were identified as early as the 17 century (Korevaar, 2018). It is worth noting that aside from real estate, the empirical research on bubbles also focused on stocks (Homm & Breitung, 2012a), commodities (Yildirim, 2021), and even art (Assaf, 2018),

There is no shortage of the definition of the housing bubble; however, in general, the phenomenon is typically understood as an above-average increase in house prices that is not explained by fundamental economic factors but rather by self-sustaining and irrational expectations of house buyers who view housing as an investment (Case & Shiller, 2003, p. 321). Following before mentioned intuitions, Arce and Lopez-Salido (2011, p. 212) define a housing bubble as “an equilibrium in which some investors hold houses for resale purposes only and not with the expectation of receiving a dividend, either in the form of rent or utility”. A comprehensive review presents a typology of speculative price bubbles in the housing market (Brzezicka, 2021; Brzezicka & Wisniewski, 2022). There is no shortage of general economic research on asset price bubbles (Galbraith, 1993; Shiller, 2015), but finding a valid instrument allowing for the timely detection of bubble formation is problematic, as different methods yield different results (Xie et al., 2019a). Theoretical challenges associated with testing for the presence of housing bubbles are summarised by Giglio et al. (2016).

From a theoretical perspective bubble detection procedure tackle two problems related to test size and power. Firstly, the bubble testing procedure should minimise the probability of false bubble detection if no price exuberance is present. Secondly, it should minimise the probability of failing to detect the bubble when there is a price exuberance on the market. Evans provided simulation-based evidence that, under specific conditions, several tests fail to detect bubbles in asset prices (Evans, 1991). There are different categories of bubble detection tests – generally based on the relation of house prices to the fundamentals (Clark & Coggin, 2011) or explosive house price growth (Franses, 2016). Gurkaynak (2008) identifies several classic asset bubble test categories: (i) variance bounds tests (LeRoy & Porter, 1981; Shiller, 1981), (ii) West's Two-Step Tests (West, 1987, 1988), (iii) integration/cointegration based tests (Diba & Grossman, 1988b, 1988a). In his theoretical survey Gurkaynak (2008) argues that despite advances in econometrics, classic economic tests used to detect asset price bubbles yield unsatisfactory results. In the recent decade, a new generation of robust procedures has been developed to tackle those problems. A novel real-time CUSUM method of bubble detection was proposed by Homm and Breitung (2012b). The recursive test procedure to identify explosive growth in asset prices was described by Phillips, Wu and Yu (2011) – PWY and further developed to allow for more reliable detection of bubbles if multiple are present in the study period by Phillips, Shi and Yu (Phillips et al., 2015) - PSY. The testing procedure aims at directly addressing the problem of finding when irrational exuberance resulted in a disproportionate increase in asset prices – and authors draw inspiration from Alan Greenspan's comment on financial markets in December 1996. The review of this new statistical procedure, along with its further development and statistical software implementation, was discussed by Phillips and Shi (2020). Both PWY and PSI testing procedures have been used in multiple economic papers investigating the explosive behaviour of house prices. Recently a panel generalisation of the PSY testing procedure was introduced by Pavlidis et al. (2019).

The interest in bubbles in the housing market is cyclical and, to a large extent, synchronised with house price dynamics and ongoing public debate (Clark & Coggin, 2011). In recent years several papers tried to address the sharp increases in house prices and sought to find whether the fundamentals justified the dynamics. Since 2015 a growing body of empirical evidence has been together to identify housing bubbles in various countries. Most research to date origins from the US, where the formation of housing bubbles has been addressed at the regional (Goodman & Thibodeau, 2008; Kivedal, 2013; Kuo et al., 2021; Shi, 2017; Tang et al., 2020) and local levels (Y.-H. Chen & Fik, 2017).

Housing bubbles are not specific to the US; thus, explosive behaviour of house prices has been investigated in other developed and emerging economies. Using a battery of linear and non-linear unit root tests on OECD countries, Xie et al. demonstrated that identification of the presence of the housing bubble is heavily test-dependent (Xie et al., 2019b) – as the results were, in many cases, inconclusive. Czerniak et al. used the logit model to identify housing market bubbles in 15 EU countries using an extensive set of macroeconomic, financial, demographic and institutional variables (Czerniak et al., 2020). Other empirical papers suggest that interest rates, stock market development and inflation are key factors behind the housing bubble formation (Martínez-García & Grossman, 2020).

Pitros and Arayici examined the housing market in the UK from 1983 to 2011 and identified housing bubbles in the UK's 1988–1989 and 2003–2007 periods (Pitros & Arayici, 2016). In addition, Fabozzi et al. (2020) and Zhang et al. (2021) confirmed evidence of housing bubbles in the UK. Furthermore, an Irish study suggested that low-interest rates may contribute to the housing bubble and substantially increase the risk of a subsequent housing crisis (Moons & Hellinckx, 2019).

Explosive price dynamics were found in several German cities and linked to financial and economic factors (Kholodilin et al., 2018)

Growing concern about potential formation fostered some empirical papers on the house price bubble in Australia. Examples include Baur and Heaney (2017) exploration of 8 major provincial housing markets and a recent study by Bangura and Lee (2022), who investigated the Greater Sydney housing market. Housing bubble formation in Australian cities was also addressed by Shi et al. (2016), Wang et al. (2020), and Shi et al. (2020),

Many recent economic papers have investigated the Chinese real estate market to identify potential housing bubble formation. Zhi et al. (2019) examined whether house prices deviate from the fundamentals, as well as adopt Log-Periodic-Power-Law-Singularity (LPPLS) model to find that 10 Chinese cities (out of 35 in the sample) were subject to housing bubble formation. Several other papers address both formation and consequences of the housing bubble in China (L. Chen, 2011; Huang & Chiang, 2017; R. Liu et al., 2017; Mao & Shen, 2019; Tsai & Chiang, 2019). Evidence from Hong Kong and Taipei (Teng et al., 2013) suggests that the bubble formation probability is related to the land ownership system (freehold vs leasehold). The growing risk of a housing bubble has been reported in Korean study, especially since 2014 (Kim & Lim, 2016).

The explosive behaviour of house prices in Turkey has drawn considerable attention in real estate economics (Coskun et al., 2020a; Coskun & Jadevicius, 2017; Coskun & Pitros, 2022a). In particular, the empirical test based on Pitros and Arayici (2016) bubble algorithmic model shows the housing market bubble in Turkey during 2013–2017, followed by its collapse in 2018 (Coskun & Pitros, 2022b). On the other hand, the Israeli study suggested that housing price appreciations at the national and regional levels are consistent with the house price dynamics, which was in line with the fundamentals and no housing bubble was detected (Caspi, 2015).

Last but not least, housing bubbles have been a subject of economic debate in Poland and an object of econometric investigation. The house price bubbles in the housing market in Poland before and during the Financial Crisis of 2008 were detected by Brzezicka (2016) in Olsztyn and Zelazowski (2016) in regional cities in Poland using the PSY test on price-to-income ratio. More recently, Czerniak and Kawalec (2020) used NBP data to identify bubbles in primary and secondary housing markets in 17 cities in Poland (Czerniak & Kawalec, 2020) based on a set of five simple statistical indicators. The results are susceptible to the method used and generally suggest the existence of the bubble in 3 quarter of 2019 in most of the cities in the case of existing apartments. Using more robust econometric procedure was applied by Tomal, who identified a relatively short period of explosive house price behaviour in 2014 based on the decomposition of the log price-to-rent ratio and PSY testing procedure (Tomal, 2021a). The selection of the most recent studies on housing bubbles is presented in Table 1.

Table 1
Recent studies on housing bubbles

Research	Time	Place	Method
(Gil-Alana et al., 2019)	2003–2016 (monthly)	Chile (Santiago)	Cointegration
(Fabozzi et al., 2020)	US 1977–2015 (quarterly); UK 1986–2016 (monthly	US and UK	PSY and PWY tests
(Caspi, 2015)	1999–2013 (monthly)	Isreal	PSY and COSUM recursive unit root test
(Kholodilin et al., 2018)	1990–2013 (annual)	Germany (127 cities)	Explosive unit root test
(Baur & Heaney, 2017)	1995–2015 (monthly)	Australia (8 cities)	PSY and PWY tests
(Bangura & Lee, 2022)	1991–2016 (quarterly)	Australia (Sydney submarkets)	PSY test
(Zhang et al., 2021)	1980–2007 (quarterly)	UK	co-explosive vector autoregression (VAR) model
(Xie et al., 2019b)	1970–2017 (quarterly)	OECD (18 countries)	Multiple test procedures (unit root),
(Czerniak et al., 2020)	1995–2014 (quarterly)	EU (15 countries)	Logit model fundamentals (macroeconomic, financial, demographic and institutional)
(Zhi et al., 2019)	2008–2010 (monthly)	China (35 cities)	Log-Periodic-Power-Law-Singularity model, Cointegration - fundamentals (rent, construction costs, mortgage interest rate)
(Tomal, 2021b)	2006–2020 (quarterly)	Poland (13 cities)	Decomposition of log price-to-rent ratio, PSY test
(Coskun et al., 2020b)	2007–2014 (monthly)	Turkey	Bounds test, Cointegration - fundamentals (rent, construction costs, mortgage interest rate)
(Coskun & Pitros, 2022b)	2006–2018 (annual)	Turkey	Bubble algorithmic model
Source: Own research			

The evidence suggests that explosive dynamics in housing markets may be linked to interest rates and policy uncertainty (Pavlidis et al., 2019). The role of the domestic monetary policy in the formation of the housing bubbles has been demonstrated based on OECD data (Amador-Torres et al., 2018). The probability of housing bubbles in real estate is also associated with mortgage lending practices (Kholodilin et al., 2018). Despite economic evidence, some scholars argue that theoretical linkages between monetary policy, mortgage lending, inflation and the housing bubble are still underdeveloped. Empirical results often lack robustness (Joebges et al., 2015).

Some papers suggest that housing bubbles are spatially contagious, and house price spill-overs may be detected in regional housing markets (Weng & Gong, 2017). The propensity to observe house price bubbles may differ across cities (Glaeser et al., 2008) and within cities (C. H. Liu et al., 2016), partially due to new supply adjustments.

3. Methods And Data

3.1. Bubble detection method

Our research methodology is based on a novel approach to housing bubbles that tackles the explosive behaviour of asset prices not explained by fundamentals. The housing bubble testing approach was laid out in 2011 by Phillips, Wu and Yu (Phillips et al., 2011) and later generalised (Phillips et al., 2015) and refined (Shi & Phillips, 2021).

In principle, the test is based on ADF regression of the following form (Caspi, 2015):

$$y_t = \alpha_{r1,r2} + \beta_{r1,r2} y_{t-1} + \sum_{i=1}^{k} \delta_{r1,r2}^{i} \Delta y_{t-1} + \epsilon_t$$

1

Where y_t is the time series being examined, typically asset price or fundamental relation based on asset price. This research uses the price-to-income ratio (PI), but we also use the price-to-rent ratio (PR) in the robustness test. Additionally, ϵ_t is the error term, $\alpha_{r1,r2}$ is the intercept, $\beta_{r1,r2}$is the autoregressive coefficient, and *r*1 and *r*2 are respectively starting and ending points utilised in the estimation procedure. We denote the first difference operator as Δ, and number of lags as *k*.

Based on (1) we test for mildly explosive root(Phillips & Magdalinos, 2007), using the null hypothesis H0: $\beta_{r1,r2} = 1$ (no bubble) against H1: $\beta_{r1,r2} > 1$ (explosive behaviour).

Aside from standard ADF statistics based on the entire period, in the research, we apply Supremum Augmented Dickey–Fuller (SADF) test introduced by Phillips, Wu and Yu (2011) – PWY. The test is based on supremum t-statistics that are obtained from forward recursive estimation(Caspi, 2015):

$$\mathrm{SADF}_{(r0)} = \sup_{r2 \in [r0,1]} \mathrm{ADF}_0^{r2}$$

2

The research methodology involves date-stamping identification of periods of house price explosive behaviour. The recursive windows procedure used in the PWY method allows for consistent identification of the beginning and end of the first bubble (stamping relevant dates). However, its usability is seriously limited in case of subsequent occurrences of bubbles. Phillips, Shi and Yu (2015) demonstrate that PWY method is not effective when multiple periods of explosive behaviour are present in a given time series. Thus, its validity is compromised when it occurs in the study period. To account for the possibility of multiple bubbles recurring in the study period, we use another bubble indicator based on the Generalised Supremum Augmented Dickey–Fuller (GSADF) test developed by Phillips, Shi and Yu (2015) - PSY. The testing procedure uses sample sequences with a varying range of observation (beginning from 0 to r2-r0 and ending from r0 to 1)

$$\mathrm{GSADF}_{(r0)} = \sup_{r1 \in [0, r2-r0] r2 \in [r0,1]} \mathrm{ADF}_{r1}^{r2}$$

3

Critical values in right-tailed ADF, SADF and GSADF tests are calculated using Monte Carlo simulations.

The testing procedure allows for detecting explosive behaviour of asset prices - positive and negative – however, the former has drawn considerably more attention from economists and market analysts. The calculations are made with the R package exuber developed by Vasilopoulos, Pavlidis, and Martínez-García (2022).

3.2. Empirical data

The Statistical Office (SO) and the National Bank of Poland NBP provide Poland’s official house price indexes. These data were used in earlier studies on bubble detection and regional house price dynamics. The Public Statistics Statistical Research Program includes the NBP house price indices as of 2013. They have been publishing quarterly since 2010 and are likely the most reliable source of information on Poland’s residential price dynamics (data from the 3rd quarter of 2006). The alternative CSO house price indices have been provided for provincial cities since 2015. We discovered that NBP and SO data did not support the study goal of our research. The first decade of the 2000s, which is particularly interesting for examining the housing market bubble in Poland, is not included in the NBP and SO datasets. Moreover, there have been some criticisms of the NBP dataset. For example, there are differences between NBP data and complete information on housing transactions in recorded transaction volume and average house prices in the beginning period of the indexes (Gluszak et al., 2018; Hill & Trojanek, 2022; Konawalczuk, 2014).

This study employed a unique database of over 4 million apartment listings in 18 Polish provincial cities from 2000 to 2022. A detailed description of dataset formation can be found in Trojanek (Trojanek, 2021). Using the collected information on apartment offers, house price indices were constructed with the hedonic method (Trojanek, 2022). Finally, data were converted into real values with CPI reported for Poland. The Fig. 1 presents HPI for 18 provincial cities in Poland for 2000–2022 in constant prices.

Over the past 30 years, there have been significant changes to the Polish real estate market. The development of the real estate market and the housing market within it can be attributed to Poland's political transformation in 1989 and the reforms implemented in the housing sector. As a result, the Polish housing market experienced both boom and bust cycles in recent decades, just like more developed markets.

The price of an apartment increased by 110% in real terms in province cities between 2000 and 2022 (nominally by 380 per cent). While the time series of housing price indices in different cities show a similar trend in the same direction, the strength of these changes has already begun to vary. In the studied period, there were times when prices rose and fell. The price decline between 2000 and 2002 was primarily a result of the slowing economy. Following Poland's EU accession and the country's economic situation, apartment prices increased between 2003 and 2007. Additionally, favourable economic conditions, declining unemployment, rising household income, or non-fundamental factors like media coverage of the potential for an increase in VAT, the final chance to benefit from the relief, or the widespread perception that housing prices will only rise are among the main determinants. Also added to the market is speculative capital. There is undoubtedly a need for more land with development potential on the supply side of things (the effect of changes in legal regulations). However, growth was slowed by the global financial crisis, the tight credit market for housing loans, and the weaker economy (Trojanek, 2021; Trojanek et al., 2022).

In some cities, sooner or later, apartment prices started to rise once more in 2014, driven by factors such as increased demand brought on by the economy, government initiatives supporting the purchase of a first apartment, low-interest rates, and the growth of Poland's residential rental market, which includes Airbnb (Trojanek et al., 2021). In addition, the decline in bank deposit interest rates, which had long been regarded as a good inflation hedge, attracted individual investors to the housing market.

The Price-Rent ratio is the most popular indicator used in scientific research for bubble detection. Unfortunately, we could not use it in this study as the rent indices are not provided for the years of analysis. NBP provides information on average housing rent since 2009. We did not decide to use these data mainly because of the much shorter time horizon and because, in the beginning periods, the indices based on the average show difficult-to-explain behaviour (high volatility).

Because of the above, we decided to use the Price-Income ratio, which can also be used in the bubble detection procedure. The data on quarterly salaries and CPI for analysed cities comes from SO. To be precise, the SO provides information on average salary. Therefore, we have estimated the yearly household income as the gross annual salaries of two persons. As a price, we used an apartment's average price of 50 square meters derived from HPI and a mean price of 1 square metre in Q1 of the 2000 year in each city.

The price-to-income ratios in Polish cities have been increasing on average by 25% over the past 22 years, as illustrated in Fig. Bialystok saw the largest growth (by 70%), whereas, in Krakow, the ratio was unchanged between Q1 2000 and Q4 2022. The price-to-income ratio, however, reached its highest point during the financial crisis of 2007–2008, after which it started to decline sharply. Stabilisation of the studied ratio has been seen since about 2015.

4. Results And Discussion

4.1. Empirical findings

The recursive unit root test statistics computation necessitates the selection of the minimum window size, r0, and the autoregressive lag length, k. The minimum window size has to be large enough to allow initial estimation, but it should be manageable to avoid missing short episodes of exuberance. We employed Phillips et al. (2015a,b) recommendation and set the minimum window size according to the rule of thumb: $r_0 = 0.01 + 1.8/\sqrt{T}$. Concerning the selection of k, simulation evidence indicates the proposed right-tailed unit root methodologies work well when the number of lags is fixed at a small value, i.e., 0 or 1 (Vasilopoulos et al., 2022). Concerning the autoregressive lag length, k, we evaluate our results primarily for two cases, k equals 0 and 1. Our findings do not appear very sensitive to the lag length specification (in the paper, we presented the results for lag 1 and in the appendix for lag 0). The minimum length of exuberance was set for four quarters.

Table 2
reports results for SADF and GSDAF tests for real house prices and price-to-income ratios in provincial capital cities in Poland

	Real House Prices		**Price to Income**	
Panel A : Test statistics	SADF	GSADF	SADF	GSADF
Bialystok	3.04***	5.41***	2.63***	2.64***
Bydgoszcz	2.43***	5.16***	1.01*	1.96**
Gdansk	3.35***	4.11***	2.43***	3.87***
Gorzow Wielk.	4.25***	4.95***	3.73***	4.39***
Katowice	2.22***	5.81***	0.41	2.43**
Kielce	2.49***	3.39***	2.21***	2.99***
Krakow	1.71**	5.04***	1.81***	2.67***
Lodz	2.56***	4.00***	0.57	2.36**
Lublin	2.29***	3.40***	2.41**	2.45**
Olsztyn	2.65***	3.37***	3.69***	3.83***
Opole	2.61***	4.24***	2.50***	5.30***
Poznan	2.19***	2.58***	1.92***	2.45**
Rzeszow	2.67***	3.84***	2.58***	2.58***
Szczecin	2.46***	4.84***	2.00***	4.04***
Torun	1.87***	4.16***	1.39**	2.11**
Warsaw	2.78***	5.27***	2.90***	4.08***
Wroclaw	4.46***	5.14***	3.91***	4.54***
Zielona Gora	3.93***	4.79***	1.98***	3.46***
Panel B: Critical Values				
90%	0.972	1.65	0.972	1.65

Note: *, **, and *** denote statistical significance at the 10, 5 and 1 percent significance levels, respectively. All results are for autoregressive lag length k = 1.

Source: Own research

	Real House Prices		Price to Income	
95%	1.28	1.91	1.28	1.91
99%	1.79	2.46	1.79	2.46
Note: *, **, and *** denote statistical significance at the 10, 5 and 1 percent significance levels, respectively. All results are for autoregressive lag length k = 1.				
Source: Own research				

Comparing the results of the two econometric tests does not reveal large differences. For the GSADF, there is strong evidence of exuberance in real house prices and price-to-income ratio in all analysed cities. Similar results provide the SADF test, which suggests rejecting the null hypothesis of the price-income ratio for two cities – Katowice and Lodz. Given the superior power properties of the GSADF procedure, we conclude that emerges is that episodes of exuberance were widespread across housing markets in Polish cities. The Figure presents a chronology of the identified periods of exuberance detected by two ratios for each city.

The analysis of two subplots provides new evidence on the timing of exuberance for each city. The results obtained based on real housing prices indicate the existence of two periods of exuberance in the years 2000–2022. They coincide with periods of housing price growth in each city. The price-to-income ratio suggested the existence of exuberance movements only in 2006–2008. In all cities besides Katowice, Lodz and Rzeszow, the duration of the exuberance period exceeds three quarters. In the Fig. 4 identified, explosive (grey bars) movements (minimum duration of four quarters) of price-to-income ratios in Polish major housing markets were presented.

4.2. Robustness check

To ensure that our results are robust to empirical specification and data issues, we tested whether the conclusions are supported when (1) using transaction data and (2) using price-to-rent fundamental relation.

There are no available transaction-based indices on the housing market for the first half-decade of the 2000s for Poland’s provincial capital cities. The problem of the unavailability or inaccuracy of data concerning the housing market may be approached using listings (asking) data, thus analysing the market’s supply side. More research has emerged in recent years that compared housing price indices based on listings and transactions in the sales market. The studies (Anenberg & Laufer, 2017; Ardila et al., 2021; B. Wang, 2021) indicate the high accuracy of the listings-based price indices and their anticipatory nature. Taking advantage of the dataset for the local housing market (Poznan), we have compared the results based on the listings and transactions (the time scope 2000–2021). The additional tests on transaction data carried out in the case of Poznań confirm the results achieved based on the listing data.

Similar to other papers (Campbell et al., 2009; R. Liu et al., 2017; Mikhed & Zemčík, 2009), we tested whether house prices dissociate from their fundamental values embodied by rents. First, we adopted the gross housing return approach derived from the Gordon growth formula and calculated the listing-based price-to-rent ratio for Poznan in 2000–2022. Then, we tested for exuberance periods. The results are presented in the Fig. 5.

In principle, the housing bubble tests based on the price-rent ratio also provide evidence of exuberance in Poznan during the housing boom in 2007. The overall duration of the bubble period was the same. Still, it started one quarter earlier than in the case of the housing bubble identified based on the price-to-income relation investigated in this paper.

4.3. Discussion

Empirical findings, confirmed by robustness tests, provide compelling evidence of the presence of the housing bubble in all major cities in Poland shortly before the housing meltdown in 2008. This is in line with the overwhelming majority of the literature that addressed the formation of the housing bubble in different countries before the Global Financial Crisis (Case & Shiller, 2003; Caspi, 2015; L. Chen, 2011; Y.-H. Chen & Fik, 2017; Kim & Lim, 2016; Mikhed & Zemčík, 2009; Moons & Hellinckx, 2019; Tsai, 2015; Tsai & Peng, 2011).

Despite previous evidence that a substantial decrease in interest rates and policy uncertainty may contribute to bubble formation (Pavlidis, Martínez-García, & Grossman, 2019), we have not found strong evidence for a housing bubble in Poland during the turmoil caused by the Covid-19 pandemic. One explanation is the tightening of monetary policy in Poland that followed a relatively short period of monetary easing during the first wave of pandemics.

Recent house price dynamics in Poland were significantly affected by exogenous factors, such as the Covid-19 pandemic (Trojanek et al., 2021) and related economic and monetary policies (Głuszak & Belniak, 2020), and more recently by War in Ukraine (Trojanek & Gluszak, 2022). Therefore, despite explosive house price increases in major Polish cities, the research has not provided convincing results for the presence of a housing bubble in Poland since the outbreak of the Covid-19 pandemic.

The research has some limitations. Firstly, we investigated the behaviour using house price indices using housing offers. Secondly, due to serious lags in official statistical data on economic, financial and social factors that are fundamental drivers of house prices, we relied on basic fundamental relations such as the price-to-income ratio or price-to-rent ratio. We did not decompose either of the empirical indicators into the fundamental and non-fundamental components – the latter to be used in the bubble detection procedure. We decided against the approach advocated by Tomal (Tomal, 2021a), so we could identify the presence of the housing bubble (or rather its absence) following the Covid-19 pandemic and the recent Russian invasion of Ukraine.

There are some apparent directions for further research. Firstly, provided empirical data is available, it is plausible to extend the methodology using the framework described by Tomal. Secondly, an interesting empirical question that remains relatively understudied relates to possible bubble formation within different housing submarkets within respective cities – defined by location (centre vs suburbs) or quality (luxury vs sub-standard). Thirdly, the sample of cities could be expanded to include smaller housing markets where housing dynamics may be less or more explosive than in major metropolitan areas. Finally, popular tourist destinations in the Tatra mountains (Zakopane) and the Baltic coastline (Sopot) are an interesting class of cities that could exhibit a propensity for housing bubbles.

5. Conclusions

In the paper, we tested for the housing bubbles in major Polish cities from 2000 to 2022. First, we investigated the dynamics of price-to-income ratios and tested whether house prices deviate from their fundamentals embodied by household incomes. Then, we compared it to price-to-rent ratios dynamics using a rigorous housing bubble detection methodology proposed in the early 2010s (Phillips et al., 2011) and further refined in recent years (Phillips et al., 2015; Phillips & Shi, 2020).

The first robust result of our study concerns the presence of the housing bubble during the housing boom just before the 2008 Financial Crisis. We observed explosive behaviour in regional housing markets in 2006–2007 in all cities in Poland we examined. The bubble periods in regional cities differed in length and exact timing. Nevertheless, the results align with prior evidence from other countries, which provides additional support for the claim that the housing bubble in 2007 was a global phenomenon.

The results build on the previous findings on housing bubble formation in Poland by Tomal (Tomal, 2021a) and Zelazowski (Zelazowski, 2016). In particular, we used a considerably longer study period that goes back to 2000 and critically assessed the formation of the housing bubble in 2006–2007.

Most importantly, in this paper we addresse d potential price bubble formation during the Covid-19 pandemic and even more recent War in Ukraine. Contrary to some popular beliefs expressed in the media we have not observed signs of explosive behaviour in Polish cities in 2018–2022. Therefore, we conclude that compared to robust evidence on the first housing bubble between 2006 and 2007, there is no strong support for the existence of the housing bubble in recent years.

The value added to the paper is straightforward. It is one of the few empirical studies that address the housing bubble problem in the context of the Covid-19 pandemic. To our best knowledge, it is the first test of the explosive behaviour of house prices since the beginning of the War in Ukraine.

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Figures

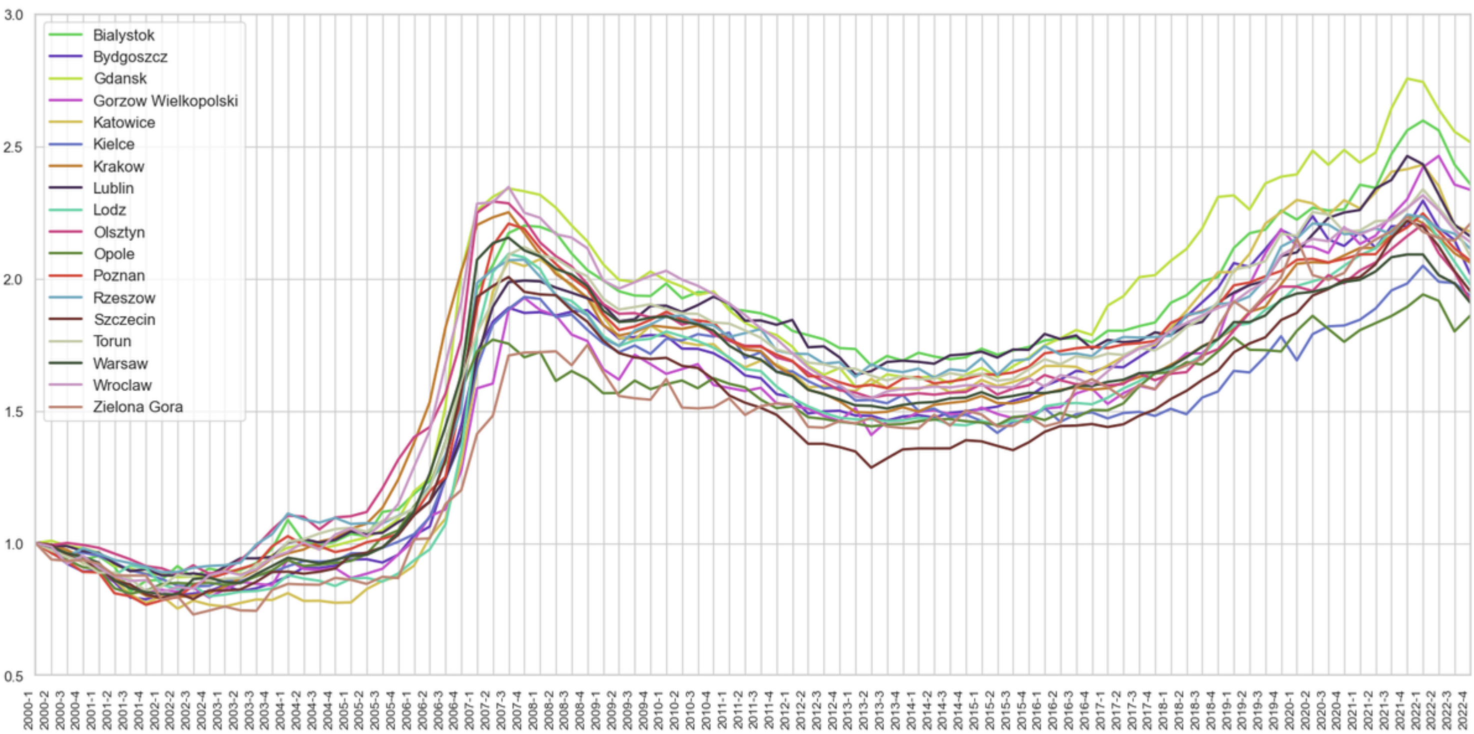

Figure 1

Real HPI for provincial capital cities in Poland for Q1 2000 - Q4 2022 (Q1 2000 = 1)

Source: Trojanek (2022)

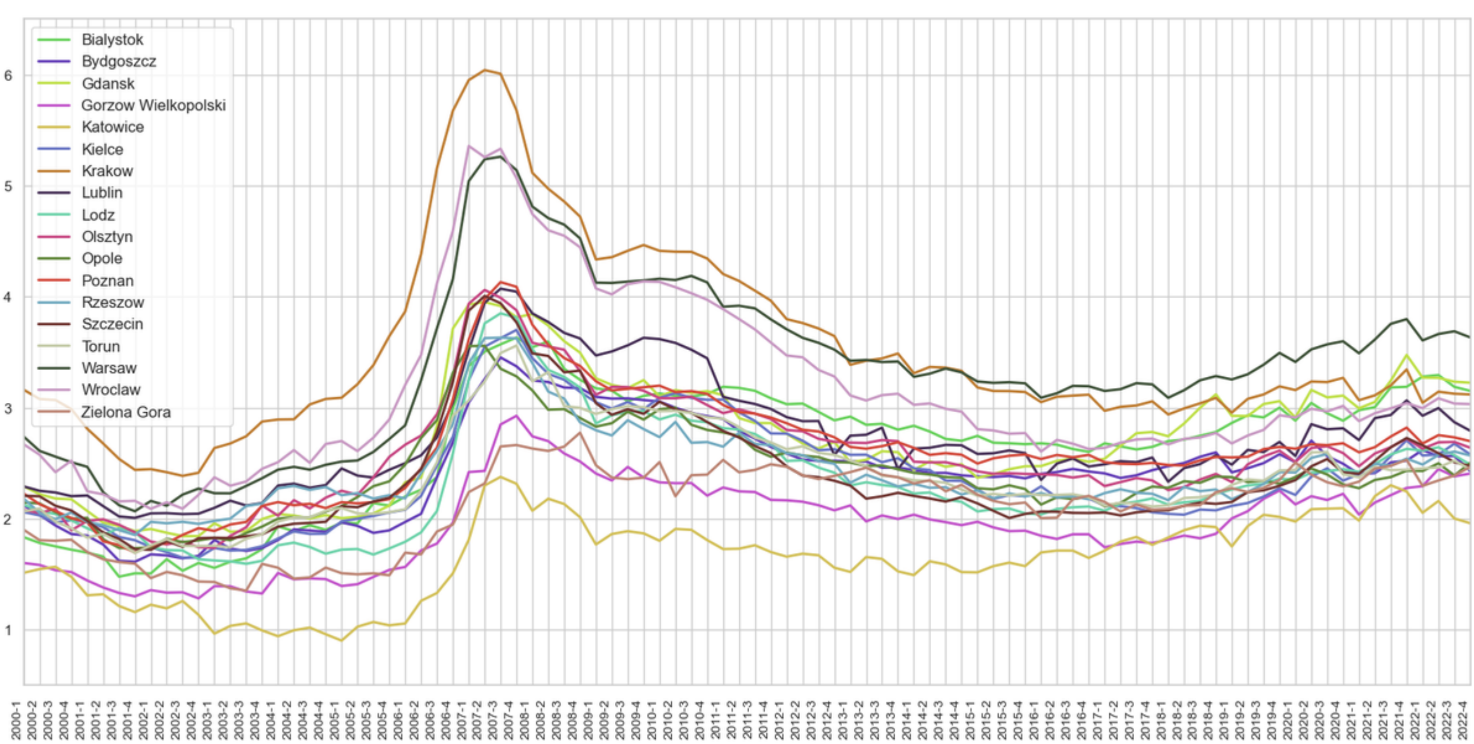

Figure 2

Price to income ratio in provincial capital cities in Poland for Q1 2000 - Q4 2022 (Q1 2000 = 1)

Source: Own research

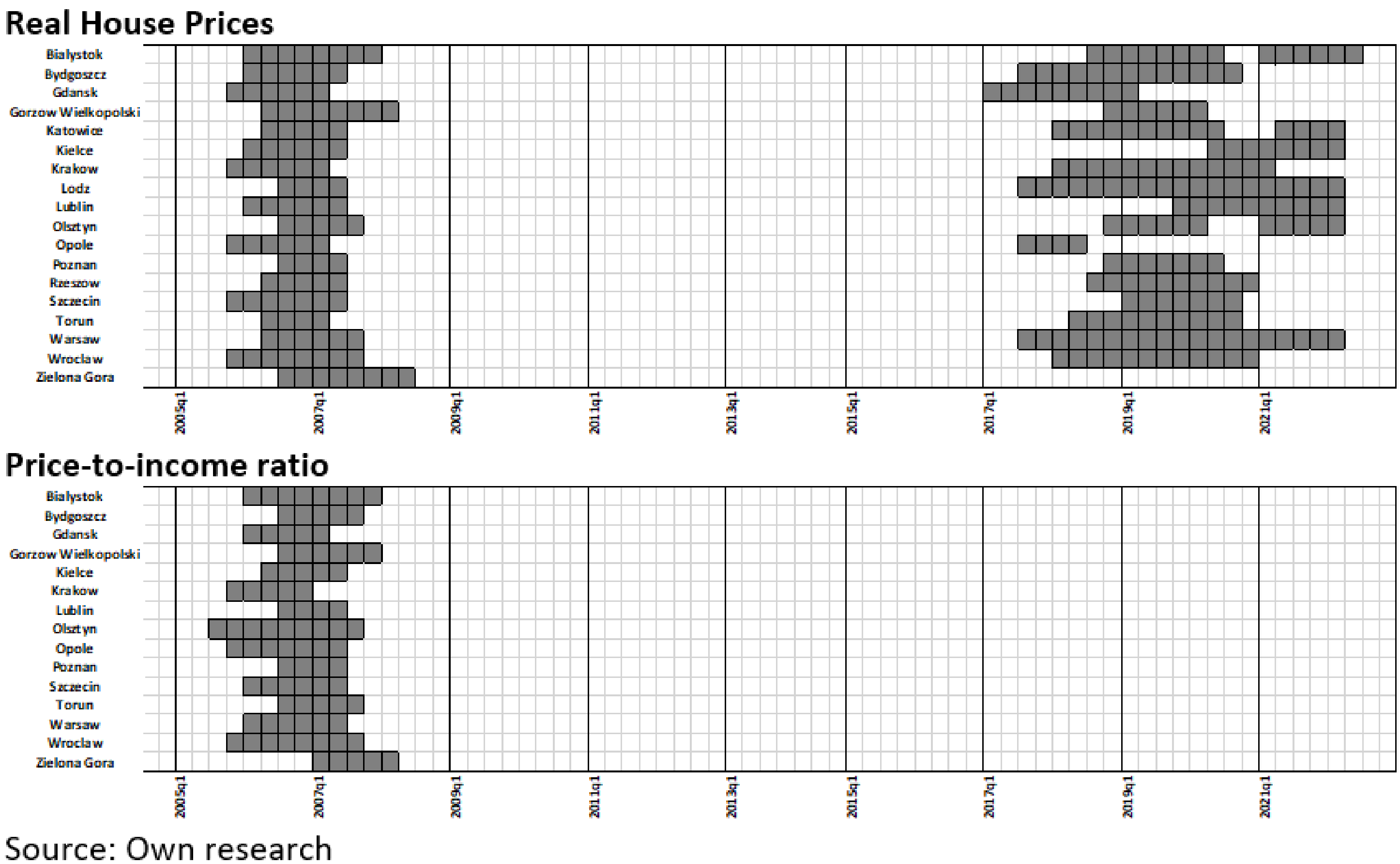

Figure 3

Date-Stamping with Real House Prices and the Price-to-Income Ratio Across Cities

Source: Own research

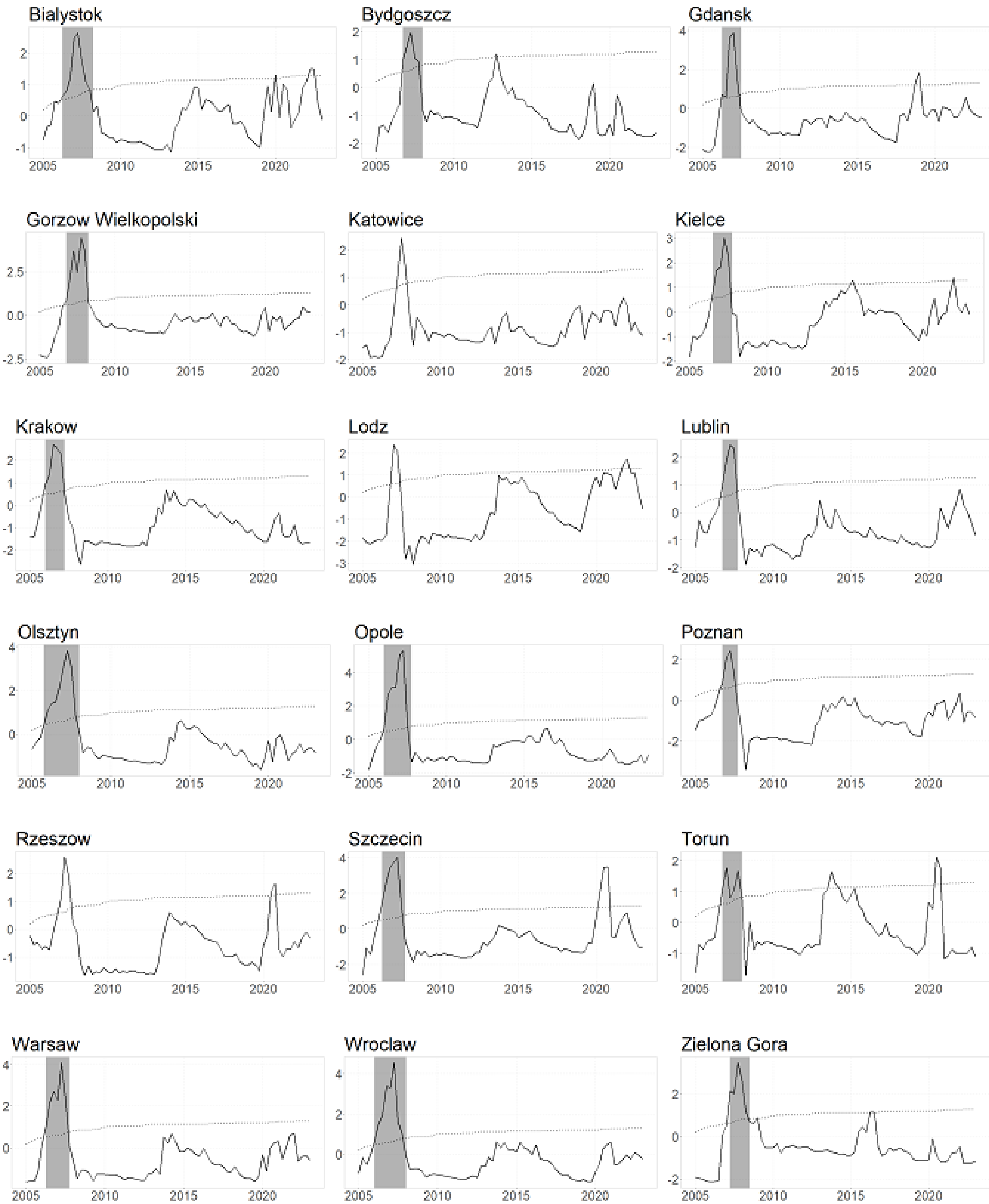

Figure 4

Identified explosive (grey bars) movements (minimum duration four quarters) of price-to-income ratios in Polish major housing markets

Source: Own research

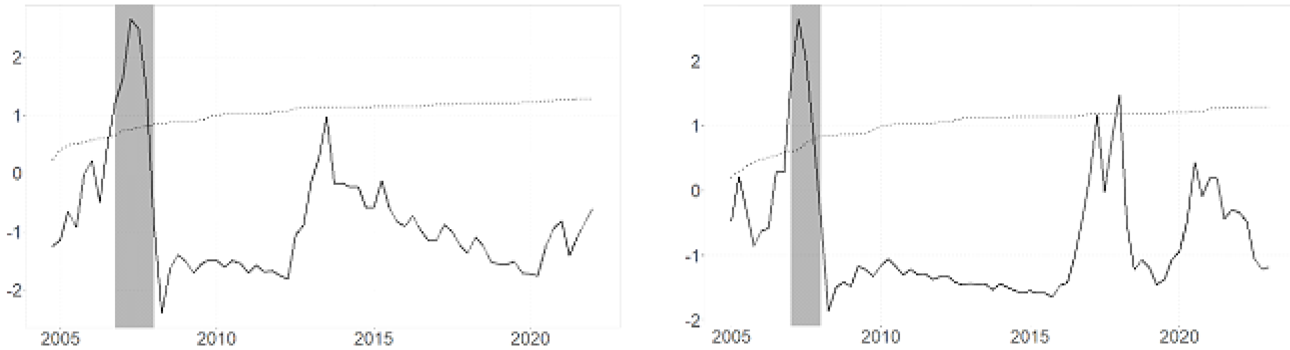

Figure 5

Identified explosive (grey bars) movements (minimum duration four quarters) of price-to-income (left panel) and price-to-rent (right panel) ratios in Poznan

Source: Own research

Supplementary Files

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- Appendix.docx