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Developments and convergence of real housing prices in Poland during the COVID-19 pandemic: focus on voivodeship capitals

Summary. The paper aims to present and assess the changes in real housing prices in Poland during the COVID-19 pandemic. We analyse transaction prices of residential premises in a multi-family housing (apartments) in the primary and secondary markets within 16 administrative capitals of voivodeships. We use quarterly data on House Prices Database collected by the National Bank of Poland and data on quarterly price indices of consumer goods and services from Statistics Poland. The research period covers the period 2018-2021, with distinction into COVID-19- and pre-COVID-19 periods. We observe the highest housing prices in Warszawa, Gdańsk, Kraków, and Wrocław, while the lowest in Zielona Góra and Kielce. Surprisingly, the growth rate in real housing prices in the pandemic sub-period is lower than in corresponding pre-COVID-19 period. In the COVID-19 sub-period, we observe the most significant increases in real estate prices in Zielona Góra and Szczecin in the primary market, and Kraków, Lublin, and Łódź in the secondary market. Additionally, we reveal the existence of regional price convergence in the housing market in analysed cities, both in primary and secondary markets. However, we do not observe a common price convergence, but only convergence clubs (city-groups) where the housing prices tend to converge in the COVID-19 sub-period.

Key words: real estate market, housing prices, regional price convergence in housing market, COVID-19, voivodeship capitals, Poland

Introduction

The COVID-19 pandemic is the most defining economic and social event in decades, as it has both caused millions of infections and deaths and rocked the global economy¹. Governments and central banks worldwide have responded to the COVID-19 pandemic and the economic crisis using both fiscal and monetary tools on an unprecedented scale².

¹ K. Czech, M. Wielechowski, P. Kotyza, I. Benešová, A. Laputkowa: Shaking Stability: COVID-19 Impact on the Visegrad Group Countries' Financial Markets, *Sustainability* 12 (15), 2020, p. 1-18.

² E. Benmelech, N. Tzur-Ilan: The Determinants of Fiscal and Monetary Policies During the COVID-19 Crisis, National Bureau of Economic Research, July 2020, <http://www.nber.org/papers/w27461.pdf> (access: 30.10.2021).

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Fiscal policy has played a pivotal role given the nature of the shock and a public health emergency with massive real effects³. The economic crisis spurred by the novel coronavirus global rapid spread confronts central banks with an unseen challenge⁴. Negative interest rates have become a new phenomenon⁵. In the initial phase of the novel coronavirus pandemic, the National Bank of Poland substantially eased its monetary policy, what with the parallel decrease in credit demand, led to the gradual interest rates cuts⁶.

Price changes during COVID-19 have been affected in a multifaceted manner by different demand and supply factors⁷. Household measures of inflation expectations jumped substantially during the novel coronavirus pandemic⁸. The empirical findings from the European Union countries indicate that the exchange rate, money supply ratios, and neighbourhood relations have led to an increase in inflation⁹. Domestic policies in the Central and Eastern European countries remain crucial in managing actual and expected inflation, regardless of the adopted monetary policy regime¹⁰. Unfortunately, Poland belongs to the inflation leaders in the EU.

Our study deals with the effects of pandemics on the real estate market, particularly housing prices. The COVID-19 pandemic has modified the people's way of life towards seeking new places to live or new sociality types. One of the most involved sectors in the rethinking of living spaces is the real estate market¹¹. Liu and Su¹², analysing the U.S. housing market, reveal that the pandemic reduced the housing demand in central city neighbourhoods and neighbourhoods with higher population density. According to them, it is due to the less need of living near the workplace and financial reasons.

³ E. Alberola, Y. Arslan, G. Cheng, R. Moessne: Fiscal Response to the COVID-19 Crisis in Advanced and Emerging Market Economies *Pac Econ Rev* 26.4, 2021, p. 459-468.

⁴ S. Lang, W. Schadner: The Trilemma of Expansionary Monetary Policy in the Euro Area during the COVID-19 Crisis, *Finance Research Letters* 42, 102048, 2021, p.1-4.

⁵ J. Henk von Eije: Negative Interest Rates, COVID-19, and the Finances of Listed Euro Firms, *SSRN Journal*, 2021, <https://www.ssrn.com/abstract=3886064> (access: 30.10.2021).

⁶ A. Daniłowska: The Impact of the COVID19 Pandemic on the Credit Market in Poland, *ERSJ XXIV*, Issue 3, 2021, p. 229-240.

⁷ D. O'Brien, C. Dumoncel, E. Goncalves: The role of demand and supply factors in HICP inflation during the COVID-19 pandemic – a disaggregated perspective. *ECB Economic Bulletin*, Issue 1/2021, https://www.ecb.europa.eu/pub/economic-bulletin/articles/2021/html/ecb.ebart202101_02~7c3bd48751.en.html (access: 30.10.2021).

⁸ B.H. Meyer, B. Prescott, X.S. Sheng: The Impact of the COVID-19 Pandemic on Business Expectations, *International Journal of Forecasting*, S0169207021000509, 2021, p. 1-50.

⁹ S. Erdođan, D.C. Yildirim, A. Gedikli: Dynamics and Determinants of Inflation During the COVID-19 Pandemic Period in European Countries: A Spatial Panel Data Analysis, *Düzce Týp Fakóltesi Dergisi* 2020, <https://dergipark.org.tr/en/doi/10.18678/dtfd.794107> (access: 30.10.2021).

¹⁰ Y. Xu, Z. Liu, Ch. Su, J. Ortiz: Causality between Actual and Expected Inflation in Central and Eastern Europe: Evidence Using a Heterogeneous Panel Analysis, *Eastern European Economics* 59.2, 2021 p. 148-170.

¹¹ P. De Toro, F. Nocca, F. Buglione: Real Estate Market Responses to the COVID-19 Crisis: Which Prospects for the Metropolitan Area of Naples (Italy), *Urban Science* 5.1 23, 2021, p. 1-31.

¹² S. Liu, Y. Su: The Impact of the COVID-19 Pandemic on the Demand for Density: Evidence from the U.S. Housing Market, *Economics Letters* 207, 110010, 2021, p. 1-4.

Additionally, the COVID-19 pandemic has directly disrupted the supply of raw materials and human resources in the real estate market¹³. Changes in global markets and shortages of raw materials have resulted in a significant increase in building materials prices, affecting entire construction costs¹⁴.

Francke and Korevaar¹⁵, and Ambrus et al.¹⁶, based on historical outbreaks of the plagues, find a negative impact of the pandemic on house prices. Moreover, Wong¹⁷ observes the price declines of housing during SARS epidemic in Hong Kong.

Some studies, focusing on the initial phase of COVID-19 (January-March 2020), observe the negative impact of the novel coronavirus pandemic on real estate prices. Gupta et al.¹⁸, based on data from most U.S. metropolitan areas, show that the novel coronavirus pandemic has caused a decline of house prices and rents in city centres and an increase in house prices and rents away from the centres. Brueckner et al.¹⁹ and Davis et al.²⁰ examine changes in residential valuations as an effect of working from home across cities. Hu et al., using the daily hedonic housing price index for five Australian capital cities at the first stage of the COVID-19 spread, reveal a negative relationship between prior COVID-19 cases and daily housing returns²¹. Kaynak et al.²², for the city level in Turkey, show that the COVID-19 pandemic has a negative effect on abnormal returns of residential prices during the novel coronavirus pandemic. Del Giudice et al.²³, analysing Campania Region in Italy, document substantial decreasing house prices.

¹³ N. HA: Factors Affecting Real Estate Prices During the COVID-19 Pandemic: An Empirical Study in Vietnam, *The Journal of Asian Finance, Economics and Business* 8.10, 2021, p. 159-164.

¹⁴ <https://constructionmarketexperts.com/en/news/building-material-prices-are-still-on-the-rise/> (access: 30.10.2021).

¹⁵ M. Francke, M. Korevaar: Housing Markets in a Pandemic: Evidence from Historical Outbreaks, *Journal of Urban Economics* 123, 103333, 2021, p. 1-12.

¹⁶ A. Ambrus, E. Field, R. Gonzalez: Loss in the Time of Cholera: Long-Run Impact of a Disease Epidemic on the Urban Landscape, *American Economic Review* 110.2, 2020, p. 475-525.

¹⁷ G. Wong: Has SARS Infected the Property Market? Evidence from Hong Kong, *Journal of Urban Economics* 63.1, 2008, p. 74-95.

¹⁸ A. Gupta, V. Mittal, J. Peeters, S. Van Nieuwerburgh: Flattening the Curve: Pandemic-Induced Revaluation of Urban Real Estate (Cambridge, MA: National Bureau of Economic Research, April 2021), <http://www.nber.org/papers/w28675.pdf> (access: 30.10.2021).

¹⁹ J. Brueckner, M. Kahn, G. Lin: A New Spatial Hedonic Equilibrium in the Emerging Work-from-Home Economy? (Cambridge, MA: National Bureau of Economic Research, March 2021), <http://www.nber.org/papers/w28526.pdf> (access: 30.10.2021).

²⁰ M. Davis, A. Ghent, J. Gregory: The Work-from-Home Technology Boon and Its Consequences, (Cambridge, MA: National Bureau of Economic Research, February 2021), <http://www.nber.org/papers/w28461.pdf> (access: 30.10.2021).

²¹ M.R. Hu, A.D. Lee, D. Zou: COVID-19 and Housing Prices: Australian Evidence with Daily Hedonic Returns, *Finance Research Letters* 101960, 2021, p. 1-8.

²² S. Kaynak, A. Ekinci, H.F. Kaya: The Effect of COVID-19 Pandemic on Residential Real Estate Prices: Turkish Case, *QFE* 5.4, 2021, p. 623-639.

²³ V. Del Giudice, P. De Paola, F.P. Del Giudice: COVID-19 Infects Real Estate Markets: Short and Mid-Run Effects on Housing Prices in Campania Region (Italy), *Social Sciences* 9.7, 114, 2020, p. 1-18.

Moreover, D’Lima et al²⁴., using micro-level data on U.S. residential property transactions, reveal the pricing effect in housing market following the government anti-COVID-19 responses during the first wave of the pandemic. They find that house prices depend on population density (prices fell in densely populated locations but increased in low-density locations) and the size of the properties (prices decreased more in the case of smaller properties).

However, the following months of the COVID-19 pandemic brought a change in the house price trend, i.e., an increase in prices. Based on the U.S., Zhao²⁵ observes the housing market’s recovery after April 2020, mainly increasing real estate prices and intensified housing demand. Wang²⁶ also observe the similar trend. Yiu²⁷, conducting a five-country study, reveals that the increase in house prices during COVID-19 is affected by the changes in real interest rates; precisely, a 1% decrease in the real interest rate causes a 1.5% increase in house prices. According to Knight Frank’s Global House Price Index, house prices have been rising at the fastest rate since the pre-global financial crisis period²⁸. The COVID-19-induced global housing boom has led to the house prices increase by 9,2% in the year (based on data from 55 countries worldwide in the period June 2020-June 2021)²⁹. House prices reaction is mainly driven by national expansionary monetary and fiscal policies, which have been globally introduced to revive the economic activity. It corresponds with the IMF findings that house prices are synchronized across countries and are affected by global interest rate shocks³⁰. Chahrour and Gaballo³¹ present the idea that house price changes may drive rational waves of optimism and pessimism in the economy. According to their model, a house price increase caused by aggregate disturbances may be misinterpreted as a sign of higher local permanent income, leading households to demand more consumption and housing.

The theory of price convergence in housing markets assume that housing prices at the regional or international level tend to achieve a state of stable equilibrium³². Holmes

²⁴ W. D’Lima, L.A. Lopez, A. Pradhan: COVID-19 and housing market effects: evidence from US shut-down orders. Available at SSRN 3647252, 2020, p. 1-48.

²⁵ Y. Zhao: US housing market during COVID-19: aggregate and distributional evidence, IMF Working Paper No. 2020/212, 2020, p. 1-37.

²⁶ B. Wang: How Does COVID-19 Affect House Prices? A Cross-City Analysis, *JRFM* 14.2, 47, 2021, p. 1-15.

²⁷ Ch. Yim Yiu: Why House Prices Increase in the COVID-19 Recession: A Five-Country Empirical Study on the Real Interest Rate Hypothesis, *Urban Science* 5.4, 77, 2021, p. 1-14.

²⁸ Knight Frank, Global House Price Index Q2 2021, <https://content.knightfrank.com/research/84/documents/en/global-house-price-index-q1-2021-8146.pdf> (access: 30.10.2021).

²⁹ Knight Frank, Global House Price Index Q1 2021, <https://content.knightfrank.com/research/84/documents/en/global-house-price-index-q2-2021-8422.pdf> (access: 30.10.2021).

³⁰ M. Katagiri, C. Raddatz: House price synchronization and financial openness: A dynamic factor model approach. *International Monetary Fund*, 2018, p. 1-14.

³¹ R. Chahrour, G. Gaballo: Learning from House Prices: Amplification and Business Fluctuations, *The Review of Economic Studies*, 88.4, 2021, p. 1720-1759.

³² K. Żelazowski: Convergence of Housing Markets: European Perspective, *Folia Oeconomica Stetinensia* 18.2, 2018, p. 190-202.

et al.³³ and Kim and Rous³⁴, based on the U.S. market, confirm the existence of long-run regional house price convergence. Tomal³⁵ and Żelazowski³⁶, analysing housing prices in voivodeship capitals in Poland, does not reveal a common price convergence in the long-run. However, he observes convergence clubs (city-groups) in primary and secondary markets where the housing prices tend to converge.

Our contribution is that by calculating real housing prices, we assess the changes in housing prices in voivodeship capitals in Poland during the COVID-19 pandemic and search for the price convergence processes on this market. Our study indicates the regional changes in the real estate market in Poland.

The paper is organised as follows: the next section describes the methodology, i.e., the study's aim, research hypotheses, and description of material and methods used. The subsequent section presents the empirical findings, and the final section offers our conclusions.

Methodology

The paper aims to present and assess the changes in real housing prices in Poland during the COVID-19 pandemic. In detail, we analyse real transaction prices of residential premises in multi-family housing (apartments) in the primary market (new construction) and secondary market (existing housing stock) within 16 administrative capitals of voivodeships.

To achieve the aim of the paper, we formulate the following research hypothesis:

H1: The growth rate of real housing prices in voivodeship capitals in Poland during the COVID-19 pandemic is higher than in the corresponding pre-COVID-19 period.

H2: We observe the regional price convergence in real estate prices in voivodeship capitals in Poland during the COVID-19 pandemic.

Analysing transaction prices of housing in 16 administrative capitals of voivodeships in Poland, we use quarterly data from the House Prices Database (BaRN) collected by the National Bank of Poland (NBP). The database is developed by sharing data by real estate agents and developers with the NBP. The obligation to provide statistical data results from the Polish law.

To calculate the real housing prices in voivodeship capitals in Poland, we divide the nominal prices by the price index of consumer goods and services. The price index of consumer goods and services is based on surveys on prices of consumer goods and services on the retail market and surveys on average expenditures of households on consumer goods and services. Statistics Poland calculates this index according to the

³³ M.J. Holmes, J. Otero, T. Panagiotidis: Investigating Regional House Price Convergence in the United States: Evidence from a Pair-Wise Approach, *Economic Modelling* 28.6, 2011, p. 2369-2376.

³⁴ Y. Se Kim, J.J. Rous: House Price Convergence: Evidence from US State and Metropolitan Area Panels, *Journal of Housing Economics* 21.2, 2012, p. 169-186.

³⁵ M. Tomal: House Price Convergence on the Primary and Secondary Markets: Evidence from Polish Provincial Capitals, *Real Estate Management and Valuation* 27.4, 2019, p. 62-73.

³⁶ K. Żelazowski: Price Convergence in the Regional Housing Markets in Poland, *Real Estate Management and Valuation* 27.2, 2019, p. 44-52.

Classification of Individual Consumption by Purpose, i.e., the classification adapted for the Harmonised Indices of Consumer Prices (HICP). Data on the index come from Statistics Poland.

To detect the process of regional price convergence among 16 voivodeship capitals in Poland, we calculate the self-developed index of housing prices. We calculate the average price per square metre of housing in Poland as the arithmetic mean of prices in individual 16 voivodeship capitals, weighted by the size of the population of each city. Data on population in 16 voivodeship capitals are up-to-date and come from Statistics Poland.

The research covers the 2018-2021 period. In the analysis, we distinguish the COVID-19 period and the corresponding pre-COVID-19 period. The COVID-19 period refers to seven quarters between the first quarter of 2020 and the third quarter of 2021. The pre-COVID-19 period represents seven quarters between the first quarter of 2018 and the third quarter of 2019.

We present research results using graphic and tabular methods, primarily mapping and Japanese candlestick charting.

Results and discussion

The macroeconomic factors having a significant impact on the real estate market in Poland during the COVID-19 pandemic include, among others, stable economic growth (despite a GDP decrease of 2.8% in 2020), high inflation (one of the highest levels in the European Union), and low level of interest rates (the Monetary Policy Council of the NBP lowered the reference rate from 1.5 to 0.1%). In Q3 and Q4 2020, a significant increase in demand for housing is observed due to historically low-interest rates and increased household wages. The pandemic contributes to the rise in the supply of housing in Poland. According to the NBP estimate, the housing stock in 16 voivodeship capitals increases by approx. 85 thousand in 2020, reaching the level of over 3.8 million premises (in the entire country, it amounted to approx. 15 million premises) at the end of 2020. However, the dynamics of the increase in the number of housings in the stock in individual centres varies and is related to the situation on regional markets. In addition, the uncertainty associated with the COVID-19 pandemic, primarily concerns about the health of loved ones and the performance of work and study remotely, resulting in a decline in interest in renting housing in Poland. This uncertainty is a reason for deciding to buy one's apartment and, consequently, resignation from further renting housing, which increases the supply of apartments for rent. The operation of all the above-mentioned factors contributes to the oversupply of the apartment rental market, resulting in increased competition among landlords, increased number of vacant spaces, and decreased rental rates³⁷.

³⁷ NBP, Raport o sytuacji na rynkach nieruchomości mieszkaniowych i komercyjnych w Polsce w 2020 r., 2021, https://www.nbp.pl/publikacje/rynek_nieruchomosci/raport_2020.pdf (access: 30.10.2021).

In the study, we analyse the real prices of housing in Poland. Thus, we consider changes in the level of prices in the Polish economy. Figure 1 depicts the prices changes in Poland in 2021-2021, measured by the levels of the quarterly price index of consumer goods and services.

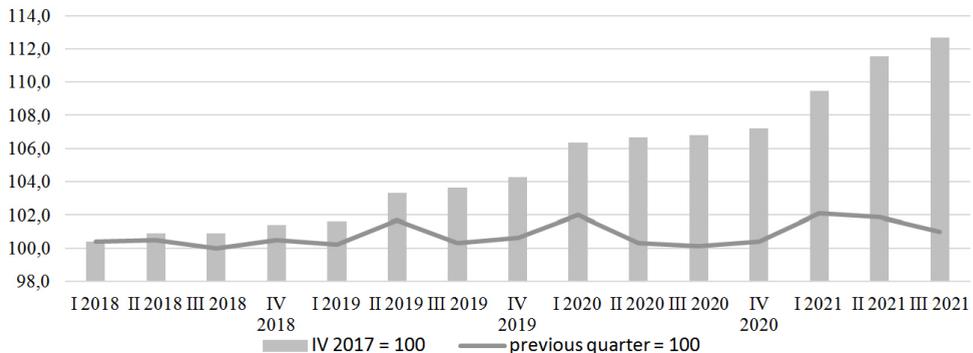


Figure 1. Quarterly price indices of consumer goods and services in Poland in 2018-2021

Source: Own calculation and elaboration based on Statistics Poland.

The data in Figure 1 show that in the entire analysed period, i.e., Q1 2018-Q3 2021, prices of consumer goods and services in Poland increase by almost 13%. The price growth dynamics differ in individual quarters. However, we observe a specific trend. In the pre-COVID-19 sub-period, the price growth rate is much lower than in the COVID-19 period, i.e., 3.6% vs. 8%, respectively. During the entire analysed period, the most significant quarterly changes in the price levels are recorded in the first quarters of 2020 and 2010, precisely about 2%. Figure 1 depicts that the COVID-19 pandemic explicitly contributes to the substantial inflation growth in Poland.

Figure 2 presents the developments in real transaction housing prices in the primary market in 16 voivodeship capitals in Poland in the 2018-2021 period, in the division into two sub-periods, i.e., pre-COVID-19 and COVID-19 periods. The Japanese candle chartings depict the real prices in PLN, while the maps present the percentage prices changes.

In the entire analysed period, 2018-2021, the highest housing prices in the primary market are recorded in Warszawa, Gdańsk, Kraków, and Wrocław, and the lowest in Zielona Góra and Kielce. Prices in Warszawa are about twice as high as in Zielona Góra. In the pre-COVID-19 sub-period, the average price per square meter of housing in analysed cities equals PLN 5950. We are observing an increase in real housing prices in the primary market in all 16 voivodeship capitals. The highest, over 20% increase in housing prices is observed in Katowice, Rzeszów, and Gdańsk, while housing prices in Olsztyn do not change. In the COVID-19 sub-period, the average real price per square meter of housing in the analysed cities is PLN 6640. The highest increases in real housing prices are

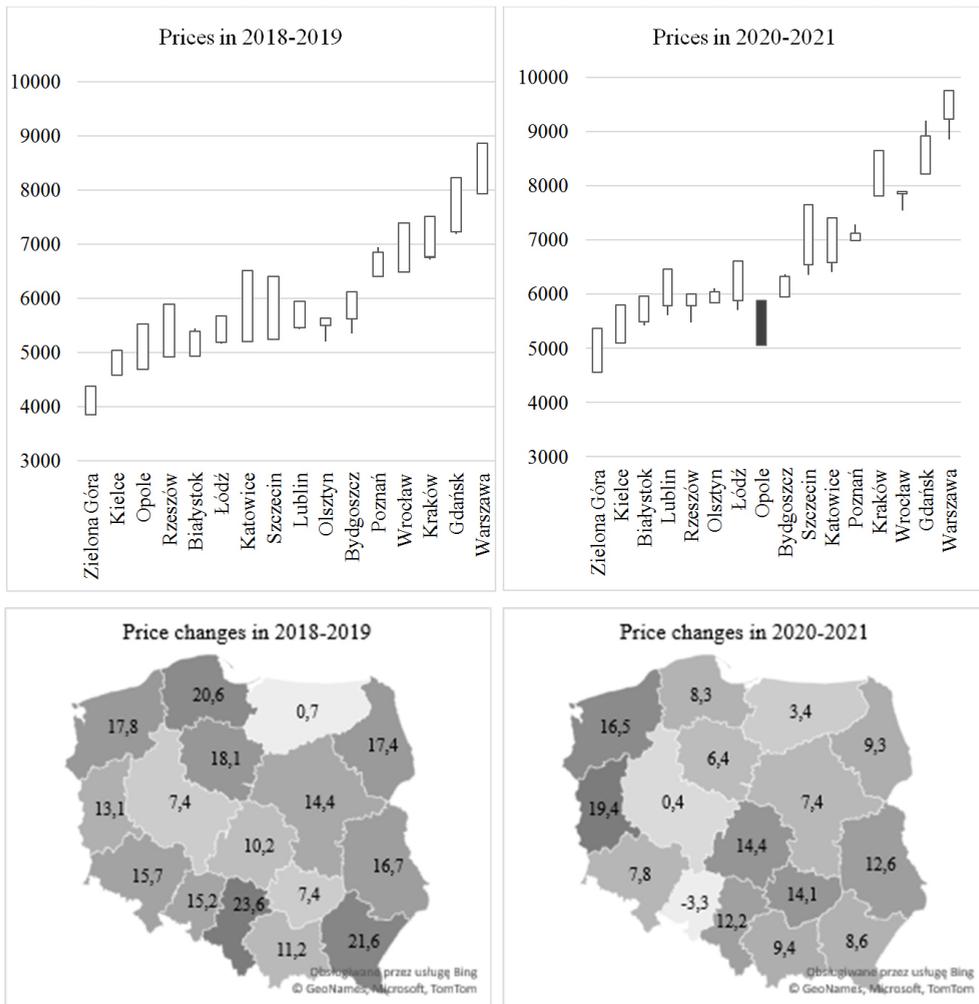


Figure 2. Real transaction housing prices in the primary market in voivodeship capitals in Poland in 2018-2021

Source: own calculation and elaboration based on the NBP House Prices Database and Statistics Poland.

recorded in Zielona Góra, Szczecin, Łódź, and Kielce, over 14%. The real price of housing unexpectedly drops in Opole, while in Poznań, the price hardly changes. The average increase in real housing prices in the pre-COVID-19 period is almost 15%, and surprisingly in the COVID-19 period equals only 9%. In the case of 12 voivodeship capitals, housing prices increase more in the pre-COVID-19 period.

Figure 3 presents the developments in real transaction housing prices in the secondary market in 16 voivodeship capitals in Poland in the 2018-2021 period, in the division into two sub-periods, i.e., pre-COVID-19 and COVID-19 periods.

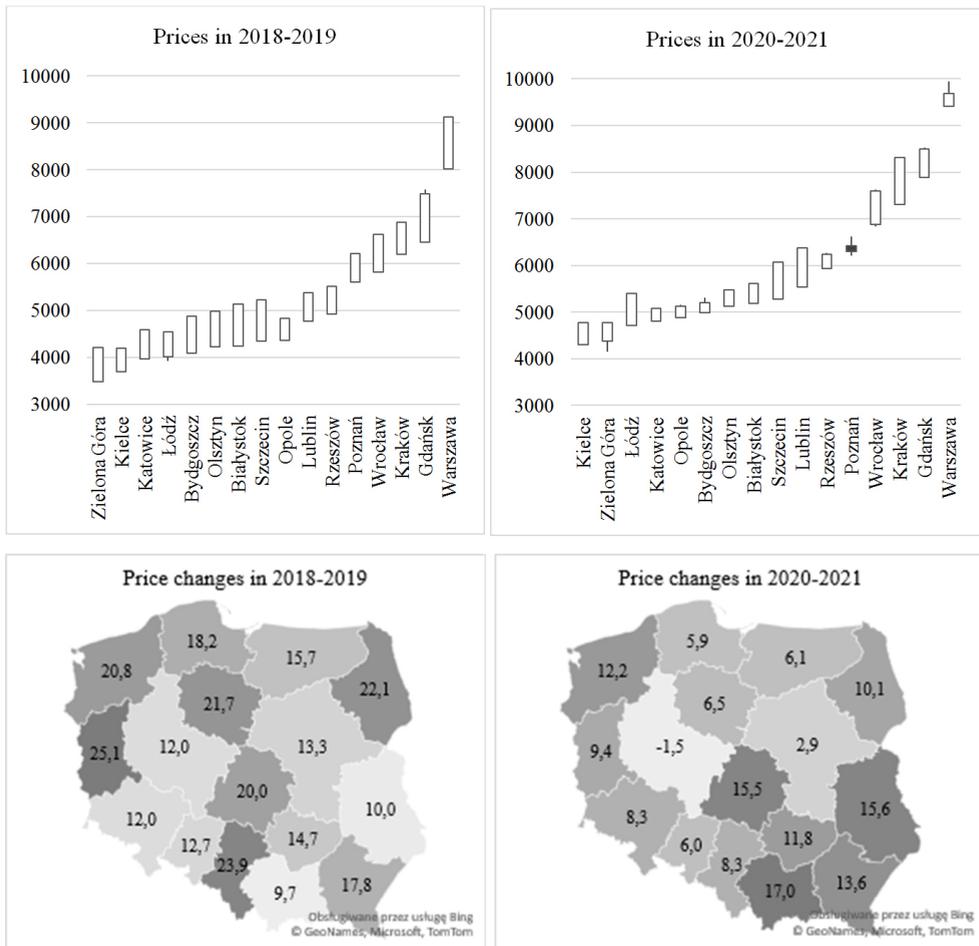


Figure 3. Real transaction housing prices in the secondary market in voivodeship capitals in Poland in 2018-2021

Source: own calculation and elaboration based on the NBP House Prices Database and Statistics Poland.

As in the primary market, during the entire analysed period 2018-2021, the highest real housing prices in the secondary market are recorded in Warszawa, Gdańsk, Kraków, and Wrocław. However, in the secondary market, the price difference between Warszawa and other analysed cities is even more substantial. The lowest prices are recorded in Zielona Góra and Kielce. In the pre-COVID-19 sub-period, the average real price per square meter of housing in the analysed cities equals PLN 5260. We observe an increase in real housing prices in all 16 voivodeship capitals. We observe an over 20% increase in housing prices in Zielona Góra, Katowice, Białystok, Bydgoszcz, Szczecin, and Łódź. In Kraków and Lublin, this increase amounts to only 10%. In the COVID-19 sub-period, the average real price per square meter of housing in the secondary market in the

analysed cities is PLN 6075. We record the most significant increase in real housing prices in Kraków, Lublin, and Łódź, precisely over 15%. Unexpectedly, in Poznań, we observe a decrease in the real housing price, and in Warszawa, the increase equals less than 3%. The average increase in the housing prices in the secondary market in the pre-COVID-19 period is 17 %, and surprisingly in the COVID-19 period - only 9%. In 13 out of 16 voivodeship capitals, real housing prices rise much faster before the COVID-19 outbreak.

Overall, both in the pre-COVID-19 and COVID-19 periods, real housing prices in the primary market are substantially higher than those in the secondary market, i.e., by 13 and 9%, respectively.

Our research results do not confirm the first research hypothesis that the growth rate of real housing prices in voivodeship capitals in Poland during the COVID-19 pandemic is higher than in the corresponding pre-COVID-19 period. Nevertheless, our study results correspond to Zhao³⁸, and Wang³⁹, who observe the increase in housing prices during the COVID-19 pandemic. We agree with Yiu⁴⁰ that the interest rate policy mainly drives the process. Additionally, we are consistent with Chahrour and Gaballo's⁴¹ statement that housing price changes might reflect the level of optimism and pessimism in the economy.

Our next task is to detect the existence and assess the process of the regional price convergence in the housing market in analysed voivodeship capitals. Table 1 results show the values of the housing price index for the primary and secondary markets in the analysed voivodeship capitals in the 2018-2021 period.

Analysing the values of the housing price index for the primary market, we see that housing prices in Warszawa are about 25% higher than the average price in 16 voivodeship capitals. The levels of the housing price index for Gdańsk, Kraków, Wrocław, and Poznań are also above the average. On the other hand, the lowest index levels are recorded in the case of Zielona Góra, Opole, Kielce, Rzeszów, and Białystok, i.e., less than 80% of the average housing price in 16 analysed cities. Table 1 results depict the existence of regional housing price convergence in most of the analysed voivodeship capitals. During the COVID-19 pandemic, the price index level increases the most in the case of Szczecin, Katowice, and Białystok, by 8.4, 4.9, and 4.2 percentage points, respectively. In addition, we record an increase in the index level in Łódź, Zielona Góra, Kielce, and Rzeszów. Moreover, we observe a slight decrease in the housing price index values for voivodeship capitals with the highest price per square meter of housing in the primary market, i.e., Gdańsk, Warszawa, and Wrocław. However, we also reveal a process of regional price

³⁸ Y. Zhao: US housing market during COVID-19: aggregate and distributional evidence, 2020, p. 1-37.

³⁹ H. Wong: Has SARS Infected the Property Market? Evidence from Hong Kong, *Journal of Urban Economics* 63.1, 2008, p.74-95.

⁴⁰ Ch. Yim Yiu: Why House Prices Increase in the COVID-19 Recession: A Five-Country Empirical Study on the Real Interest Rate Hypothesis, *Urban Science* 5.4, 77, 2021, p. 1-14. Why House Prices Increase in the COVID-19 Recession.

⁴¹ R. Chahrour, G. Gaballo, "Learning from House Prices: Amplification and Business Fluctuations", *The Review of Economic Studies* 88.4, 2021, p. 1720-1759.

Table 1. The index of housing prices in voivodeship capitals in Poland, based on real transaction prices from primary and secondary markets (the index value for Poland = 100)

Voivodeship capital	Primary market				Secondary market			
	I 2018	III 2019	IV 2020	III 2021	I 2018	III 2019	IV 2020	III 2021
Białystok	77.9	75.9	72.0	76.2	74.1	78.5	76.3	77.3
Bydgoszcz	88.7	86.2	82.5	80.8	71.4	74.6	74.1	71.7
Gdańsk	114.2	116.1	116.3	114.0	112.9	114.7	117.6	117.0
Katowice	82.2	91.7	89.7	94.6	69.3	70.2	69.9	70.1
Kielce	72.3	71.0	73.3	74.1	64.5	64.2	63.3	65.8
Kraków	107.0	105.9	108.1	110.5	108.2	105.4	105.6	114.6
Lublin	86.2	83.8	84.8	82.5	83.3	82.2	82.7	87.8
Łódź	82.1	80.0	82.0	84.5	70.0	69.6	71.8	74.3
Olsztyn	86.9	79.4	80.4	77.3	73.9	76.4	75.2	75.4
Opole	74.1	77.9	73.9	64.6	76.1	73.9	71.8	70.6
Poznań	101.3	96.6	94.5	91.0	97.9	95.2	92.3	86.7
Rzeszów	77.6	83.0	76.1	76.7	86.1	84.3	87.3	86.0
Szczecin	82.8	90.3	89.1	97.7	75.8	79.9	79.7	83.6
Warszawa	125.4	125.0	126.7	124.7	140.1	139.7	138.7	133.4
Wrocław	102.5	104.2	101.9	100.9	101.7	101.3	103.7	104.7
Zielona Góra	60.8	61.7	66.2	68.6	60.9	64.3	62.0	65.7

Source: own calculation and elaboration based on the NBP House Prices Database and Statistics Poland.

divergence of housing in several analysed cities. We observe the most significant decrease in the value of the analysed index in Opole, almost 10 pp. Additionally, we notice a similar tendency in Poznań, Olsztyn, Lublin and Bydgoszcz.

When analysing the values of the housing price index for the secondary market, we observe similar trends as in the primary market. Prices in Warszawa are over one-third higher than the average for 16 voivodeship capitals. Moreover, the housing price index is above average in the case of Gdańsk, Kraków, and Wrocław. In the case of Zielona Góra and Kielce, the index reaches the lowest values, i.e., below 70% of the average. Similarly to the primary market, we observe the process of regional price convergence of housing in 10 analysed voivodeship capitals (Lublin, Szczecin, Zielona Góra, Łódź, Kielce, Białystok, Olsztyn, Katowice as well as Warszawa and Gdańsk). However, in the case of the remaining cities, we reveal the divergence process in the housing market. During the COVID-19 epidemic, the housing price index in Krakow increased by almost 10%.

We confirm the existence of regional price convergence in the housing market in analysed cities, both in primary and secondary markets. It is consistent with the second hypothesis. However, we do not observe a common price convergence, but only

convergence clubs (city-groups) where the housing prices tend to converge in the COVID-19 sub-period. Our results are in line with Tomal⁴² and Żelazowski⁴³, who reveal the process only in the case of given convergence clubs, not for all analysed voivodeship capitals.

Conclusions

The COVID-19 pandemic changes the real estate market in Poland. We observe the highest real housing prices in Warszawa, Gdańsk, Kraków, and Wrocław, while the lowest in Zielona Góra and Kielce. In the pre-COVID-19 and COVID-19 periods, real housing prices in the primary market are substantially higher than those in the secondary market. In the COVID-19 sub-period, we observe the most significant increases in real estate prices in Zielona Góra and Szczecin in the primary market, and Kraków, Lublin, and Łódź in the secondary market. Surprisingly, the growth rate in real housing prices in the COVID-19 sub-period is lower than in corresponding pre-COVID-19 period. Moreover, we reveal the existence of regional price convergence in the housing market in analysed cities, both in primary and secondary markets. However, we do not observe a common price convergence, but only convergence clubs (city-groups) where the housing prices tend to converge in the COVID-19 sub-period.

Finding and analysis of socio-economic determinants of the regional differences in developments in real housing prices in Poland stand as a challenge for future research.

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