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The Role of Economic Factors and Government Policies in the Development of the Polish Housing Market

Abstract

Objective: The objective of this study is to empirically examine the combined effects of macroeconomic demand-side determinants and policy interventions within a unified analytical framework, focusing on the housing markets of Warsaw, Kraków and Wrocław.

Methodology: The analysis employs a quantitative research design based on a fixed-effects panel data regression model using quarterly data from 2014Q1 to 2024Q4. Housing prices on the secondary market serve as the dependent variable, while income, interest rates, unemployment and policy implementation are included as explanatory variables. Data are sourced from the National Bank of Poland (NBP) and the Central Statistical Office (GUS). Model diagnostics address multicollinearity, serial correlation and cross-sectional dependence, with Driscoll–Kraay standard errors applied to ensure robustness.

Findings: The results indicate that income is the primary driver of housing prices in major Polish cities, confirming the importance of demand-side economic fundamentals. Unemployment also exhibits a statistically significant positive relationship with housing prices, reflecting atypical market dynamics during periods of economic shocks, including the COVID-19 pandemic and geopolitical events in Eastern Europe. Interest rates do not show a statistically significant effect. Contrary to initial expectations, the introduction of government housing policies is associated with a short-term decline in housing prices, suggesting delayed or indirect policy effects rather than immediate price inflation.

Value Added: This study contributes to the literature by integrating economic determinants and housing policy variables in a unified empirical model for the Polish housing market in the post-2014 period. It extends prior research by focusing on recent data and large urban agglomerations, providing updated evidence on price formation mechanisms under conditions of economic disruption and active policy intervention.

Recommendations: The findings suggest that housing price dynamics in Poland are driven primarily by economic fundamentals rather than short-term policy measures. Policymakers should therefore account for income growth and labour market conditions when designing housing interventions. Future housing policies may benefit from improved timing, clearer targeting and alignment with prevailing market prices to enhance effectiveness and reduce unintended short-term distortions.

Key words: housing market, housing prices, economic determinants, government housing policy, panel data analysis, Polish housing market

JEL codes: R31, E24, E43, C23

Introduction

Housing is a fundamental component of both citizens' well-being and national economic stability (Brzezicka et al., 2022). Over the past decades, Poland has experienced significant fluctuations in the residential real estate market, characterised by rising prices, growing demand and increasing difficulties in accessing affordable housing (Melnychenko et al., 2022). Despite an exceptionally high home-ownership rate of 87 percent – one of the highest in the European Union (Eurostat, 2024) – housing prices in many Polish cities have almost doubled since 2014. This price growth has substantially outpaced income and wage dynamics, intensifying public debate on market overheating and the risk of speculative bubbles (Trojanek et al., 2023). Importantly, a high ownership rate does not necessarily reflect a well-functioning housing market (Narodowy Bank Polski, 2024). Poland ranks last in the EU in terms of rooms per person, with an average of only 1.1 rooms, and more than one-third of the Polish households experience overcrowding, pointing to structural deficiencies in housing availability and quality (Eurostat, 2024). These developments underscore the urgency of identifying the drivers behind housing price dynamics, as they carry significant social and macroeconomic implications.

Recent years have further intensified these pressures due to a sequence of external shocks. The SARS-CoV-2 pandemic disrupted housing market activity, initially leading to transaction stagnation, followed by a rapid increase in dwelling prices that further reduced affordability (Narodowy Bank Polski, 2022). In parallel, geopolitical developments on Poland's eastern border have exerted additional demand-side pressure. Three years after the onset of Russian aggression against Ukraine, more than 1.5 million Ukrainians reside in Poland, predominantly in large urban agglomerations (Gov.pl, 2025). A further inflow of migrants originates from Belarus; official statistics report over 100,000 legal residents, mainly concentrated in the Mazowieckie voivodeship (Gov.pl, 2023, July 12), while existing studies suggest that actual numbers may be higher due to undocumented migration flows (Petrakova, 2022). This sustained population inflow has increased housing demand in major cities, contributing to rising prices and reduced availability for both Polish nationals and incoming migrants (Trojanek & Gluszak, 2022).

In response to these challenges, successive Polish governments have implemented a range of targeted housing policies since 2014, aiming to reduce financial barriers to homeownership and improve access to housing. Programs such as *Mieszkanie dla Młodych*, *Mieszkanie Plus*, *Mieszkanie na Start*, and *Pierwsze Mieszkanie* were designed to address different aspects of housing affordability and market access (Narodowy Program Mieszkaniowy, 2016; Ustawa z dnia 27 września 2013 r. o pomocy państwa w nabyciu pierwszego mieszkania przez młodych ludzi, 2013; Ustawa z dnia 20 lipca 2018 r. o pomocy państwa w ponoszeniu wydatków mieszkaniowych w pierwszych latach najmu mieszkania, 2018; Ustawa z dnia 1 października 2021 r. o gwarantowanym kredycie mieszkaniowym i Bezpiecznym Kredycie 2%, 2021). However, these interventions have generated considerable debate regarding their actual effectiveness and potential unintended consequences, particularly in terms of price formation and demand stimulation.

Although prior research has examined housing price dynamics either through macroeconomic determinants or through the lens of housing policy interventions, studies that systematically integrate both dimensions remain scarce. This lack of comprehensive empirical evidence limits the understanding of whether observed price increases are primarily driven by economic fundamentals, policy-induced

demand effects, or the interaction between the two. Addressing this gap is particularly relevant in the Polish context, where rapid price growth coincides with repeated policy interventions and pronounced economic shocks.

Considering this background, this study investigates how selected economic factors and the introduction of government housing policies have influenced housing prices in Poland's three largest cities – Warsaw, Kraków and Wroclaw – over the period 2014–2024. The chosen timeframe captures major policy initiatives as well as significant macroeconomic and geopolitical events affecting the Polish economy and housing market. The empirical analysis is based on quantitative methods using secondary data from the National Bank of Poland (NBP) and the Central Statistical Office (GUS). The effects of key macroeconomic variables, including wages, GDP, interest rates and unemployment, alongside the introduction of housing policy measures, are examined using a panel regression framework.

The findings contribute to the literature by providing updated empirical evidence on housing price determinants in Poland's major urban markets and by explicitly integrating economic and policy-related drivers within a single analytical framework. From a practical perspective, the results offer insights for policymakers regarding the effectiveness and potential side effects of housing policy instruments, particularly in large metropolitan areas where demand pressures are most pronounced.

The remainder of the paper is structured as follows. The chapter following the introduction presents the legal background and identifies the research gap through a structured literature review. The third chapter outlines the applied methodology and data collection process. The fourth chapter presents the empirical results, followed by a discussion of the findings. The final chapter summarizes the main conclusions, outlines policy implications and discusses limitations and directions for future research.

Theoretical Background and Literature Review

Legal Background

Constitutionally, the Polish government is obliged to prioritise actions addressing housing needs, including measures aimed at improving housing accessibility and supporting citizens in securing adequate housing (Glocker & Plouin, 2016; Groeger, 2016; Matel, 2024). A pivotal turning point for the Polish housing market occurred in 1990 with the transition from a centrally planned economy to a market-based system. Although privatisation gradually improved housing availability, the overall quality and standard of housing remained significantly below European benchmarks for many years (Glocker & Plouin, 2016; Gomułka, 2016; Kisiel et al., 2021). Poland's accession to the European Union in 2004 marked another important shift, as declining domestic interest rates increased access to mortgage financing. However, according to the OECD, although lower-income households were increasingly able to purchase dwellings, they often lacked sufficient resources to cover maintenance and quality improvements, limiting the broader effectiveness of increased homeownership (Glocker & Plouin, 2016, p. 6).

In line with these constitutional obligations and the persistence of structural housing challenges, successive Polish governments introduced a range of policy initiatives aimed at improving housing conditions and affordability. The first major programme, *Rodzina na Swoim* (Family on Their Own), launched in 2006, was designed to support households unable to afford homeownership independently. Due to its growing fiscal burden, the programme was terminated in 2013, prompting policymakers to introduce new instruments intended to address evolving housing market constraints (Groeger, 2016).

From 2014 onward, a new wave of housing policies targeted broadly similar groups of beneficiaries. The *Mieszkanie dla Młodych* (Housing for the Young) programme was designed for young individuals without prior homeownership. Eligibility was restricted to individuals under 35 years of age, although this criterion did not apply to families with at least three children (Glocker & Plouin,

2016). The programme primarily targeted households capable of obtaining mortgage financing and initially applied only to the primary housing market. Following criticism regarding limited availability of eligible dwellings, the programme was extended to include secondary market housing (Groeger, 2016; Mirczak, 2018). Nevertheless, restrictive criteria related to apartment size and price excluded a substantial share of housing stock, limiting programme uptake (Matel, 2024). After four years, the programme was discontinued, with assessments suggesting that it disproportionately benefited higher-income households and contributed to price inflation among eligible properties (Narodowy Bank Polski, 2016).

In 2016, alongside the ongoing *Mieszkanie dla Młodych* programme, the government introduced *Mieszkanie Plus* (Apartment Plus) as part of the National Housing Programme (Narodowy Program Mieszkaniowy, 2016). At that time, Poland ranked near the bottom among EU countries in terms of housing availability and affordability, prompting the programme's focus on increasing supply. Its objectives included improving access to housing for households excluded from market-based rental or ownership options, promoting family formation and stimulating housing investment. As stated in Resolution No. 115/2016 of the Council of Ministers, the programme aimed to "increase access to housing for individuals whose income currently prevents them from purchasing or renting on commercial terms" (Resolution No. 115/2016, p. 49). The programme assumed the construction of new rental dwellings with regulated rents capped below market levels. Tenants were granted the option to purchase their apartments after a 30-year rental period (Mirczak, 2018).

Three years later, in 2019, the *Mieszkanie na Start* (Housing for Start) programme was introduced. Unlike *Mieszkanie Plus*, this initiative focused on rent subsidies rather than direct support for construction. The programme provided financial assistance to eligible tenants in newly built or revitalised dwellings, with eligibility determined by income thresholds and household composition. Importantly, the construction of the dwellings themselves was not directly subsidised by the state. Additional eligibility criteria applied to both tenants and properties (Ustawa z dnia 20 lipca 2018 r. o pomocy państwa w ponoszeniu wydatków mieszkaniowych w pierwszych latach najmu mieszkania, 2018).

The most recent housing initiative, *Pierwsze Mieszkanie* (First Apartment), implemented in mid-2023, introduced two complementary financing instruments. The first component, *Bezpieczny Kredyt 2%* (2% Secure Credit), guarantees that borrowers' financing costs do not exceed a fixed rate of 2%, with the difference between the market-based interest rate and the statutory cap covered through public subsidies (Ustawa z dnia 1 października 2021 r. o Gwarantowanym Kredycie Mieszkaniowym i Bezpiecznym Kredycie 2%, 2021). The second component, the *Konto Mieszkaniowe* (Housing Account), supports savings for future home purchases. Under this scheme, individuals aged 13 to 45 commit to regular monthly deposits ranging from 500 PLN to 2,000 PLN. Account holders may defer one payment per year without penalty, provided that at least eleven qualifying deposits are made annually. Savings are indexed annually to inflation, enhancing their real value over time (Gov.pl, 2023).

In addition to targeted housing programmes, the Polish government introduced temporary mortgage repayment relief measures, known as *wakacje kredytowe* (credit holidays), in response to the economic deterioration associated with the SARS-CoV-2 pandemic and the Russian aggression against Ukraine. These measures allowed borrowers to temporarily suspend loan repayments, aiming to reduce household financial stress and support liquidity in the housing market (Narodowy Bank Polski, 2024).

Table 1 summarises the key housing policy programmes implemented in Poland between 2014 and 2024, outlining their objectives, target groups and principal mechanisms. This overview provides an essential institutional context for the subsequent empirical analysis, as the effects of these policy interventions constitute a central focus of the research.

Table 1. Overview of government policies in Poland 2014–2027

Program	Program Name	Time Span	Objective	Key Features	Target Group
Mieszkanie dla Młodych	Housing for Young	2014 - 2018	increasing the availability of housing for young people, supporting family growth, increasing investment in the housing market	co-financing of the down payment when taking out a loan to purchase one's own apartment	married couples and individuals up to 35 years of age purchasing their first apartment using a mortgage loan, families raising at least three children (no age restrictions or ownership restrictions regarding the apartment)
Mieszkanie Plus	Apartment Plus	2016 - 2019	increase of avaliability of housing for people who could not afford purchase of apartment	provision of affordable rental apartments with an option to come to ownership after specified period	individuals whose income does not allow to take mortgage
Mieszkanie na Start	Housing for Start	2019 - Present	reduce the financial burden of rent in initial renal period	rent subsidies for rentals in new apartments	low to moderate income households, young adults and families with childrens
Pierwsze Mieszkanie	First Apartment	2023 - 2027	support first time homebuyers	subsidized mortgages with fixed 2% interest rate housing account,	Loan: no elegibity criteria Housing account : 13 - 45 years olds

Source: Systematised by authors.

The overview of Polish housing policies presented in Table 1 indicates a clear evolution in policy orientation over the past decade. The initial programme, *Mieszkanie dla Młodych* (Housing for the Young), was primarily designed to stimulate homeownership through financial incentives, particularly in the form of subsidies supporting mortgage down payments. Subsequent initiatives, including *Mieszkanie Plus* (Apartment Plus) and *Mieszkanie na Start* (Housing for Start), expanded the policy focus beyond ownership by addressing rental affordability and broader market access. These programmes targeted households whose housing needs were not necessarily linked to the immediate purchase of a dwelling, reflecting a gradual diversification of policy instruments.

The most recent initiative, *Pierwsze Mieszkanie* (First Apartment), integrates savings and borrowing mechanisms by offering subsidised mortgage financing alongside an inflation-indexed savings account. Unlike earlier programmes, it does not impose income thresholds, thereby extending eligibility to a wider group of potential participants. At the same time, the programme maintains a strong emphasis on homeownership, indicating continuity in the underlying policy objective of promoting owner-occupied housing.

From a policy analysis perspective, the sequence of housing interventions suggests a predominantly reactive approach to emerging market pressures rather than a long-term, coordinated strategy. Although the programmes were introduced with the intention of reducing barriers to housing access, their cumulative

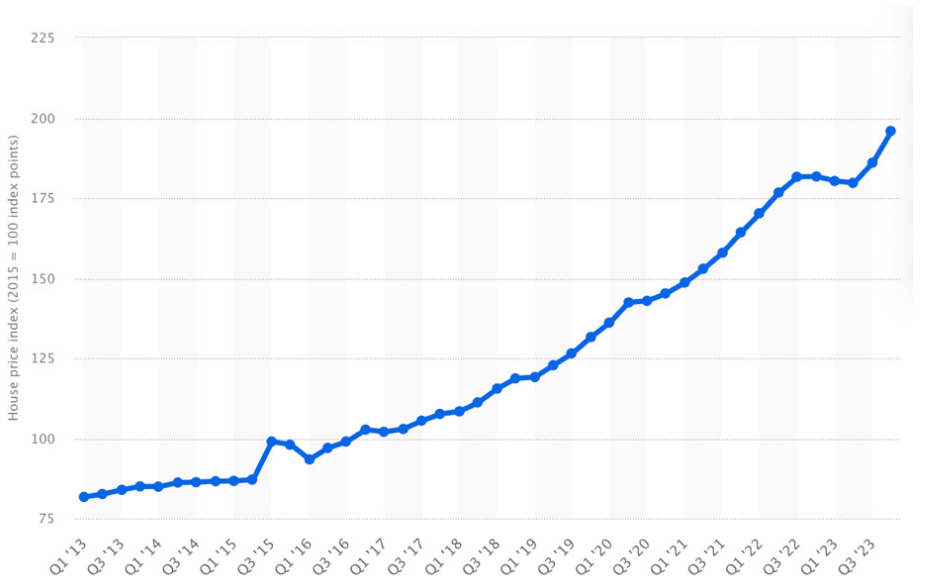
effects on price dynamics and market sustainability remain uncertain (Bochenek et al., 2023; Kiszluk, 2023; Radzimski, 2014). The relatively frequent introduction of new policy instruments – often at intervals of approximately three years and with limited clarity regarding their duration – may contribute to uncertainty among market participants. Such conditions have the potential to influence decision-making by both households and developers, potentially affecting participation in policy-supported housing schemes.

To assess the effectiveness and limitations of these housing policies more systematically, it is necessary to situate them within a broader theoretical framework. Accordingly, the following section presents key theories of housing market price formation, which provide the analytical foundation for the empirical analysis developed in subsequent chapters.

Analysis of Recent Publications

The interaction between economic factors and government policies plays a central role in shaping housing markets worldwide, and the Polish housing market is no exception. Following recovery from the global housing crisis of 2008, the Polish residential real estate market entered a new cycle in 2014 (Narodowy Bank Polski, 2020; Trojanek et al., 2023). As illustrated in Figure 1, the period between 2014 and 2024 was characterised by substantial price volatility. Over this decade, the house price index – measuring changes in transaction prices of dwellings relative to the base period of Q3 2015 – nearly doubled between 2014 Q1 and 2023 Q4 (Eurostat, n.d.; Statista, 2024). This pronounced increase indicates a sharp escalation in residential property values and underscores the extent of market fluctuations observed during the period.

Figure 1. EMF house price index in Poland from the 1st quarter of 2013 to the 4th quarter of 2023



Source: Adopted from Statista (2024).

Trojanek et al. (2023) analysed the period under consideration using a new generation of recursive housing bubble detection methods applied to both price-to-rent and price-to-income ratios for the capitals of 18 Polish voivodeships. Their findings indicate no statistically significant episodes of housing bubbles between 2014 and 2022, suggesting that the observed price appreciation was broadly consistent with underlying market fundamentals rather than driven by speculative behaviour. These results reduce the likelihood that housing price dynamics in Poland during this period were primarily shaped by speculative demand and instead emphasise the importance of analysing fundamental economic determinants of price formation.

The role of market fundamentals in housing price formation has been widely examined in the literature. The National Bank of Poland, in its annual reports, identifies unemployment, income and GDP as key determinants of housing prices, although it does not provide quantified estimates of their individual impacts (Narodowy Bank Polski, 2024). The relationship between unemployment and

housing prices was empirically assessed by Grum and Govekar (2016) using a multiple linear regression framework. Their results indicate an inverse relationship between unemployment and housing prices. In addition to unemployment, the study examined the effects of GDP, industrial production and stock market indicators; however, only unemployment proved statistically significant for Poland. In contrast, Melecky and Paksi (2024) identified GDP as one of the primary drivers of housing prices across 15 European countries. Based on this body of evidence, the following hypothesis is formulated:

H1: *An increase in GDP leads to an increase in housing prices.*

Income effects have also been extensively analysed in the context of housing markets. Ryś and Ryś (2025) examined the relationship between average income and housing prices using a linear regression model and found a statistically significant association. Their results indicate that a one PLN increase in income corresponds to a 1.70 PLN increase in apartment transaction prices. The study focused on the seven largest Polish cities over a twelve-year period. These findings are consistent with the panel analysis conducted by Leszczyński and Olszewski (2014), which examined the previous housing market cycle in Poland and demonstrated that both income levels and unemployment significantly affect housing price formation, in line with neoclassical theoretical predictions. International evidence further supports these conclusions. Égert and Mihaljek (2007) found a strong positive relationship between income – measured by GDP per capita – and housing prices across multiple countries. Given the consistency of empirical evidence at both national and international levels, the following hypothesis is proposed:

H2: *An increase in average individual income has a positive effect on housing prices.*

Interest rates, which are of critical importance to mortgage affordability, exhibit a more nuanced relationship with housing market dynamics. The Polish housing market is commonly classified as credit-oriented, with approximately 71% of

household loans consisting of mortgages (Melnychenko et al., 2022). However, according to Narodowy Bank Polski (2023a), a substantial share of primary market housing transactions – approximately 76% of purchase value – is financed through buyers' own funds. This high cash component suggests that the sensitivity of housing prices to interest rate changes may vary across market segments. While the effects of interest rates on the Polish housing market have not been extensively examined in domestic empirical studies, international evidence provides mixed results. In Lithuania, a comparable transitioning economy, Cohen and Karpavičiūtė (2017) found no statistically significant impact of interest rates on housing prices, largely due to the dominance of cash-financed purchases. Conversely, Belke and Keil (2017), analysing 127 German regions, reported a statistically significant positive effect of interest rates – proxied by yields on ten-year government bonds – on both house and apartment prices. Similarly, Vonlanthen (2023) demonstrated that a decline in interest rates in Switzerland increased median house prices by 1.5% and owner-occupied apartment prices by 2.5%. Given the importance of interest rates as both a monetary policy instrument and a housing affordability determinant, and considering the lack of quantitative evidence for Poland, the following hypothesis is formulated:

H3: *Interest rates influence housing prices.*

The analysis of interest rate effects is particularly relevant in the Polish context due to recent monetary policy adjustments. In response to inflationary pressures associated with the SARS-CoV-2 pandemic, the policy interest rate was raised sharply from approximately 2–3% to nearly 9%. This tightening of monetary conditions reduced credit availability and borrowing capacity, potentially dampening housing demand and affecting price dynamics (Łaszek et al., 2024).

Inflation is also frequently cited as a determinant of housing prices. During periods of elevated inflation, real assets such as housing are often perceived as stores of value, increasing demand for property investment. Poland's inflation surges during the SARS-CoV-2 pandemic and the war in Ukraine illustrate this mechanism, as households sought protection against currency depreciation (Narodowy Bank Polski, 2023b, 2024). However, empirical evidence on the inflation–housing price nexus is mixed.

Cohen and Karpavičiūtė (2017), analysing the Lithuanian housing market, found that inflation did not Granger-cause housing price changes and instead observed an inverse relationship, with housing prices influencing inflation. Considering these findings and the conceptual understanding of inflation as a general price-level phenomenon, this study treats inflation as a background macroeconomic condition rather than a direct explanatory variable and excludes it from the regression model.

Supply-side determinants are also important in housing price formation but are less extensively analysed in this study due to data limitations. Construction costs and supply-chain disruptions can significantly affect housing prices (Melecky & Paksi, 2024). Existing literature highlights factors such as land availability, infrastructure, permits and profit margins, although their quantitative effects are often not explicitly estimated (Brzezicka et al., 2022). Additionally, Narodowy Bank Polski (2023) identifies the SARS-CoV-2 pandemic and the war in Ukraine as major supply-side shocks, contributing to increased construction costs, labour shortages and material price inflation. Given the limited availability of consistent supply-side data at the city level, the present study focuses primarily on demand-side determinants of housing prices in Poland.

Finally, the literature underscores the importance of analysing government housing policies, which may stimulate both housing demand and supply (Brzezicka et al., 2022). Empirical evidence suggests that policy interventions yield mixed outcomes. While many programmes are designed to improve housing accessibility, some have contributed to adverse market effects (Kiszluk, 2023). A prominent example is the *Mieszkanie dla Młodych* (Housing for the Young) programme. Although its stated objective was to enhance housing access for younger households, its regulatory framework enabled developers to increase prices of eligible apartments. As a result, the programme contributed to higher developer margins rather than improved affordability, undermining its social objective (Narodowy Bank Polski, 2015). Furthermore, policy instruments often lag behind actual market developments. Subsidy price limits were frequently set well below prevailing market prices, reducing programme effectiveness (Narodowy Bank Polski, 2022). This gap was particularly pronounced in the cities analysed in this study, reaching up to 40% in Kraków, highlighting the misalignment between policy design and market conditions.

Further studies highlight inefficiencies in state-supported housing mechanisms. Bochenek et al. (2023) emphasise that lengthy administrative procedures can delay households' access to housing subsidies, thereby reducing the effectiveness of policy interventions. Moreover, the most recently introduced policy instrument – the *Bezpieczny Kredyt 2%* (Secure Loan) – appears to have temporarily stimulated housing demand, while also coinciding with a rapid increase in apartment prices (Narodowy Bank Polski, 2024). These observations are consistent with international evidence. In the United States, Floetotto et al. (2016) demonstrate that government interventions such as homebuyer tax credits lead to short-term increases in housing prices and transaction volumes but ultimately reduce overall welfare for many households. Their general equilibrium model further indicates that certain housing policy measures can distort market dynamics.

Taken together, these findings suggest that housing policies may contribute to upward pressure on prices, particularly in the period immediately following their introduction. On this basis, the following hypothesis is formulated to capture the potential short-term price effects of policy interventions:

H4: *The introduction of stimulating housing policies leads to an increase in housing prices.*

Despite an extensive body of literature examining individual housing price determinants, existing studies often analyse economic factors and policy interventions in isolation. As a result, the combined effects of simultaneous macroeconomic conditions and housing policy measures remain insufficiently explored, especially in the context of recent developments in Poland. The limited integration of policy variables into housing price models represents a notable gap in the literature, particularly given the active role of the Polish government in addressing housing market challenges through the policies discussed in subchapter *Legal Background*. While economic analyses offer valuable insights into fundamental drivers of price dynamics, they frequently overlook the interaction between sudden policy interventions and market outcomes. The following chapter therefore outlines the methodological framework applied to test the hypotheses formulated in this section.

Methodology

Research Design

To address the stated hypotheses, a quantitative research methodology was adopted, as it is well suited to capturing the complexity of housing market dynamics and the interactions between economic factors and policy interventions. Zhao and Liu (2023) provide a comprehensive review of empirical methodologies applied in housing market research, including studies on housing prices, their determinants, and the effects of housing policies. Their review identifies several widely used approaches, notably vector autoregression (VAR) models, general equilibrium (GE) models, difference-in-differences (DiD) designs and regression-based methods.

Among these, VAR models are identified as the most frequently applied technique in analyses of housing price formation (Zhao & Liu, 2023). For example, Duan et al. (2021) employed a VAR framework to study housing prices in Beijing, focusing on the dynamic interrelationships among time-series variables. While VAR models effectively capture temporal dependencies and feedback effects, they are limited in their ability to account for cross-sectional heterogeneity, such as differences across cities. This limitation is particularly relevant in the present study, which explicitly examines variation across multiple urban areas.

General equilibrium models represent another prominent methodological framework in housing market analysis (Zhao & Liu, 2023). Piskorski and Tchistyi (2017), for instance, applied a general equilibrium approach to analyse the effects of mortgage design on housing price formation. Although GE models offer a comprehensive representation of market interactions, they are inherently complex and require extensive and highly detailed data. Given the scope, data availability and time constraints of the current study, the application of a general equilibrium framework was not feasible.

Zhao and Liu (2023) also highlight the use of difference-in-differences models, which are commonly employed to identify causal effects of policy interventions or structural changes by comparing treated and control groups. An example is provided by Diao et al. (2017), who used a DiD design to analyse changes in

housing prices in Singapore following the construction of new metro stations. However, the DiD approach is not suitable for the present analysis, as the macroeconomic conditions and housing policy measures considered apply uniformly across Poland, leaving no distinct control group for comparison.

Taking into account these considerations, a panel regression model was selected as the most appropriate methodological approach for this study. Panel data techniques allow for the simultaneous analysis of temporal and cross-sectional variation, making them particularly suitable for examining housing price dynamics across multiple cities over time. The following subsection outlines the structure of the panel regression model and explains its specific application in the context of this research.

Panel data analysis, also referred to as longitudinal data analysis, involves observations of multiple entities – such as cities – collected over several time periods. By combining cross-sectional and time-series dimensions, panel data enables the simultaneous examination of both spatial and temporal dynamics within a single empirical framework. Panel data models are typically classified into three main types: Pooled Ordinary Least Squares (OLS), the Fixed Effects (FE) model and the Random Effects (RE) model.

The Pooled OLS model assumes homogeneity across entities and therefore does not account for individual-specific effects. It serves as a baseline specification, allowing for an initial assessment of whether models incorporating entity-level heterogeneity provide a better fit. In this approach, all observations are pooled and estimated using a common intercept and slope coefficients, analogous to a standard linear regression model. In contrast, the Fixed Effects model explicitly accounts for unobserved heterogeneity by allowing entity-specific intercepts. This specification assumes that individual-specific effects may be correlated with the explanatory variables and effectively controls for all time-invariant characteristics of the entities, making it particularly suitable when entities differ systematically in ways that may influence the dependent variable. The Random Effects model, by comparison, treats individual-specific effects as random and assumes that they are uncorrelated with the explanatory variables. This model is appropriate when variations across entities are considered random rather than structurally linked to the regressors (Baltagi, 2021).

The application of panel data models requires several diagnostic tests to ensure the validity and robustness of the empirical results. Initially, potential correlation among variables must be assessed, followed by tests for multicollinearity. Variance inflation factors exceeding commonly accepted thresholds may indicate inflated standard errors and unreliable coefficient estimates. After model estimation, additional diagnostics are conducted to detect serial correlation, heteroskedasticity, and cross-sectional dependence, all of which may bias inference if left unaddressed (Baltagi, 2021).

Applying panel data models to the analysis of housing prices in Polish cities between 2014 and 2024 enables the examination of how economic variables – such as income, GDP and interest rates – and government policy measures affect housing markets across both space and time. A Fixed Effects specification is particularly well suited to this context, as major Polish cities are likely to exhibit persistent and unobservable differences that influence housing price dynamics. This approach facilitates a clearer identification of how economic conditions and policy interventions shape local housing markets. Prior empirical research on the Polish housing market has similarly employed Fixed Effects models, supporting their relevance in this context (Leszczyński & Olszewski, 2014). Nevertheless, the final model choice is determined empirically using the Hausman test.

The empirical analysis was conducted using RStudio, which was selected for its flexibility, open-source nature and strong community support. The primary package used for panel data estimation was **plm**, while diagnostic tests were implemented using the **lmtest** package. Additional packages were utilised for data preparation and visualisation purposes (Croissant & Millo, 2008; Hothorn & Zeileis, 2002; R Core Team, 2025).

The methodological framework of this study is strongly informed by the work of Leszczyński and Olszewski (2014), whose analysis of the previous housing cycle in Poland provides an important foundation for the empirical approach adopted in this research.

Data Collection

Data used in the study were collected from the National Bank of Poland and the Central Statistical Office databases. The sample contains data from the first quarter of 2014 to the last quarter of 2024. Capturing quarterly data was essential for observing clearly the effects of the variables in such a short period of time. For exact operational definitions of the variables, please refer to Table 2.

Table 2. Variables definitions and data sources

Variable	Definiton	Frequency	Level	Data Source
SPRICE	price for 1m^2 on the secondary market	Quarterly	City	National Bank of Poland
GDP	Gross Domestic Product	Quarterly	Country	Statistical Office
INCOME	Average gross income	Quarterly	Region	Statistical Office
RATE	Interest rate for motgage	Quarterly	Country	National Bank of Poland
POLICY	Existance of the goveremnt policy if 1 - quarter of introduction of the policy	Quarterly	Country	National Bank of Poland
UNEMPL	registered unemployment rate	Quarterly	City	Statistical Office

Source: Authors own analysis based on GUS and NBP data.

The dependent variable, **SPRICE**, is defined as the transaction price per square metre of residential property on the secondary market in each analysed city. The data are obtained from the National Bank of Poland, which compiles housing price statistics based on market surveys and questionnaires conducted among market participants (Narodowy Bank Polski, 2024). The independent variables included in the model are gross domestic product (GDP), interest rates (RATE), income, policy implementation (POLICY) and the unemployment rate (UNEMPL).

The **POLICY** variable is specified as a binary indicator, taking the value of one in the quarter in which a given housing policy was introduced and zero in all remaining quarters. Income data are collected at the regional level, allowing the model to capture differences in local economic conditions across the analysed cities. In contrast, GDP and interest rates are national-level variables and do not vary across cities; therefore, they are classified as entity-invariant regressors. The interest rate used in the analysis represents the average interest rate on new PLN-denominated residential real estate loans, excluding renegotiated contracts. The registered unemployment rate (**UNEMPL**) is included as a control variable.

All financial variables are expressed in the national currency, Polish zloty (PLN). The panel structure of the dataset corresponds to a long-balanced panel, as defined by Baltagi (2021).

The raw datasets were initially collected in CSV and PDF formats and subsequently consolidated into a single Excel spreadsheet to facilitate data processing in RStudio. Particular attention was paid to maintaining the correct panel data structure during data preparation (Baltagi, 2021). The dataset contains no missing observations. The final sample consists of N = 3 cities observed over the period from Q1 2014 to Q4 2024, covering eleven years and yielding a total of 132 observations across nine variables.

The selection of variables was strongly informed by the empirical model applied by Leszczyński and Olszewski (2014), as well as by the broader empirical literature reviewed in subchapter *Analysis of Recent Publications*. To account for potential non-linear relationships between housing prices and their determinants, all variables included in the regression model were transformed into logarithmic form. Logarithmic transformation also supports distributional normality and facilitates elasticity-based interpretation of the estimated coefficients. This transformation approach is consistent with that applied in the study by Leszczyński and Olszewski (2014).

The following chapter provides a detailed descriptive analysis of the dataset, followed by the presentation and discussion of the regression results.

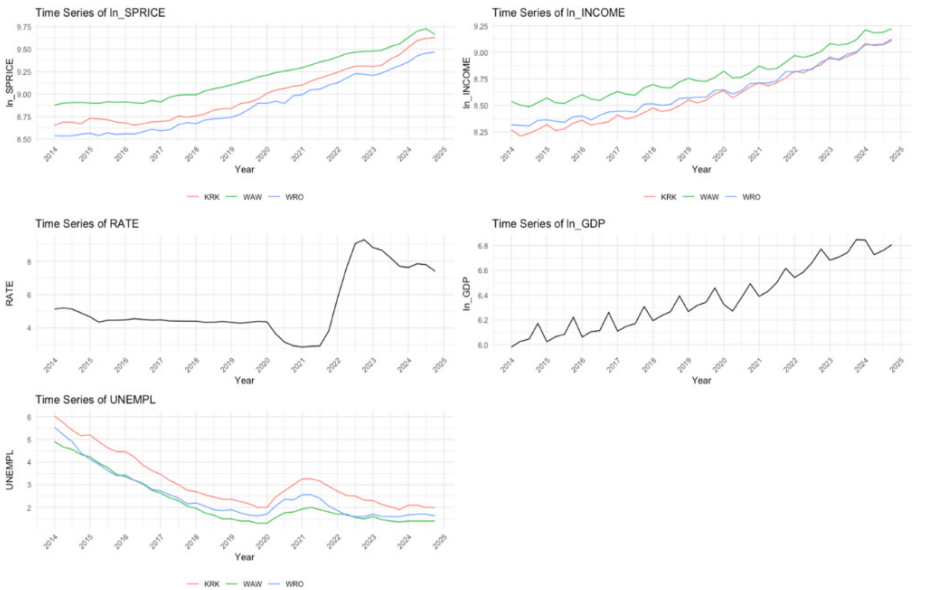
Analysis

Descriptive Results

To ensure data quality and consistency, a descriptive analysis was conducted prior to model estimation. First, the data structure was examined to confirm its suitability for panel data analysis. The **QUARTER** variable was reformatted to enable correct temporal ordering and further processing within the panel framework. Subsequently, **GDP**, **SPRICE** and **INCOME** were transformed into logarithmic form to support econometric analysis and facilitate interpretation.

Time-series plots of the key variables were then examined. As illustrated in Figure 2, housing prices display a clear upward trajectory across all analysed cities, indicating a strong and persistent growth trend.

Figure 2. Time Series of variables used in the study



Source: Authors' analysis based on GUS and NBP data.

The visual analysis suggests a positive association between housing prices and city size. Notable accelerations in price growth are observed around 2018 and again towards the end of 2023. Similarly, the logarithmic income series exhibits a steady increase over time. While Warsaw consistently records the highest housing prices and income levels, Kraków demonstrates a strong and sustained increase in prices, nearly closing the gap with Warsaw. At the same time, Wroclaw shows income levels closer to those of Warsaw while maintaining relatively lower apartment prices, suggesting comparatively more favourable affordability conditions. Overall, the parallel upward trajectories of **ln_INCOME** and **ln_SPRICE** provide preliminary visual support for Hypothesis 2, which posits a positive relationship between income and housing prices.

The interest rate series reveals a pronounced spike in mid-2021, reflecting heightened inflationary pressures following the SARS-CoV-2 pandemic. This development corresponds to the government's decision to raise borrowing costs as part of a broader monetary tightening aimed at curbing consumer spending and addressing pandemic-related economic imbalances (Łaszek et al., 2024; Narodowy Bank Polski, 2022). The **GDP** series displays a general upward trend, with periodic fluctuations associated with year-end effects. The sharp contraction observed in 2020 clearly reflects the economic impact of the SARS-CoV-2 pandemic, which is also evident in the interest rate series reaching historically low levels during the same period (Narodowy Bank Polski, 2021). The subsequent economic rebound coincides with renewed growth in income and housing prices, consistent with the pro-cyclical relationship between economic expansion and housing demand predicted by the neoclassical theory (Ge & Runeson, 2006).

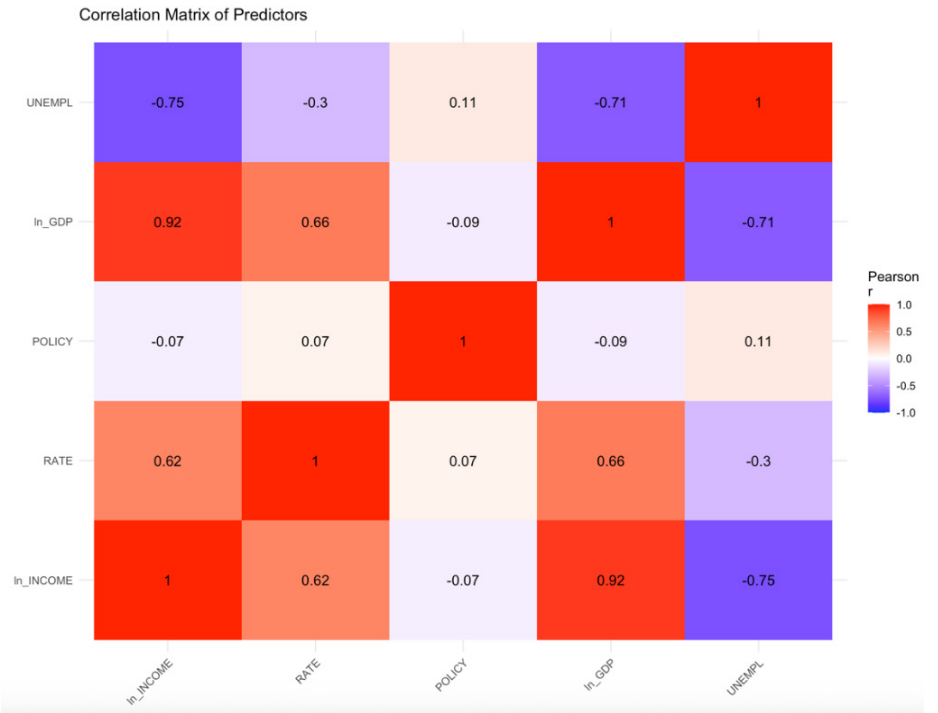
The unemployment rate (**UNEMPL**) exhibits a general downward trend across all analysed cities, indicating long-term labour market improvement. However, the time series also clearly captures the economic disruptions associated with the SARS-CoV-2 pandemic, during which unemployment increased markedly. Following its peak in 2021, unemployment rates began to decline, signalling economic recovery. This recovery phase coincides with rising interest rates and renewed housing market activity. The observed inverse relationship between unemployment and housing prices is consistent with findings reported in the literature, further supporting the relevance of labour market conditions as a determinant of housing price dynamics. Overall, the descriptive analysis indicates that economic factors are substantial in shaping housing prices in major Polish cities. To further assess the relationships between the explanatory variables and housing prices, scatterplots were constructed with each determinant plotted against housing prices.

The scatterplots reveal notable differences in the strength of associations across variables. In particular, the relationship between **RATE** and **ln_SPRICE** appears weaker and more dispersed compared to other determinants, suggesting that interest rates may not constitute the dominant driver of housing prices in the subsequent regression models. In contrast, the remaining variables exhibit relatively strong linear relationships with **SPRICE**, indicating their

potential explanatory power with respect to housing price dynamics. Additionally, the relationship between **POLICY** and **ln_SPRICE** was examined by marking the quarter of policy introduction with a vertical reference line in the relevant plots. All scatterplots and time-series visualisations are provided in Appendix 1.

To assess the degree of correlation among the regressors, Pearson correlation coefficients were calculated. As illustrated in Figure 3, **ln_GDP** and **ln_INCOME** exhibit a very high correlation coefficient of 0.92, signalling potential multicollinearity concerns. This strong correlation is consistent with existing economic evidence, as approximately 50% of Poland's gross domestic product consists of employee compensation, implying a close structural link between income and GDP growth (FRED, 2021). As wages and salaries increase, they directly contribute to GDP, thereby reinforcing this collinearity. No similarly problematic correlations were observed among the remaining variables.

Figure 3. Correlation of variables



Source: Authors' analysis based on GUS and NBP data.

To further assess multicollinearity, a pooled OLS regression model was estimated, and Variance Inflation Factors (VIFs) were calculated. The results confirmed the presence of multicollinearity, with VIF values exceeding six for both **ln_INCOME** and **ln_GDP**. Consequently, GDP was excluded from the regression model. Income was retained as it serves as a more direct proxy for household purchasing power, which economic theory identifies as a key determinant of housing demand. Following the exclusion of GDP, VIF values for the remaining variables fell below four, indicating that multicollinearity was no longer a concern (James et al., 2013).

To assess the presence of heteroskedasticity, the Breusch–Pagan test was first applied to the residuals of the pooled OLS model. For hypothesis testing, the significance level (α) was set at 0.05. This threshold was consistently applied across all statistical tests conducted in the study. The null hypothesis of homoskedasticity was evaluated based on whether the p-value fell below the specified significance level. The test results yielded a p-value greater than 0.05; therefore, the null hypothesis could not be rejected, indicating no evidence of heteroskedasticity in the pooled OLS residuals (Breusch & Pagan, 1979).

Subsequently, model selection tests were performed to determine the appropriate panel specification. To assess whether panel effects were present or whether a simple OLS model was sufficient, the Breusch–Pagan Lagrange Multiplier (LM) test for random effects was conducted. The test produced a p-value below the significance threshold, indicating statistically significant panel effects and supporting the use of a panel data model rather than a pooled OLS specification. Under standard circumstances, the Hausman test is then employed to determine whether a Fixed Effects (FE) or Random Effects (RE) model is more appropriate, based on the correlation between unobserved individual effects and the explanatory variables (Baltagi, 2021). However, due to the small cross-sectional dimension of the dataset – comprising only three cities – the Random Effects model could not be estimated, as it requires the number of cross-sectional units to exceed the number of parameters. Consequently, only the Fixed Effects model was feasible given the structure of the data.

Following the selection of the FE specification, additional diagnostic tests were conducted to assess model validity. The choice of diagnostic procedures

was guided by the methodological frameworks outlined by Baltagi (2021) and Croissant and Millo (2008). First, the Breusch–Pagan test was again applied to the residuals of the FE model. As in the pooled OLS case, the test failed to reject the null hypothesis, indicating no evidence of heteroskedasticity (Breusch & Pagan, 1979).

Next, serial correlation was examined using the Breusch–Godfrey/Wooldridge test for autocorrelation in panel data models. The test yielded a p-value below the significance level, indicating the presence of serial correlation in the residuals. In addition, cross-sectional dependence was assessed using the Pesaran CD test. The results showed a very small p-value, leading to rejection of the null hypothesis of cross-sectional independence and indicating the presence of cross-sectional dependence in the data.

To address the simultaneous presence of serial correlation and cross-sectional dependence, the use of Driscoll–Kraay standard errors was adopted, as recommended in the literature (Driscoll & Kraay, 1998). Driscoll–Kraay standard errors are robust to heteroskedasticity, serial correlation and cross-sectional dependence. The estimator accounts for common shocks and spillover effects across entities by pooling covariance information over time and across cross-sectional units. Unlike conventional heteroskedasticity-robust or cluster-robust standard errors, which address only within-cluster correlation, the Driscoll–Kraay approach remains valid in the presence of contemporaneous correlation across units (Driscoll & Kraay, 1998).

With the model specification validated and appropriate corrections applied, the following subsection presents the estimation results and interprets them in relation to the research hypotheses.

Modelling Outcome

The fixed effects panel regression qualifies how quarterly changes in fundamentals translate into prices of one m2 of the housing within Poland's three largest cities. The estimated model, after accounting for the issues addressed in the above section, yielded significant results to address the research question. The equation for the model could be established as follows:

$$\ln(\mathrm{SPRICE}_{it}) = \alpha_i + \beta_1 \ln(\mathrm{INCOME}_{it}) + \beta_2 \mathrm{RATE}_t + \beta_3 \mathrm{POLICY}_t + \beta_4 \mathrm{UNEMPL}_{it} + u_{it},$$

where i = 1,2,3 denotes cities and t = 2014Q1, …, 2024Q4 (44 periods in total). Individual effects αi absorb time–invariant city heterogeneity, such as differences in population, land availability and other factors mentioned in the literature to be affecting price formation.

The summary statistics of the estimated model, presented in Table 3, indicate a very strong overall model fit. The coefficient of determination (R^2) shows that approximately 98% of the variation in the dependent variable is explained by the explanatory variables included in the model. The adjusted R^2 is only marginally lower than the unadjusted R^2, suggesting that the inclusion of multiple regressors meaningfully contributes to explanatory power and does not result in overfitting. This consistency supports the relevance of the selected variables for explaining housing price dynamics (James et al., 2013).

As discussed in the previous section, the initial coefficient estimates required correction due to the presence of serial correlation and cross-sectional dependence in the residuals. Consequently, statistical inference was conducted using Driscoll–Kraay standard errors to ensure the robustness and reliability of the estimated coefficients.

Table 3. Summary statistics overview

	(1)
ln_INCOME	1.288***
	(0.042)
RATE	-0.005
	(0.005)
POLICY	-0.037**
	(0.012)
UNEMPL	0.028***
	(0.007)
R^2	0.976
Adj. R^2	0.974
Observations	132
* p < 0.05, ** p < 0.01, *** p < 0.001	

Source: Authors' own analysis based on GUS and NBP data.

The estimation results indicate that only three determinants exhibit statistically significant effects on housing prices. Hypothesis 1 could not be tested due to the presence of multicollinearity among the explanatory variables; as a result, GDP was excluded from the final specification and does not enter the empirical analysis.

The first significant determinant is **ln_INCOME**, defined as the logarithm of average gross quarterly earnings. The estimated coefficient of 1.29, with a standard error of 0.042, implies that a 1% increase in household purchasing power is associated with an approximately 1.3% increase in transaction prices on the secondary housing market. This finding supports Hypothesis 2, which posited a positive relationship between income and housing prices, and underscores the importance of demand-side economic fundamentals in shaping housing market outcomes over the study period.

Turning to monetary policy instruments, the interest rate variable (**RATE**) does not reach statistical significance in explaining housing price dynamics. Although the estimated coefficient indicates a negative relationship, the effect is not statistically distinguishable from zero. Consequently, Hypothesis 3, which hypothesised a significant impact of interest rates on housing prices, is not supported by the empirical results. This outcome is consistent with the descriptive evidence obtained from scatterplot analysis, which suggested a weak association between interest rates and housing prices.

The policy variable (**POLICY**), capturing the introduction of government housing programmes, yields a statistically significant coefficient indicating an approximate 0.04% decrease in housing prices in the quarter of policy implementation, with a standard error of 0.012. This result runs counter to Hypothesis 4, which anticipated a short-term price increase following policy introduction. Instead, the findings suggest that housing policies exerted a modest dampening effect on prices in the short run, at least within the quarterly timeframe captured by the binary indicator.

The unemployment rate (**UNEMPL**), included as a control variable based on prior literature, also emerges as statistically significant. In contrast to earlier empirical findings and the descriptive time-series analysis, the estimated coefficient indicates a positive relationship between unemployment and housing

prices (Grum & Govekar, 2016; Leszczyński & Olszewski, 2014). While this result may appear counterintuitive, it can be rationalised by the presence of omitted macroeconomic or structural factors that may simultaneously influence labour market conditions and housing demand.

Finally, the use of a Fixed Effects model allows for the estimation of city-specific intercepts. These fixed effects capture time-invariant characteristics unique to each city, represented by the individual effects (α_i) in the model specification. The estimated fixed effects for the analysed cities are reported in Table 4.

Table 4. Fixed Effect Estimates

City	Fixed-Effect
KRK	-2.132
WAW	-2.154
WRO	-2.277

Source: Authors' analysis based on data from GUS and NB.

The estimated fixed effects capture city-specific influences that are not explicitly accounted for by the explanatory variables included in the baseline model. These estimates indicate that, on average, housing prices in the analysed cities are lower than the overall sample mean once broader economic conditions and policy measures are controlled for. The negative values suggest that time-invariant local characteristics – such as structural, institutional or spatial factors – are associated with comparatively lower housing prices, reflecting persistent differences across cities.

Overall, the estimation results provide insight into the determinants of housing price formation in three major Polish cities over the period from 2014 to 2024. The findings indicate that economic fundamentals, particularly income dynamics, are decisive in driving housing prices than government policy interventions. The model thus offers a clear response to the guiding research question by demonstrating how macroeconomic factors and public policy interact in shaping housing market outcomes in Poland.

Discussion

The fixed-effects panel data analysis provides clear evidence that macroeconomic fundamentals and policy interventions jointly shaped urban housing markets during the analysed period. The model identifies income and unemployment as significant economic drivers of housing prices, while the introduction of housing policies is associated with a short-term downward adjustment in prices. GDP was excluded from the final specification due to high collinearity with income. The results therefore highlight the dual role of economic fundamentals and institutional interventions in residential price formation. This chapter situates these empirical findings within the theoretical perspectives and empirical evidence discussed in chapter *Theoretical Background and Literature Review*.

The findings strongly support the neoclassical view that housing markets are primarily driven by fundamental economic forces. The neoclassical framework assumes that prices adjust to equilibrate supply and demand (Ge & Runeson, 2006). When demand-side determinants such as income improve, housing demand shifts outward. Given that housing supply is relatively inelastic in the short run, demand shocks are predominantly absorbed through price increases rather than quantity adjustments (Łaszek et al., 2021). The positive and statistically significant coefficient on income is consistent with this mechanism and aligns with the expected sign derived from the model proposed by Égert and Mihaljek (2007). These results indicate that, in major Polish cities, strong demand fundamentals translated directly into higher housing prices, as new supply could not immediately offset rising demand. The significance of unemployment in the model also broadly corresponds to neoclassical theory, which links labour market conditions to housing demand.

The empirical results are also consistent with earlier panel data analyses conducted for Poland, particularly the study by Leszczyński and Olszewski (2014), which strongly influenced the methodological approach and variable selection in this paper. Their analysis of 17 voivodeship capitals concluded that economic fundamentals – especially income and unemployment – significantly affect housing prices, while interest rates do not exert a statistically significant effect. This study confirms these findings with respect to income and interest rates,

suggesting structural similarities between the housing cycles examined. Notably, the insignificance of interest rates persists despite differences in interest rate measurement between the two studies.

However, the positive relationship between unemployment and housing prices observed in this study diverges from neoclassical expectations and from earlier empirical evidence. One plausible explanation lies in the extraordinary economic conditions during the analysed period. The SARS-CoV-2 pandemic triggered a severe economic slowdown and widespread labour market disruptions, including business closures, school and childcare shutdowns, and increased labour force withdrawals (Adamowicz, 2022). These developments contributed to the simultaneous rise in unemployment and inflation, creating an atypical macroeconomic environment in which housing demand and prices continued to increase despite deteriorating labour market conditions. Furthermore, the outbreak of war in Ukraine and the subsequent inflow of refugees into Poland intensified housing demand, particularly in large urban centres, potentially supporting price growth even amid rising unemployment (Łaszek et al., 2024). It should also be acknowledged that the positive unemployment coefficient may reflect model limitations. Although variance inflation factors were within acceptable ranges, income and unemployment remain correlated, which may introduce estimation bias.

The strong income effect identified in this study is also consistent with the findings of Ryś and Ryś (2025). Given the overlap in the analysed periods, the results reinforce the robustness of the income-price relationship and further validate the neoclassical interpretation of housing market dynamics. Importantly, beyond confirming the central role of income, this study demonstrates that additional economic and institutional factors jointly shape price formation.

The lack of a statistically significant effect of interest rates aligns with the findings of Cohen and Karpavičiūtė (2017), who argue that in developing or transition economies interest rates may play a less decisive role in housing price determination than in more mature markets. This result is somewhat unexpected considering National Bank of Poland reports indicating that secondary market transactions are predominantly mortgage-financed (Narodowy Bank Polski, 2024). One explanation may lie in the specificity of large urban

agglomerations. Housing prices in cities such as Warsaw, Kraków and Wroclaw are substantially higher than the national average, potentially constraining mortgage affordability and increasing reliance on household savings. Differences in wealth distribution and demographic characteristics may further weaken the transmission of interest rate changes to housing prices in these markets.

With respect to housing policy interventions, the findings diverge from results reported by Floetotto et al. (2016), Narodowy Bank Polski (2015) and Kiszluk (2023), which generally associate policy support with price increases. A closer examination of policy design and the construction of the policy dummy variable provide a coherent explanation for this discrepancy. Statutory price ceilings determining subsidy eligibility consistently lagged behind prevailing market prices. As a result, only a limited subset of dwellings qualified for support, shifting demand towards lower-priced properties and potentially reducing average transaction prices in the short run. Moreover, lengthy administrative procedures may have delayed demand responses in the quarter of policy introduction (Bochenek et al., 2023). Frequent policy changes, limited funding horizons, and uncertainty regarding programme continuity may also have discouraged immediate market responses by both developers and buyers. Finally, differences in empirical design may contribute to divergent findings. While Floetotto et al. (2016) model policy interventions using continuous quantitative measures, the binary policy indicator employed in this study captures only the timing of policy introduction rather than its scale or intensity.

Overall, this paper integrates macroeconomic fundamentals with housing policy analysis to examine housing price dynamics in Poland in the post-2014 period. By doing so, it addresses a clear gap in the literature: the absence of studies that simultaneously account for economic drivers and policy interventions using recent data in the Polish context. Existing research has typically focused either on market fundamentals or on policy effects in isolation. In contrast, this study demonstrates how economic conditions and government interventions interact in shaping housing market outcomes in major Polish cities, thereby contributing to a more comprehensive understanding of residential price formation.

Conclusions

This study examined the interplay between economic factors and government housing policies in shaping housing prices in Poland's three largest cities over the period 2014–2024. Using a quantitative research design based on a fixed-effects panel regression model, the analysis demonstrates that both macroeconomic fundamentals and policy interventions play a meaningful role in housing market dynamics. In addressing the central research question – how economic factors and government policies influence housing prices in Poland – the results indicate that income and unemployment act as positive drivers of transaction prices on the secondary housing market, while the introduction of housing policies is associated with a short-term decline in prices. Contrary to initial expectations, interest rates do not exhibit a statistically significant effect in the estimated model. GDP could not be tested empirically due to high collinearity with income and was therefore excluded from the regression specification.

Several limitations of the study should be acknowledged. First, the applied regression framework allows for the identification of correlations rather than causal relationships. Although the selected economic and policy variables are grounded in established theory, incorporating causality tests would strengthen the robustness of the findings. Future research should therefore explicitly address causal mechanisms. Moreover, alternative theoretical perspectives highlight the role of social and institutional factors in housing market formation. The present analysis focuses primarily on demand-side determinants, which limits the ability to capture the full range of forces influencing housing prices. A more comprehensive framework incorporating supply-side, social and institutional variables would provide a fuller understanding of price formation.

In addition, the study relies exclusively on transaction prices from the secondary housing market. Due to limited access to the initial data, offer prices and primary market data were not included. Future research incorporating both market segments, as well as offer price information, could yield a more complete picture of housing market dynamics. The geographical scope of the analysis is also limited to highly urbanised areas, which constrains the generalisability of the results. Extending the analysis to smaller cities and less

urbanised regions would address this limitation and broaden the empirical relevance of the findings. Finally, the policy variable captures only the timing of policy introduction rather than its full duration or intensity. While short-term effects appear beneficial in terms of price moderation, long-term impacts may differ substantially. Future studies could improve measurement by incorporating information on programme scale, government expenditure, or the number of supported loans or contracts, although such data are currently not publicly available.

Despite these limitations, the study yields several important implications. From a theoretical perspective, it contributes to the literature by integrating economic fundamentals and housing policy interventions within a single empirical framework for the Polish housing market. The findings reinforce the relevance of the neoclassical approach by demonstrating a strong relationship between economic determinants and housing prices, while also highlighting how crisis conditions can alter conventional relationships, particularly in the case of unemployment. From a practical standpoint, the results offer valuable insights for policymakers. By illustrating how economic shifts and policy introductions influence market outcomes, the study can inform more effective policy design aimed at improving housing affordability. The lack of a significant interest rate effect suggests that central banks may need to rely more heavily on alternative macroprudential tools when addressing housing market imbalances.

In conclusion, the housing market extends beyond its economic function; it plays a central role in social well-being, public health and national stability. Continuous, evidence-based research is essential for informing effective housing policies and ensuring that access to adequate housing remains a core public objective. As homeownership and housing security should not be reserved for a privileged minority, governments must prioritise affordability and inclusiveness when designing housing interventions. Rigorous, data-driven analyses such as this study are therefore critical to ensuring that housing remains a fundamental pillar of social welfare rather than a vehicle for speculative excess.

References

Adamowicz, M. (2022). COVID-19 Pandemic as a Change Factor in the Labour Market in Poland. *Sustainability*, *14*(15), 9197. https://doi.org/10.3390/su14159197.

Baltagi, B. H. (2021). *Econometric Analysis of Panel Data* (6th ed.). Springer Cham. https://doi.org/10.1007/978-3-030-53953-5.

Belke, A., & Keil, J. (2017). Fundamental determinants of real estate prices: A panel study of German regions (Working Paper No. 731; Ruhr Economic Papers). *RWI – Leibniz Institute for Economic Research*. https://doi.org/10.4419/86788851.

Bochenek, M., Szczepańska-Przekota, A., Przekota, G., & Hadław, M. (2023). Podażowe i cenowe konsekwencje zmian w rządowych programach mieszkaniowych w Polsce w latach 1998–2021. *Horyzonty Polityki*, *14*(47), 229–250. https://doi.org/10.35765/hp.2321.

Breusch, T. S., & Pagan, A. R. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica*, *47*(5), 1287–1294. https://doi.org/10.2307/1911963.

Brzezicka, J., Łaszek, J., Olszewski, K., & Wisniewski, R. (2022). The missing asymmetry in the Polish house price cycle: An analysis of the behaviour of house prices in 17 major cities. *Journal of Housing and the Built Environment*, *37*(2), 1029–1056. https://doi.org/10.1007/s10901-021-09861-w.

Cohen, V., & Karpavičiūtė, L. (2017). The analysis of the determinants of housing prices. Independent *Journal of Management & Production*, *8*(1), 49–63. https://doi.org/10.14807/ijmp.v8i1.521.

Croissant, Y., & Millo, G. (2008). Panel Data Econometrics in R: The plm Package. *Journal of Statistical Software*, *27*(2), 1–43. https://doi.org/10.18637/jss.v027.i02.

Diao, M., Leonard, D., & Sing, T. F. (2017). Spatial-difference-in-differences models for impact of new mass rapid transit line on private housing values. *Regional Science and Urban Economics*, *67*, 64–77. https://doi.org/10.1016/j.regsciurbeco.2017.08.006.

Driscoll, J. C., & Kraay, A. C. (1998). Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. *The Review of Economics and Statistics*, *80*(4), 549–560. https://doi.org/10.1162/003465398557825.

Duan, J., Tian, G., Yang, L., & Zhou, T. (2021). Addressing the macroeconomic and hedonic determinants of housing prices in Beijing Metropolitan Area, China. *Habitat International*, *113*, 102374. https://doi.org/10.1016/j.habitatint.2021.102374.

Égert, B., & Mihaljek, D. (2007). Determinants of House Prices in Central and Eastern Europe. *Comparative Economic Studies*, *49*(3), 367–388. https://doi.org/10.1057/palgrave.ces.8100221.

Eurostat (2024). Housing in Europe. Publications Office of the European Union. Retrieved from: https://data.europa.eu/doi/10.2785/5544429. Access: 4.10.2025.

Eurostat (n.d.). Glossary: House price index (HPI). Statistics Explained. Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:House_price_index_(HPI). Access: 4.10.2025.

Floetotto, M., Kirker, M., & Stroebel, J. (2016). Government intervention in the housing market: Who wins, who loses? *Journal of Monetary Economics*, *80*, 106–123. https://doi.org/10.1016/j.jmoneco.2016.04.005.

FRED (2021). Share of Labour Compensation in GDP at Current National Prices for Poland (Series ID No. LABSHPPLA156NRUG). University of Groningen & University of California, Davis. Retrieved from: https://fred.stlouisfed.org/series/LABSHPPLA156NRUG. Access: 4.10.2025.

Ge, X. J., & Runeson, G. (2006). A Dynamic Model of Housing Markets and House Prices. In: *AUBEA 2006: Proceedings of the 31st Australasian University Building Educators Association Conference: 11–14 July 2006*. University of Technology, Sydney.

Glocker, D., & Plouin, M. (2016). Overview of Housing Policy Interventions in Poland. *OECD Regional Development Working Papers*, *7*. https://doi.org/10.1787/5jlpl4n838f2-en.

Gomułka, S. (2016). Poland's economic and social transformation 1989–2014 and contemporary challenges. *Central Bank Review*, *16*(1), 19–23. https://doi.org/10.1016/j.cbrev.2016.03.005.

Gov.pl (2023). Program Pierwsze Mieszkanie – Mieszkanie dla ciebie. Retrieved from: https://www.gov.pl/web/mieszkanie-dla-ciebie/program-pierwsze-mieszkanie. Access: 4.10.2025.

Gov.pl (2023, July 12). Obywatele Białorusi w Polsce – raport. Urząd do Spraw Cudzoziemców. Retrieved from: https://www.gov.pl/web/udsc/obywatele-bialorusi-w-polsce--raport2. Access: 4.10.2025.

Gov.pl (2025, February 24). Obywatele Ukrainy w Polsce – raport. Urząd do Spraw Cudzoziemców. Retrieved from: https://www.gov.pl/web/udsc/obywatele-ukrainy-w-polsce--aktualne-dane-migracyjne2. Access: 4.10.2025.

Groeger, L. (2016). Programy wspierania budownictwa mieszkaniowego w Polsce i ich wpływ na rynek nieruchomości mieszkaniowych. *Space – Society – Economy*, *18*, 131–146. https://doi.org/10.18778/1733-3180.18.09.

Grum, B., & Govekar, D. K. (2016). Influence of Macroeconomic Factors on Prices of Real Estate in Various Cultural Environments: Case of Slovenia, Greece, France, Poland and Norway. *Procedia Economics and Finance*, *39*, 597–604. https://doi.org/10.1016/S2212-5671(16)30304-5.

Hothorn, T., & Zeileis, A. (2002). Diagnostic Checking in Regression. *Relationships*, *2*(3), 7–10.

James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An Introduction to Statistical Learning: With Applications in R*. Springer Science & Business Media.

Kisiel, R., Zielińska-Szczepkowska, J., & Dzieżyk, K. (2021). Housing policy in Poland. *Studia Prawno-Ekonomiczne*, *118*, 227–247. https://doi.org/10.26485/SPE/2021/118/12.

Kiszluk, K. (2023). Ocena rozwiązań zaproponowanych w ramach programu "Pierwsze Mieszkanie" w świetle dotychczasowej polityki mieszkaniowej państwa. *Roczniki Administracji i Prawa*, *3*(XXIII), 169–177. https://doi.org/10.5604/01.3001.0053.9517.

Łaszek, J., Olszewski, K., & Augustyniak, H. (2024). How the War between Russia and Ukraine Caused a Multi-Cycle in the Polish Housing Market. *Critical Housing Analysis*, *11*(1), 15–30. https://doi.org/10.13060/23362839.2024.11.1.561.

Łaszek, J., Olszewski, K., & Sobiecki, R. (2021). *Real estate at exposure: New challenges, old problems*. Oficyna Wydawnicza SGH – Szkoła Główna Handlowa.

Leszczyński, R., & Olszewski, K. (2014). An analysis of the primary and secondary housing market in Poland: Evidence from the 17 largest cities. *Baltic Journal of Economics*, *17*(2), 136–151. https://doi.org/10.1080/1406099x.2017.1344482.

Matel, A. (2024). Realizacja programu "Mieszkanie dla Młodych" w kontekście regionalnych różnic w dostępności dochodowej mieszkań. *Optimum. Economic Studies*, *1*(91), 65–79. https://doi.org/10.15290/oes.2018.01.91.05

Melecky, A., & Paksi, D. (2024). Drivers of European housing prices in the new millennium: Demand, financial, and supply determinants. *Empirica*, *51*(3), 731–753. https://doi.org/10.1007/s10663-024-09611-5.

Melnychenko, O., Osadcha, T., Kovalyov, A., & Matskul, V. (2022). Dependence of Housing Real Estate Prices on Inflation as One of the Most Important Factors: Poland's Case. *Real Estate Management and Valuation*, *30*(4), 25–41. https://doi.org/10.2478/remav-2022-0027.

Mirczak, D. (2018). Rządowe programy mieszkaniowe w Polsce w latach 2006–2017. *Studia Politicae Universitatis Silesiensis*, *22*, 59–72.

Narodowy Bank Polski (2015). Raport o sytuacji na rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2014 r. Retrieved from: https://nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/raport-roczny/. Access: 4.10.2025.

Narodowy Bank Polski (2016). Raport o sytuacji na rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2015 r. Retrieved from: https://nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/raport-roczny/. Access: 4.10.2025.

Narodowy Bank Polski (2020). Raport o sytuacji na rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2019 r. Retrieved from: https://nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/raport-roczny/. Access: 4.10.2025.

Narodowy Bank Polski (2021). Raport o sytuacji na rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2020 r. Retrieved from: https://nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/raport-roczny/. Access: 4.10.2025.

Narodowy Bank Polski (2022). Raport o sytuacji na rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2021 r. Retrieved from: https://nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/raport-roczny/. Access: 4.10.2025.

Narodowy Bank Polski (2023a). Information on home prices and the situation in the housing and commercial real estate market in Poland in 2023 Q3. Retrieved from: https://nbp.pl/en/publications/cyclical-materials/real-estate-market/quarterly-report/. Access: 4.10.2025.

Narodowy Bank Polski (2023b). Raport o sytuacji na rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2022 r. Retrieved from: https://nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/raport-roczny/. Access: 4.10.2025.

Narodowy Bank Polski (2024). Raport o sytuacji na rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2023 r. Retrieved from: https://nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/raport-roczny/. Access: 4.10.2025.

Narodowy Program Mieszkaniowy (2016). Uchwała Nr. 115/2016 Rady Ministrów z dnia 23 sierpnia 2016 r. w sprawie przyjęcia Narodowego Programu Mieszkaniowego. Retrieved from: https://www.gov.pl/web/rozwoj-technologia/narodowy-program-mieszkaniowy. Access: 4.10.2025.

Petrakova, Y. (2022). Belarus in the Eurasian Migration System: The Challenges of the Last Decade and Their Consequences. *Central and Eastern European Migration Review, 11*(1), 125–144. https://doi.org/10.54667/ceemr.2022.05.

Piskorski, T., & Tchistyi, A. (2017). An Equilibrium Model of Housing and Mortgage Markets with State-Contingent Lending Contracts (Working Paper No. 23452). *National Bureau of Economic Research*. https://doi.org/10.3386/w23452.

R Core Team (2025). R (Version 4.4.3) [macOS]. R Foundation for Statistical Computing. Retrieved from: https://www.r-project.org/. Access: 4.10.2025.

Radzimski, A. (2014). Subsidized mortgage loans and housing affordability in Poland. *Geo-Journal, 79*(4), 467–494. https://doi.org/10.1007/s10708-014-9533-2.

Ryś, M., & Ryś, M. (2025). The interplay of income growth and housing prices: A decade of real restate dynamics in Poland's largest cities. *Financial Internet Quarterly, 21*(1), 94–104. https://doi.org/10.2478/fiqf-2025-0007.

Statista (2024). EMF house price index in Poland 2023. Statista. Retrieved from: https://www.statista.com/statistics/614934/emf-house-price-index-poland-europe/. Access: 4.10.2025.

Trojanek, R., & Gluszak, M. (2022). Short-run impact of the Ukrainian refugee crisis on the housing market in Poland. *Finance Research Letters*, *50*, 103236. https://doi.org/10.1016/j.frl.2022.103236.

Trojanek, R., Gluszak, M., Tanas, J., & Van De Minne, A. (2023). Detecting housing bubble in Poland: Investigation into two housing booms. *Habitat International*, *140*, 102928. https://doi.org/10.1016/j.habitatint.2023.102928.

Ustawa z Dnia 1 Października 2021 r. o Gwarantowanym Kredycie Mieszkaniowym i Bezpiecznym Kredycie 2% (2021). Dz.U. 2021 poz. 2133. Retrieved from: https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20210002133. Access: 4.10.2025.

Ustawa z dnia 20 lipca 2018 r. o pomocy państwa w ponoszeniu wydatków mieszkaniowych w pierwszych latach najmu mieszkania (2018). Dz.U. 2018 poz. 1540. Retrieved from: https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20180001540. Access: 4.10.2025.

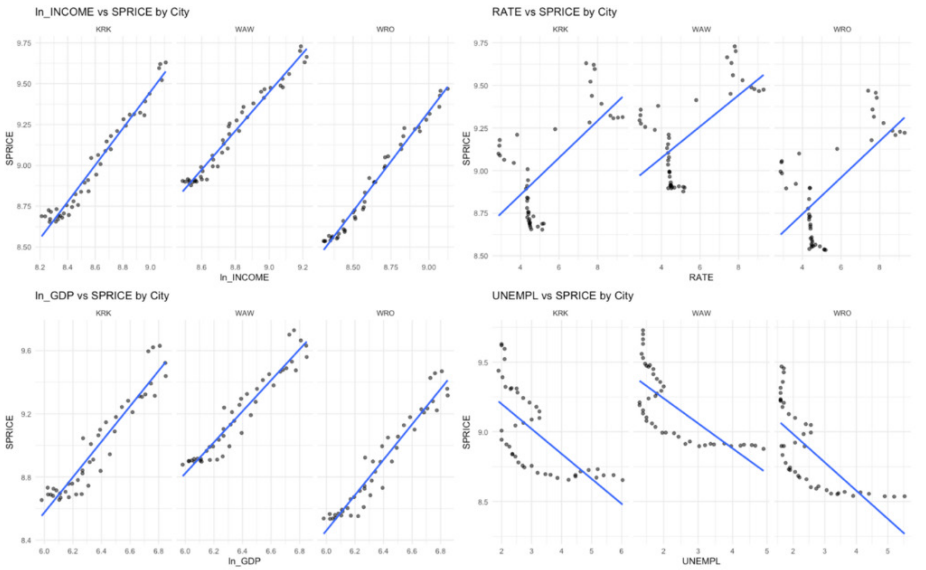
Ustawa z Dnia 27 Września 2013 r. o Pomocy Państwa w Nabyciu Pierwszego Mieszkania Przez Młodych Ludzi (2013). Dz.U. 2013 poz. 1304. Retrieved from: https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=wdu20130001304. Access: 4.10.2025

Vonlanthen, J. (2023). Interest rates and real estate prices: A panel study. *Swiss Journal of Economics and Statistics*, *159*(1), 6. https://doi.org/10.1186/s41937-023-00111-0.

Zhao, C., & Liu, F. (2023). Impact of housing policies on the real estate market – Systematic literature review. *Heliyon*, *9*(10), e20704. https://doi.org/10.1016/j.heliyon.2023.e20704.

Appendix 1

Figure 4. Scatterplots of variables against SPRICE



Source: Authors own analysis based on GUS and NPB data.