Housing affordability in Poland and its regional differentiation

Katarzyna Olbińska[1], Konrad Żelazowski[1]

[1]University of Lodz,
Poland

Abstract— **Meeting the housing needs of households under free-market conditions is primarily determined by the relationship between their financial capabilities and property prices. The literature indicates that short-term declines in households' purchasing power in the housing market confirm growing demand-supply tensions. In the long term, these dynamics justify the broader implementation of support mechanisms for households within housing policy. The aim of this article is to identify changes in the purchasing power of Polish households across 16 regional housing markets between 2003 and 2023. It also examines whether the differences in housing affordability between regions showed a tendency to decrease or deepen over the investigated period.**

Keywords— housing affordability, measures of housing affordability, convergence, housing market, Poland

I. INTRODUCTION

In accordance with data provided by (Eurostat, 2025), Poland is distinguished by a substantial and growing proportion of young adults living with their parents. In 2019, 43.7% of individuals aged 25-34 were in this situation, which increased to 52.9% four years later. Additionally, Poland exhibits one of the most significant overcrowding rates within the population vulnerable to poverty, recorded at 45.7% in 2022 (Eurostat, 2022). At the same time, there is a strong desire to meet housing needs by purchasing real estate (Martyniak, 2021). The share of homeownership in Poland is one of the highest in Europe (87,3%, including 12% of properties with mortgages). The rental market, which makes up 12.7% of housing (Eurostat, 2024), highlights limitations in Poland's rental sector, emphasizing complex housing dynamics for those seeking flexible living options.

For many households—especially young people—purchasing a residential property that meets their needs and preferences is often impossible. This challenge has recently been intensified by a sharp increase in property prices, which according to CSO data rose by 70% in the secondary market and 46% in the primary market between 2018 and 2023.

In the Polish housing system, which is based on a liberal model of meeting housing needs—primarily through property ownership—there is a noticeable lack of systemic solutions for monitoring housing affordability. However, there are numerous reasons justifying such efforts. Regular assessment of households' purchasing power in the housing market can serve, among other things, to evaluate the real estate sector's condition, including the potential risk of housing bubbles, to assess the scope and rationality of housing policy, and to determine the scale of housing exclusion among specific social groups (Marona and Tomasik, 2023; Przybylska and Krugły, 2023). Fulfilling this task, however, requires comprehensive solutions for measuring households' purchasing power in relation to residential properties.

The main aim of the research was to identify long-term changes in the financial accessibility of housing for Polish households. The analysis covered 16 regional housing markets between 2003 and 2023. In accordance with this aim, two research questions were formulated: 1) To what extent did the purchasing power of Polish households in regional housing markets change over the analyzed period? 2) Do regional markets show a long-term tendency toward decreasing disparities in housing affordability indicators (i.e., convergence of regional housing affordability measures), or is the opposite process observed?

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II. THE SIGNIFICANCE OF HOUSING FROM A HOUSEHOLD PERSPECTIVE

A residential property typically represents the most substantial financial asset owned by most families (Doling et al., 2013). Adequate housing significantly influences human welfare and quality of life (Anacker, 2019). It is essential to maintain health, a satisfactory standard of living, promote social inclusion, and increase security. The possession of a housing unit may serve as an asset that contributes to financial security in later life. Within this framework, housing is conceptualized as a vehicle for wealth accumulation (Begley and Palim, 2024; Doling et al., 2013). Homeownership is an important source of wealth building through the saving mechanisms associated with mortgage repayment (Acolin et al., 2019). The wealth effect of housing refers to the fact that households, which attempt to smooth consumption over the life cycle, will spend and borrow more when the value of their housing assets increases. A long-term increase in house prices will have a positive wealth effect on landlords and homeowners; it will nevertheless have a negative income effect on tenants and prospective first-time buyers (Stephens, 2007). Intergenerational housing wealth effects describe how a person's future ability to access housing can be impacted by the housing wealth of their parents (Haffner and Hulse, 2021).

The decision of a household to purchase rather than to rent a residential property may be deemed optimal when considering factors such as anticipated permanent income, appreciation of house prices, and the duration of residency, primarily due to transaction costs. Homeownership can be a source of financial stability as a safeguard against rising housing costs, ensuring predictable expenses compared to rent uncertainty, particularly when they increase faster than wages (Acolin et al., 2019; Sinai and Souleles, 2005). However, due to credit rationing, some households for whom ownership is optimal, based on permanent income and stage of the life cycle, cannot qualify for a mortgage due to insufficient wealth, current income, or credit score (Acolin et al., 2019).

Public apprehension regarding the affordability of housing is attributable to two primary elements. First, housing represents the most substantial expenditure component within the budgets of the majority of individuals and families, and its share in household spending has risen over time (OECD, 2021). On average, households allocate approximately one-quarter of their income to housing expenses, whereas impoverished and near-impoverished households frequently allocate half of their income to these costs. Such significant proportions imply that even minor percentage fluctuations in housing prices and rents are likely to exert considerable effects on non-housing consumption and the overall well-being of households (Quigley and Raphael, 2004). Second, many cities in different countries have experienced dynamic increases in housing prices and rents impacting the costs of living, undermining affordability and quality of life for many vulnerable households (Haffner and Hulse, 2021; Kohl, 2021; Norris and Lawson, 2023; Quigley and Raphael, 2004; Tranøy et al., 2020).

Recently, a growing body of research has been dedicated to examining regional and local inequalities in terms of housing affordability (Haffner and Hulse, 2021; Hulse et al., 2010), resulting in commuting disadvantages from jobs and services, and spatial lock-in. The latter occurs when those moving to economically viable areas might later find it hard to move again due to rising housing costs elsewhere, even with changes in employment or family dynamics. These disparities facilitate segregation between individuals who can afford to reside near areas of economic and social activity and those who cannot. Such segregation has severe implications for both present and future generations, as it erodes equality of opportunity and undermines intergenerational mobility (OECD, 2021).

III. THE SIGNIFICANCE OF HOUSING FROM A MACROECONOMIC PERSPECTIVE

Housing plays a crucial role in the real economy due to its direct and multiplier effects, it accounts for a sizeable share of output (Doling et al., 2013). Construction creates demand for labour and materials (construction multiplier) and housing is connected to the land market and a wide range of professional services. Housing generates employment for numerous micro and small enterprises and can serve as collateral to obtain loans (Doling et al., 2013). Construction accounts for approximately 6% of GDP on average in OECD countries. Investment in dwellings alone account for about 20% of the gross accumulation of fixed capital. As a result, fluctuations in housing-related activities and house prices have strong effects on the business cycle. Moreover, house price cycles tend to lead economic cycles (OECD, 2021). Increasing house prices have a significant wealth effect on consumption (Xiao and Devaney, 2016). Studies carried out for OECD nations suggest that when individuals perceive an increase in their personal wealth, particularly through housing equity, there is a noticeable inclination to use part of this increase to boost consumption (André, 2010; Doling et al., 2013; Xiao and Devaney, 2016).

Acquiring homeownership constitutes a significant transaction, often being the most substantial financial decision an individual will encounter in their lifetime. The majority of households require financial assistance in order to purchase a residence, thereby rendering mortgage credit indispensable to achieve homeownership (Acolin et al., 2019). As such, housing finance is an essential component of the housing system, enabling homeownership for a much greater proportion of the population than would be observed otherwise. Finance also plays a key role in construction, supporting developers in their housing production efforts (Doling et al., 2013). The housing sector exemplifies a market where borrowing constraints hold significant economic importance (Anenberg et al., 2019). The underdevelopment of the mortgage markets constitutes a barrier to improving living conditions. Mortgages accelerate the acquisition of homeownership, but controversially mortgage subsidies as well as the deregulation of this market promoting dynamic expansion of finance sector and mortgage availability are proved to get capitalized into house prices which undermines housing affordability, especially for lower income

households (Acolin et al., 2019; Doling et al., 2013; OECD, 2021; Radzimski, 2014; Stephens, 2007). The provision of collateralized borrowing via mortgages exerts direct influence on household portfolio selection, property and asset valuation, homeownership rates, defaults, and the transmission of monetary policy (Anenberg et al., 2019). Ryan-Collins (2021) argues that the housing affordability and wealth inequality crises experienced by advanced economies are driven by the emergence of a feedback cycle between finance and real estate. The cycle has emerged due to a growing policy inclination towards private home ownership, along with the relaxation of bank credit regulations and associated financial advancements. Under such conditions, housing emerges as both the most attractive form of collateral for the banking system and the most desirable financial asset for households and investors.

Numerous authors have directly associated the decline in housing affordability with a rise in the availability of mortgage credit (Barone et al., 2020; Haffner and Hulse, 2021; Ryan-Collins, 2021). In the 20th century, providing mortgages to households emerged as one of the core activities of the banking sector (Bezemer et al., 2016). The increase in mortgage credit availability coincides with housing price inflation in many advanced and emerging economies (André, 2010; Loomans and Kaika, 2023; Xiao and Devaney, 2016).

Housing financialization has accelerated debt growth for financial institutions and households. The term refers to the increasing process of profit generation without actual production, by trading financial and immaterial assets (Aalbers, 2008). Mortgage markets transitioned from aiding the housing market to becoming standalone markets for mortgage products. Deregulation, standardisation, and international finance have turned mortgages into investment goods, generating profits in global capital markets (Aalbers, 2008; Loomans and Kaika, 2023).

Studies conducted in various countries have identified social, economic, and fiscal problems and risks generated by financialization of housing, particularly for the stability of housing markets and housing affordability and accessibility (André, 2010; Kohl, 2021; Norris and Lawson, 2023). Broader access to credit and larger mortgage loans do not lead to improved access to homeownership, but to higher house prices and greater risk and insecurity. The resulting extra demand is capitalized into house prices due to a rather inelastic supply (Haffner and Hulse, 2021). In this context a harmful 'feedback cycle' (collateral effect) is observed when excessive and non-strategic availability of credit for housing investment causes price inflation, leading to increased borrowing to afford higher prices, which undermines housing affordability, creates credit bubbles, and market crashes (Bezemer et al., 2016; Norris and Lawson, 2023; Ryan-Collins, 2021; Stephens, 2007).

At a more abstract level, the process of financialization has facilitated the switching of capital from the primary circuit of production towards the secondary circuit including the built environment and consumption (Aalbers, 2008). This is because housing has become one of the most important collateral assets for global financial markets. In these terms, housing is increasingly appraised by its market value and is seen as an asset and an investment opportunity (Norris and Lawson, 2023; Tranøy et al., 2020).

Housing and debt related products have thus not only been an object of financialization over the past decades, but also a fundamental aspect of contemporary accumulation (Loomans and Kaika, 2023). The interaction effects between housing and credit have produced endogenous decay in terms of welfare outcomes, i.e. increased stratification and re-familialisation. House prices rise faster in urban areas, leading to greater geographical wealth disparities, supporting the view that inheritance will increasingly predict economic welfare in the 21st century (Tranøy et al., 2020). The deregulation of the mortgage market has increased the significance of how housing wealth is distributed, as it has also enhanced the liquidity of housing wealth. The ability to convert housing equity into income (equity withdrawal) has blurred the relationship between wealth and income (Stephens, 2007).

Although the literature on the financialization of housing has largely concentrated on mortgage lending, newer studies acknowledge that rental housing is also impacted by financialization (Dewilde, 2018; Haffner and Hulse, 2021). They demonstrate how leading corporate real estate firms purchased foreclosed single-family homes in the U.S., building large portfolios and categorizing them as an asset class, allowing rental income to be securitized in a manner similar to mortgage payments (Fields, 2018; Haffner and Hulse, 2021).

Real estate funds, REITs, and pension funds are increasingly interested in investing in rental properties in major city centres. They invest through large developers, securing rental returns for enhanced profits. This occurs due to increased mobility of global capital through real estate investment mechanisms and the liquidity obtained by converting real estate assets into securities. The influx of global 'cheap money' into real estate post-GFC has rapidly increased land and house prices in Western countries (Haffner and Hulse, 2021). Although loan amounts have increased in pursuit of rising house prices, low dynamics of households incomes resulted in further expansion of housing unaffordability to middle-income households in major metropolitan areas, described as Global Urban Housing Affordability Crisis (Wetzstein, 2017). It's winners include homeowners, investors and speculators. On the other hand, the losers are those in overcrowded housing, renters, and individuals deprived of sufficient money for other expenses (Haffner and Hulse, 2021; Stephens, 2007).

IV. Housing affordability and its measures

Housing affordability expresses the relationship between a household's income and its housing expenditure (Hancock, 1993; Heylen, 2014; Heylen and Haffner, 2012; Nwuba and Kalu, 2018; Radzimski, 2014; Robinson et al., 2006; Whitehead, 1991; Yin et al., 2017). It indicates the extent of financial stress a household experiences when covering costs, highlighting the difficulty each household encounters in balancing its housing costs, both current or potential, and its non-housing expenses, all while staying within its income

limitations (Stone, 2006). A household faces a housing affordability problem if, once housing expenses are covered, the remaining income is inadequate to fulfil its other essential needs. (Kieti and K'Akumu, 2018). In these terms, the definitions of housing affordability can set some standard above which housing is regarded as unaffordable (Freeman et al., 1997; Hulchanski, 1995; Robinson et al., 2006). Housing affordability is further differentiated between income-, purchase- and repayment affordability. These ideas rely on the understanding that housing signifies long-term obligations through mortgages and requires sufficient funds remaining for household necessities after accounting for mortgage payments and other housing-related expenses (Bourassa, 1996). Consequently, the definition of affordability, according to Gan and Hill (2009), may evolve at different stages of property ownership. Income affordability refers to assessing housing affordability based on how accessible housing is relative to household income – access to housing – using house prices to income ratio, whereas purchase affordability and repayment affordability considers mortgage-related factors including tenure, interest rates and repayment expenses. Households are 'purchase affordable' when appropriate housing financing options are accessible – having the capacity to purchase – while 'repayment affordable' when they are not overburdened by monthly mortgage instalments relative to household income – the ability to service mortgage. Therefore, households that do not face purchase affordability issues may face repayment affordability issues if interest rates increase, raising their financial from repayment burden (Lee et al., 2021). While in the 20th century, housing affordability was mainly a social policy issue related to housing, expenditures, and income poverty, post-GFC, discussions have shifted to housing affordability influenced by rising house prices, rents, and urban restructuring, focusing on inequities in housing wealth, intergenerational, and spatial disparities (Haffner and Hulse, 2021).

Housing affordability can be measured by either the proportion of income allocated to housing or the proportion of income left after covering housing expenditures (residual income). This division highlights two broad groups of affordability measures that we can identify. These can be referred to as 'shelter first' and 'non-shelter first' measures (Burke and Ralston, 2004; Robinson et al., 2006). The shelter first approach assumes that housing expenses take priority in the household budget and that other expenditures are covered from the remainder. This category includes two primary measurement types. They are an outgoings (on housing) to income ratio (OTI) and a residual income measure (RI). A third type, similar to the first, is a house price to income ratio (Robinson et al., 2006). From the homebuyers perspective, the ratio measure models include the house price-to-income ratio (PIR), mortgage-to-income ratio (MIR) and qualifying income (QINC) for various aspects of homeownership affordability. Implementing these measures involves methodical questions as to the determination of the benchmark used to represent affordability problems. It should be noted that the benchmark and its application differ across countries. In the US, housing is considered affordable if costs, including utilities, do not exceed 30% of one's income. If this percentage is surpassed, the household is described as 'housing cost burdened', while spending over 50% of income to housing indicates being seriously or severely cost burdened. (Nwuba and Kalu, 2018).

Ratio-based metrics, such as the price-to-income ratio, are widely used to measure income affordability due to the simplicity of calculation and interpretation. The ratio measures usually apply a 'rule-of-thumb' approach, where affordability problems occur when a household allocates more than a designated portion of their income to housing expenses. However, the choice of variables in this case limits the method's applicability (Cai and Lu, 2015; Lee et al., 2021). This approach falls short of determining if the cost of housing is excessively high or if household earnings are insufficient and ignores critical components of housing cost like mortgage interest rates and downpayments, which affect monthly repayments and true housing affordability (Lee et al., 2021; Robinson et al., 2006). The ratios tend to oversimplify actual situation and thus fail to account for the diverse household types and their spending patterns (Lee et al., 2021; Robinson et al., 2006).

The residual income approach (RI) concentrates on the income remaining for non-housing expenses after covering housing costs. The measure of residual income is then income subtracting the mortgage payments. This approach can also calculate the income that remains for housing after deducting the minimum standard of living. This calculation requires an estimation of expenses for all non-housing essentials (Robinson et al., 2006). In this scenario, the most suitable measure of the connection between housing expenses and income is the difference, rather than a ratio (Stone, 2006). When the remaining amount is not enough for housing, the household faces a housing affordability problem. (Burke et al., 2011).

The RI method resolves the limitation of ratio-based measures by distinguishing between low-income households experiencing 'genuine' affordability issues (indicated by low RI) and high-income households encountering 'apparent' affordability challenges despite exhibiting the same price-to-income ratio (indicated by adequate RI). However, the measure is influenced by how a socially acceptable level of income remaining after housing-related expenses is defined (Chen et al., 2010; Robinson et al., 2006). Thus, the RI criterion is not universal and is 'socially grounded in space and time' (Stone, 2006). Thus, the RI measure maintains the arbitrary nature of setting affordability limits found in ratio-based measures. The measure can also be unreliable during times of sudden increases in housing prices (Kutty, 2005). In summary, no measures can be considered flawless when assessing housing affordability. Instead, it is essential to recognize each measure's shortcomings and use them appropriately to enhance their usefulness in evaluating housing affordability (Lee et al., 2021).

V. Materials and methods

Due to its significant socio-economic importance, the housing affordability among Polish households has been the

subject of numerous studies in various contexts. These have included, among others: comparative analyses of housing affordability in selected local markets (Strączkowski, 2015; Matel and Marcinkiewicz, 2017; Dittmann, 2018), assessments of its long-term changes (Trojanek, 2014; Zakrzewska-Półtorak and Pluta, 2023), evaluations of the purchasing power of specific household types, such as young people (Strączkowski, 2022), assessments of housing policy instruments implemented by central authorities to support households in purchasing their first home (Jędrusik, 2023), and analyses of housing affordability in Poland compared to other European countries (Czerniak et al., 2022; Slavata et al., 2024).

The main method used in these studies to identify households' purchasing power in the housing market has been the comparative analysis of household income conditions—estimated based on average wages or disposable income—and the average price level of residential properties in the primary or secondary market. However, this approach has certain limitations, as it overlooks the aspect of consumer spending necessary for households to function properly and meet their basic needs. Therefore, it should be assumed that changes in housing affordability are determined not so much by changes in household income, but by the portion of that income which can be allocated to housing expenses.

With this in mind, for the purpose of this study, housing affordability is defined as the number of square meters of housing that can be purchased with a household's annual budget surplus—calculated as the difference between disposable income and the social minimum:

$$HA(RI) = \frac{RI}{HP} = \frac{(DI-SM)\cdot 12}{HP} \qquad (1)$$

Where:

$HA(RI)$ – the housing affordability based on a household's budget surplus;

RI – the annual budget surplus of a household (residual income);

DI – the monthly disposable income of a household;

SM – the monthly social minimum for 2+1 household;

HP – the average price per square meter of usable space in the secondary market.

The social minimum included in the household budget surplus estimates defines "the threshold of expenditures measuring a minimally decent standard of living." "The social minimum basket includes goods that meet existential needs (food, clothing and footwear, housing, healthcare, and hygiene), but also those necessary for performing work (local transport and communication), education (schooling and child upbringing), maintaining family ties and social contacts, and modest participation in cultural life" (Kurowski, 2002).

As a reference point for the housing affordability measure presented above, a more classical version was adopted—estimated based on households' disposable income and residential property prices:

$$HA(I) = \frac{DI\cdot 12}{HP} \qquad (2)$$

Where:

$HA(I)$ – the housing affordability based on a household's disposable income.

The purchasing power of a representative household comprising two adults and one child (2+1) was analyzed. This is the most common household type in Polish society, accounting for 39.7% of all households according to the 2021 National Census. Moreover, the decision to have children is often a key factor motivating young families to purchase their own home or to move to a larger one (Whelan et al., 2023).

Housing affordability indicators were calculated for 16 regional markets (voivodeships) over the period 2003–2023. Data on households' disposable income came from the CSO database (BDL) and Household Budgets Surveys. For the social minimum, statistics from the Institute of Labour and Social Studies were used, while average prices of residential properties in the secondary market were obtained from the CSO database (BDL) and PKO BP reports "Housing Market in Poland".

The regional housing affordability indicators were used not only to quantify households' purchasing power in housing markets, but also to determine the scale of regional disparities and how they evolved over time. The study examined whether regional markets show a long-term tendency toward decreasing differences (convergence) or increasing differences (divergence) in terms of the adopted housing affordability measures. Two types of convergence were analyzed in detail: sigma convergence and relative convergence. Both concepts have been widely studied in relation to housing markets (Kucharska-Stasiak et al., 2020; Tomal, 2019).

Sigma convergence is understood as a process of decreasing variation among markets over time with respect to the variables describing them. One way to verify this is by using a linear trend model for a selected measure of variability. A negative and statistically significant coefficient α_1 in the trend function is an evidence of sigma convergence (Kusideł, 2013):

$$V_{HA,t} = \alpha_0 + \alpha_1 \cdot t + \varepsilon_t \qquad (3)$$

Where:

$V_{HA,t}$ – the cross-sectional measure of variation (e.g., coefficient of variation) in regional housing affordability indicators;

α_0, α_1 – the structural parameters of the trend function;

t – the time variable;

ε_t – the random component.

Testing sigma convergence with the trend model (3) may, however, lead to incorrect conclusions when the time series of variables describing the activity of the analyzed markets exhibit common stochastic or deterministic trends (Kucharska-Stasiak et al., 2020). Moreover, the lack of overall convergence across the markets does not exclude the occurrence of so-called club convergence within selected subgroups of markets.

A solution to these issues is relative convergence, proposed by Phillips and Sul (Phillips and Sul, 2007). The testing procedure for relative convergence assumes that the variable describing the analyzed markets (e.g., housing affordability indicators) X_{it} can be decomposed into two components: a systematic component g_{it} and a transitory component a_{it}. The long-term changes observed in the markets thus include a common trend u_t shared by all units in the panel, and an idiosyncratic element δ_{it} that is unique to each market and

varies over time (Du, 2017):

$$X_{it} = \left(\frac{g_{it}+a_{it}}{u_t}\right) u_t = \delta_{it} u_t \qquad (4)$$

Markets will converge toward a common steady state if: $\lim_{k\to\infty} \delta_{it+k} = \delta_i = \delta$ for all i. It is assumed that this process occurs at a rate of: $1/\left(t^{\alpha} log(t+1)\right)$, the parameter α determines the speed of convergence (Matysiak and Olszewski, 2019). If $\alpha \geq 0$ convergence in rates occurs (i.e., convergence in the rate of change of the variable). If $\alpha \geq 1$, convergence in levels occurs (i.e., convergence toward a common long-term level of the variable) and if $\alpha < 0$, the markets undergo a process of divergence (Tomal, 2022).

The hypothesis of relative convergence is tested with the so-called log t regression:

$$log\left(\frac{H_1}{H_t}\right) - 2log\ (\log(t)) = c + b \cdot log\ (t) + \varepsilon_t \qquad (5)$$

Where:

$t = [rT], [rT]+1, \ldots, T$;

r – the percentage of initial observations omitted in the estimation of the log t regression. In the case of long time series (T > 50), it is assumed that $r = 0.2$, whereas for short series (T<50) $r = 0.3$;

$b = 2\alpha$ – slope coefficient of log t regression;

$H_t = \frac{1}{N}\sum_{i=1}^{N}(h_{it}-1)^2$ – the cross-sectional variance of the variable X in the time period t;

$h_{it} = \frac{X_{it}}{N^{-1}\sum_{i=1}^{N} X_{it}}$ – - the path of changes of the i-th unit relative to the arithmetic mean for all units in the panel;

N- the number of units in the panel;

T– the time horizon of the study.

According to the assumptions of the log t regression, in the case of convergence, the markets should reduce their distance to the cross-sectional average, which represents the common trend shared by all units in the panel. The relative transition paths of each converging market should, in the long term, approach one ($h_{it} \to 1$), and the cross-sectional variance of h_{it} should approach zero ($H_t \to 0$).

The parameter b is crucial for testing the occurrence of convergence. A statistically significant and negative coefficient b indicates a process of divergence among the analyzed markets. If $0 \leq b \leq 2$, this confirms convergence in rates, and $b \geq 2$ indicates convergence in levels (Arcabić, 2018). The critical value for the one-sided t-test for parameter b, at a 5% significance level, is –1.65. Therefore, the null hypothesis (assuming that $b = 0$) is rejected in favor of the alternative hypothesis ($b < 0$) when $t_b < -1.65$ (Matysiak and Olszewski, 2019). In the absence of convergence across all markets, the Phillips and Sul procedure provides an algorithm for identifying club convergence (Phillips and Sul, 2007).

VI. Results

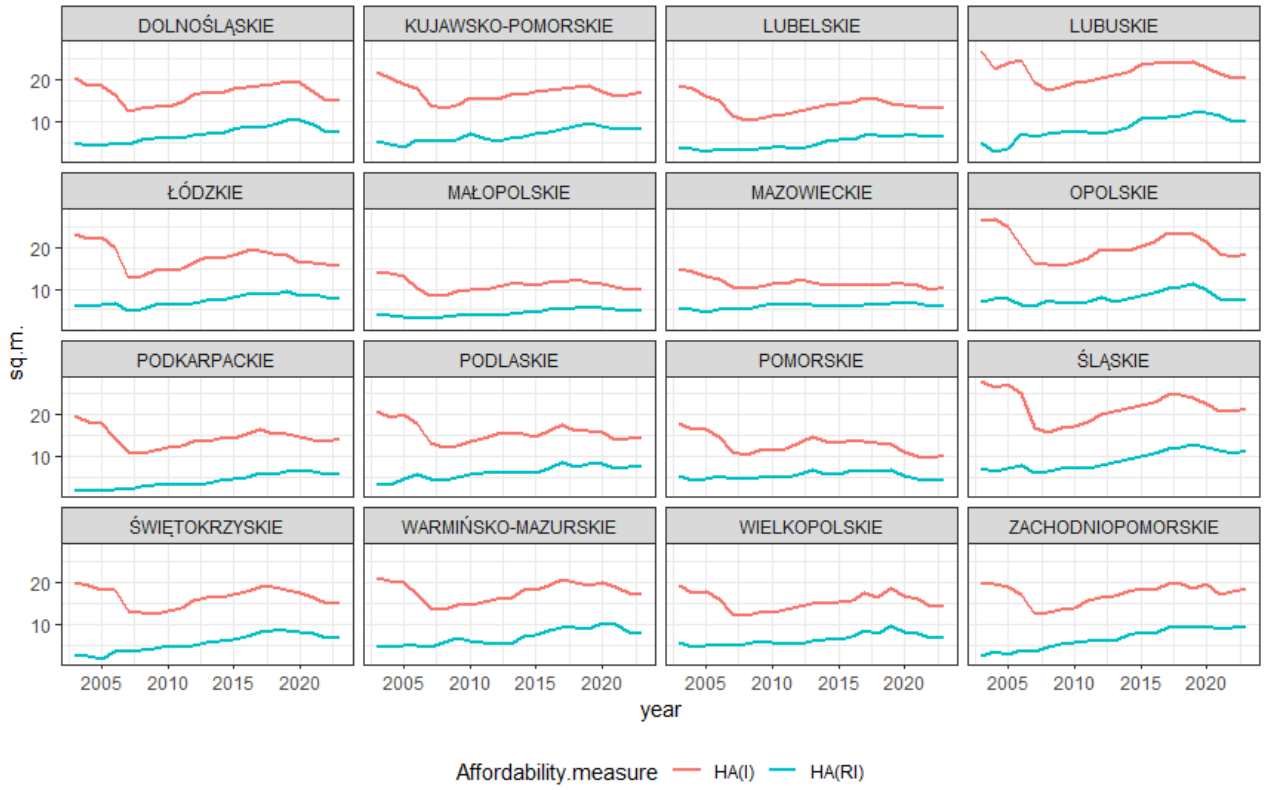
Long-term fluctuations in housing affordability indicators across regional markets are presented in Fig. 1. According to the classical form of the affordability indicator $HA(I)$, households' purchasing power followed a cyclical pattern over the analyzed time horizon. The relatively high purchasing power observed in the early years of the study (2003–2005) was sharply reduced by the formation of a housing price bubble (Żelazowski, 2018). By its peak in 2008, housing affordability across regional markets had declined by an average of 40%. In the following years, most regions experienced a long-term recovery in households' purchasing power, driven on one hand by booming labour market and rising average wages, and on the other by stable property prices during that period. The trend reversed after 2017, when the housing market entered another phase of strong price growth. However, the decline in housing affordability indicators was not as deep as during the price boom of 2006–2008.

Housing affordability measured by the $HA(RI)$ indicator shows noticeably different trends across regional markets. Importantly, this measure accounts not only for households' disposable income but also for their basic consumption expenditures, allowing for a more precise assessment of their actual, rather than potential, ability to purchase a residential property.

According to the $HA(RI)$ indicator, in the early years of the analysis, households in the Podkarpackie Voivodeship had the lowest purchasing power (approx. 1.9 sq. m. of housing affordable with the annual budget surplus), followed by Świętokrzyskie (approx. 2.2 sq. m.) and Zachodniopomorskie (2.8 sq. m). The highest purchasing power was observed in Opolskie (approx. 7.5 sq. m) and Śląskie Voivodeship (approx. 7.0 sq. m.). Until 2019, a gradual improvement in housing affordability was observed, with short-term disruptions caused by the speculative bubble (2006–2008). The upward trend was stopped by the outbreak of the COVID-19 pandemic in 2020, and the subsequent sharp appreciation of housing prices in the following years significantly reduced households' purchasing power.

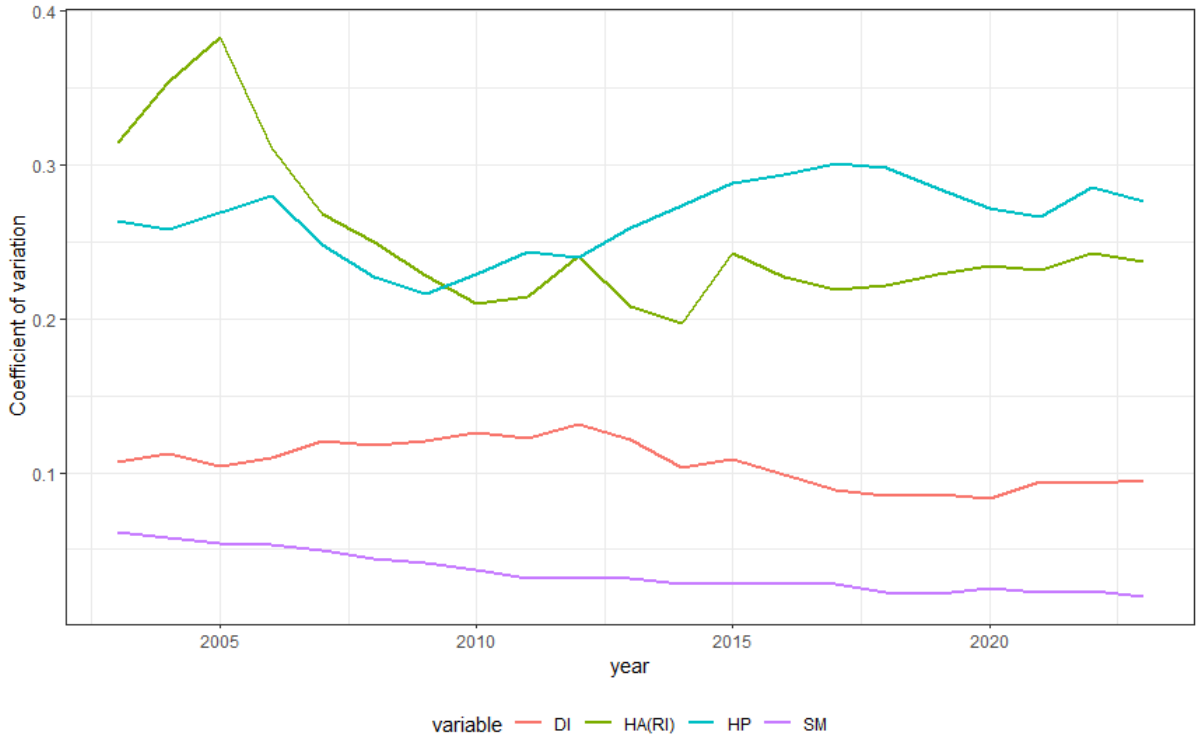
Over the entire period, the most favourable changes in housing affordability occurred in Zachodniopomorskie Voivodeship (an increase of 7.0 sq. m. compared to 2003) and Lubuskie Voivodeship (an increase of 5.1 sq. m. compared to 2003). The only voivodeship where a decline in purchasing power was recorded was Pomorskie Voivodeship (a decrease of 1.1 sq. m. compared to 2003) The $HA(RI)$ indicators estimated for regional markets showed significant variation (see Figure 2). Cross-sectional coefficients of variation were particularly high in the early years of the analysis. Between 2005 and 2010, this variation gradually decreased (with the coefficient of variation falling from 38% to 21%). Among the potential causes of this process was the declining dispersion over time in both the social minimum and housing prices (especially between 2006 and 2010). Since 2012, the coefficient of variation for housing affordability has fluctuated between 20% and 25%. A negative and statistically significant slope coefficient in the trend function (6) confirmed the occurrence of sigma convergence in households' purchasing power across regional housing markets.

Figure 1. Changes in housing affordability across regional markets



Source: own elaboration.

FIGURE 2. VARIATION IN THE HOUSING AFFORDABILITY AND ITS DETERMINANTS



Source: own elaboration

$$V_{HA,t} = 0{,}306 - 0{,}005 \cdot t \qquad (6)$$

t-stat: $(-3{,}589)$

Relative convergence was not confirmed for the full panel of 16 voivodeships. The t-statistic value for the *b* coefficient in the log t regression was lower than the critical value (t-stat < -1,65). However, the Phillips and Sul clustering procedure made it possible to identify two convergent clubs (see Table 1). The first club consisted of 13 voivodeships, excluding Mazowieckie, Małopolskie, and Pomorskie, which together

formed the second club. The α parameter (which determines the speed of convergence), being less than 1 in both clubs, indicates convergence in the rates of regional housing affordability indicators.

TABLE 1.

LOG T REGRESSION ESTIMATES

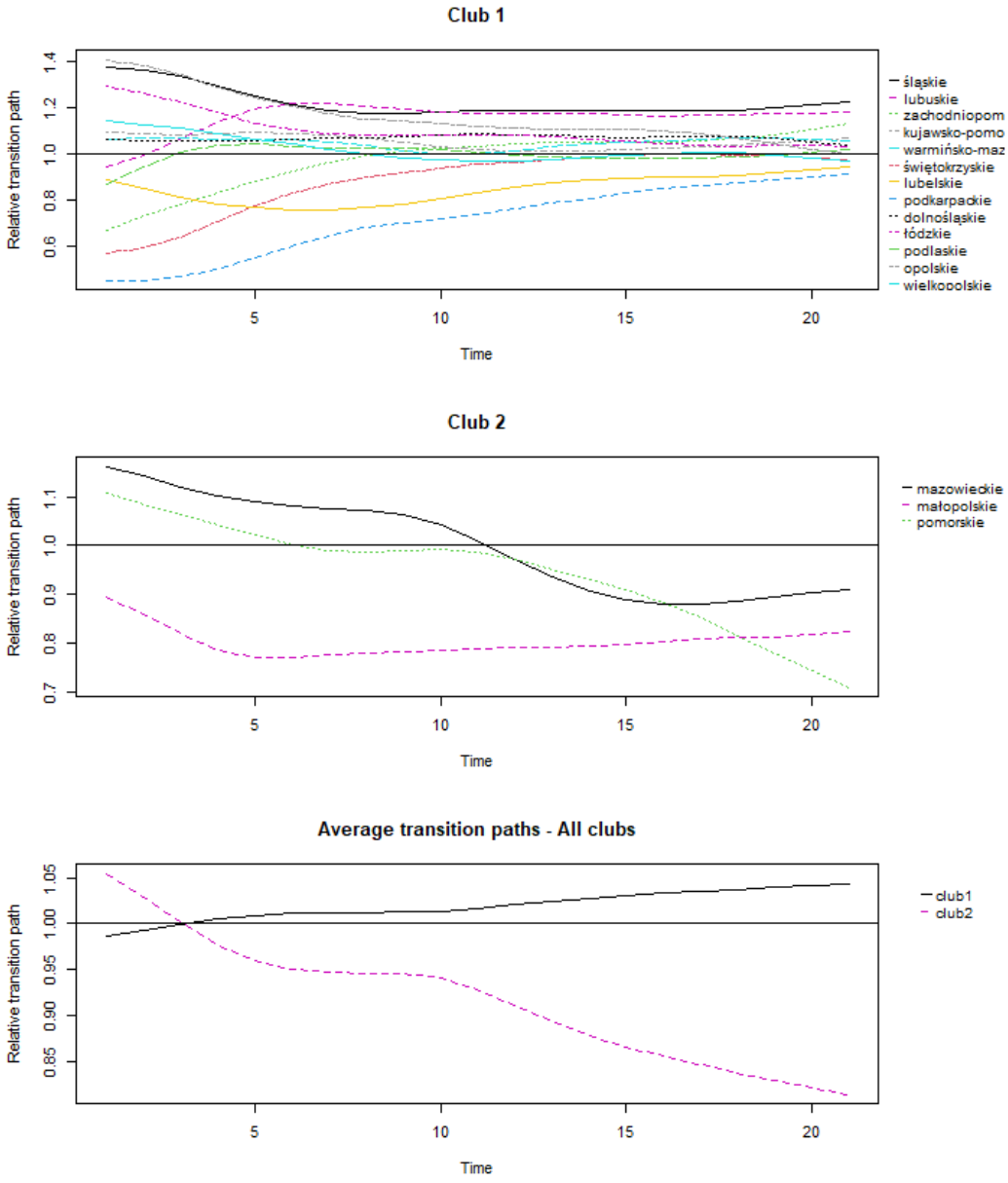
Regional housing markets	*b*	t-stat*	*α*	Regions
Whole group	-0.279	-3.367	-	All 16 voivodeships
Club 1	0.531	9.867	0.266	Dolnośląskie, Kujawsko-Pomorskie, Lubelskie, Lubuskie, Łódzkie, Opolskie, Podkarpackie, Podlaskie, Śląskie, Świętokrzyskie, Warmińsko-Mazurskie, Wielkopolskie, Zachodniopomorskie
Club 2	1.008	2.535	0.504	Mazowieckie, Małopolskie, Pomorskie

b – log t regression coefficient; α – speed of convergence, *critical value for t-statistic at 5% significance level (-1,65)

Source: own elaboration

The trajectories of changes in households' purchasing power relative to the cross-sectional average in the panel are presented in Fig. 3. They reveal a stronger and long-term tendency among the voivodeships in club 1 to converge toward the common trend. In club 2, this process primarily involved Mazowieckie and Pomorskie Voivodeships, and lasted until 2011. In the following years, these voivodeships showed a tendency to diverge from the common trend.

FIGURE 3. CONVERGENCE CLUBS FOR THE HOUSING AFFORDABILITY INDEX $HA(RI)$



Source: own elaboration

VII. Conclusions

The literature provides numerous arguments emphasizing the importance of adequate housing conditions for the proper development of households. However, the functions served by residential properties go far beyond simply providing living space. They influence households' fundamental economic choices and behaviors, including consumption, saving, and wealth accumulation. Housing also has a social dimension, shaping reproductive behavior and fostering a sense of belonging to the local community. It affects households' mental well-being by influencing life satisfaction, and strengthening feelings of security, self-reliance, and responsibility for one's future. Given the wide range of needs fulfilled by residential properties, it is essential to regularly monitor their affordability for households. This is especially important because, for over a decade, with the increasing financialization of the real estate market, households have had to compete for housing resources with institutional investors who possess significantly greater financial capacity.

The fundamental challenge in assessing housing affordability lies in the lack of universal measures and indicators applicable in this area. In this study, households' purchasing power in regional housing markets was determined based on their annual budget surplus, defined as the difference between disposable income and the social minimum. This approach expands upon previous research, which typically identified households' financial capacity based on average wages or disposable income, without accounting for consumption expenditures necessary to maintain a basic standard of living. Furthermore, the conducted research enabled an assessment of housing affordability over a period of two decades, offering a comprehensive perspective on the long-term relationship between property prices and the financial situation of Polish households—an issue of critical importance from the standpoint of housing policy.

According to the results, between 2003 and 2019, housing affordability gradually improved. The reversal of this upward trend in the years 2020–2023 was caused by an exceptionally strong increase in housing prices, which was not offset by growth in households' disposable income. Sigma convergence of regional housing affordability indicators was confirmed, although the most significant decline in variation occurred between 2005 and 2010. The relative convergence analysis, using log t regression, allowed for the identification of two convergent clubs. The regional markets assigned to these clubs exhibited long-term convergence in the rate of change of housing affordability indicators.

When interpreting the results, it is important to consider the limitations of the applied research procedure. The assessment of housing affordability was conducted for a specific type of household (2+1) based on the average level of disposable income, an estimated social minimum, and the average price of residential properties in each region. This approach does not provide a complete picture of households' situations in the housing market. A more accurate understanding of their purchasing power requires taking into account the actual distribution of households' incomes, their consumption expenditures, and an assessment of their current housing conditions.

Additionally, an important complement to this housing affordability methodology would be to include the option of mortgage financing. From this perspective, the ability to purchase a residential property depends not only on households' income and consumption expenditures, but also on whether they meet the formal criteria for obtaining a mortgage (including, for example, minimal down payment) and the costs of servicing the loan.

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