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Housing market volatility and structural factors across selected Western economies¹

Zmienność cen na rynku mieszkaniowym a czynniki strukturalne w wybranych gospodarkach zachodnich

Abstract

This study investigates how structural features of housing systems – mortgage leverage, tenure composition, and rental market depth – affect volatility and persistence in housing price indicators across six European countries (1975Q1–2024Q4). Using quarterly data on real house prices (RHPI), price-to-rent (PTR), and price-to-income (PTI) ratios, I combine visual diagnostics with formal statistical tests to assess the role of institutional factors. My results show that valuation indicators perform differently across housing regimes. PTI proves more reliable in tenant-oriented systems such as Austria and Germany, and also in France despite its sizable share of leveraged owners, whereas PTR is better suited to market-driven, ownership-heavy contexts like Ireland, Spain, and the UK. Overall, I show that housing market volatility is not merely cyclical but structurally embedded. Policy frameworks for valuation diagnostics and credit risk assessment should account for institutional diversity rather than rely on uniform thresholds.

Keywords

housing market volatility; housing market structures, price-to-rent ratio; price-to-income ratio; housing valuation indicators

JEL: R31, R38

Streszczenie

Celem badania jest analiza, w jaki sposób strukturalne cechy krajowych systemów mieszkaniowych – takie jak dźwignia kredytów hipotecznych, struktura własnościowa oraz głębokość rynku najmu – wpływają na zmienność i trwałość wskaźników cen nieruchomości w sześciu krajach europejskich w latach 1975–2024. Wykorzystując kwartalne dane dotyczące realnych cen mieszkań (RHPI), wskaźników ceny do czynszu (PTR) i ceny do dochodu (PTI), łączę analizy wizualne z formalnymi testami statystycznymi, aby ocenić rolę czynników instytucjonalnych. Na podstawie otrzymanych wyników pokazuję, że skuteczność wskaźników wyceny nie jest uniwersalna. Zalecam stosowanie PTI jako bardziej wiarygodnego miernika przewartościowania w krajach ze skuteczną ochroną najemców (np. Austria, Niemcy), również w kontekstach, gdzie istnieje reprezentatywna grupa posiadaczy (Francja). Wskaźnik PTR natomiast może lepiej sprawdzać się w systemach zdominowanych przez właścicieli i poddanych mechanizmom rynkowym, takich jak Irlandia, Hiszpania czy Wielka Brytania. Niniejsze badanie wskazuje, iż zmienność na rynku mieszkaniowym nie ma wyłącznie charakteru cyklicznego, lecz wynika z głębokich uwarunkowań instytucjonalnych. Ramy diagnostyki wyceny oraz zarządzania ryzykiem kredytowym powinny być dostosowane do strukturalnych cech danego systemu, zamiast opierać się na jednolitych progach.

Słowa kluczowe

zmienność rynku mieszkaniowego, struktura systemu mieszkaniowego, wskaźnik ceny do czynszu (PTR), wskaźnik ceny do dochodu (PTI), wskaźniki wartościowania nieruchomości

Introduction

Housing market volatility has increasingly become a concern for policymakers and academics due to its profound implications for economic stabil-

ity and social welfare. The Global Financial Crisis (GFC) of 2008–2009 starkly highlighted how dramatic swings in housing prices could escalate into severe macroeconomic disruptions, triggering deep recessions, banking crises, and long-term harm

to the economy's underlying structures, including labour markets, financial systems, and fiscal stability. Yet, despite this recognized systemic risk, not all countries experience housing market cycles equally. The variation observed across Western economies – such as evident housing bubbles in Ireland and Spain compared to the relative stability in Germany and France – raises significant questions about the drivers of those differences. Most likely explanation are structural factors.

The literature identifies several key determinants of housing market volatility, including credit leverage, mortgage financing models, tenure composition, and regulatory frameworks (Andrews, 2010). Empirical studies show that markets dominated by highly leveraged homeownership tend to amplify housing price cycles, driven by speculative dynamics and easy credit conditions (Andrews et al., 2011; Jordà et al., 2015, 2016). Conversely, well-regulated rental markets with strong tenant protections provide stability, offering viable alternatives during housing market overheating (Kofner, 2014; Czerniak & Rubaszek, 2018). Despite these insights, few studies systematically examine how these structural characteristics influence not only the volatility of housing prices, but also the behaviour of common valuation indicators, such as price-to-rent and price-to-income ratios.

Furthermore, bubble detection methods have progressed beyond traditional valuation indicators such as the price-to-rent (PTR) and price-to-income (PTI) ratios – though these remain widely used as inputs in econometric procedures. A key development in this regard is the GSADF test introduced by Phillips et al. (2015), which enables real-time detection of explosive price behaviour and has since become one of the most frequently applied methods in asset bubble research (see Hu, 2023, for a comprehensive review). Despite these methodological advancements, the literature continues to face difficulties when addressing cross-country structural differences, which hinder both direct comparisons and the reliability of housing bubble identification.

This paper addresses these gaps: I examine how structural factors affect the volatility and persistence of housing prices and valuation indicators. I posit that housing systems dominated by leveraged homeownership and weak rental market regulation will display greater volatility and be more prone to sharp, speculative price cycles. In contrast, systems with more balanced tenure structures, deeper rental markets, and strong institutional protections are expected to exhibit lower volatility and more persistent valuation trends. This higher persistence would reflect structural rigidities – such as stabilized rents, longer lease terms, or constrained affordability – that slow market corrections and

prolong adjustments over time. Accordingly, my first hypothesis is that systems characterized by higher degree of ownership (especially leveraged) experience higher volatility and more cyclical behaviour, while rental-oriented and balanced systems, though less volatile, display stronger trend persistence in price-to-rent and price-to-income ratios due to institutional stickiness and income-anchored constraints.

Moreover, I expect that valuation indicators such as price-to-rent (PTR) and price-to-income (PTI) ratios may perform differently depending on housing system structure. In ownership-dominated markets – where rents are market-determined and homeownership reinforced by social norms and policy – house prices can rapidly decouple from rents during booms, leading to large swings in the PTR ratio. This makes PTR a potentially informative early-warning signal in such systems. By contrast, in rental-oriented and balanced markets with long-term lease structures, rent stabilization, and conservative mortgage lending, rent levels tend to adjust more slowly, and housing prices are often more anchored to incomes. As a result, PTR ratios are typically more stable, and the PTI ratio – which reflects households' ability to purchase housing based on income – may serve as a more reliable indicator of overheating in these contexts. This leads to my second hypothesis: price-to-rent ratios are more volatile and thus more informative in ownership-heavy, deregulated housing systems, while price-to-income ratios provide more meaningful signals in regulated, renter-oriented or balanced markets.

To empirically explore these hypotheses, I conduct a comparative visual analysis using quarterly data spanning from 1975Q1 to 2024Q4 across six European countries (Austria, France, Germany, Ireland, Spain, and the United Kingdom). My methodological approach includes examining the dynamics of key housing price indicators (Real House Price Index, price-to-rent, and price-to-income) across housing systems characterized by tenure composition, mortgage leverage, and rental market depth. To capture these institutional dimensions in a single metric, I construct a Structural Housing Index using principal component analysis (PCA). When appropriate, I supplement visual evidence with statistical tests. I employ *t*-tests to formally evaluate differences in persistence's behaviour across countries. In cases where volatility appears spuriously high, I apply the Zivot–Andrews test to identify potential structural breaks.

This study makes three contributions to the housing market literature. First, I develop a systematic, data-driven classification of countries based on institutional features critical to housing market dynamics – namely, mortgage leverage, tenure composition, and the depth of the rental sector. The

Structural Housing Index, derived from principal component analysis (PCA), represents these dimensions on a continuous scale, allowing me to identify intermediate cases alongside clearly owner-dominated and rental-oriented systems. This typology provides a more granular framework for cross-country comparisons and for grouping structurally similar markets in empirical analyses of housing volatility and bubble detection. Second, I analyse how these structural characteristics influence both the volatility and persistence of housing indicators. I show that housing systems with high mortgage leverage and limited rental depth exhibit greater volatility, while persistence patterns – particularly for valuation ratios – vary with the degree of regulation and affordability constraints. Third, I assess the context-dependent reliability of traditional valuation indicators. My results show that price-to-rent ratios are more informative in ownership-heavy markets, whereas price-to-income ratios tend to be more reliable in highly regulated, balanced and rental-oriented systems. For policy-makers, my findings emphasize that structural features – not just macroeconomic conditions – underpin systemic risk and affect the signalling power of standard valuation diagnostics. Thus, I advocate for tailored policy responses that reflect institutional housing structures and aim to strengthen macro-financial stability and housing affordability.

Literature review

The research on real estate bubbles is extensive, though there are still significant limitations. Especially, there is sparse literature of studies investigating how housing market structures – encompassing financing models, ownership patterns, and rental arrangements – affect the price and overvaluation indicators dynamics. In this Section I provide an overview of the most important academic studies important for my hypotheses.

Housing bubbles and detection methods

A rich literature has sought to define and detect housing price “bubbles,” typically characterized by price growth that becomes decoupled from fundamental values. Traditional approaches compare house prices to income or rents, with unusually high price-to-rent or price-to-income ratios often flagged as signs of overvaluation (Girouard et al., 2006). However, such indicators can be misleading when structural factors – such as rent controls or cultural ownership preferences – cause baseline ratios to differ across countries.

In recent years, time-series econometric tools have been developed to detect bubbles directly from price or indicator dynamics. Notably, Phillips et al. (2015) and Phillips & Shi (2018) propose a recursive test for explosive behaviour in asset prices that has become widely used in real estate research and adopted by policy bodies such as the Dallas Federal Reserve (e.g. Martínez-García, 2024). Nevertheless, despite the wide adoption, Monschang & Wilfling (2021) provide critique of GSADF tests, underscoring its high sensitivity to data frequency and calibration. Thus, detecting bubbles in real time remains challenging.

Structural drivers of housing dynamics

Comparing housing cycles across countries introduces several complications. Housing markets are embedded in distinct institutional and policy environments, which affect both price levels and volatility. For example, a similar macro shock can produce very different housing outcomes depending on a country’s housing finance system and market regulations. Key structural factors, that vary across countries include (Andrews, 2010):

- **Mortgage leverage and deregulation:** e.g. prevalence of fixed vs. variable interest rates, typical loan terms, and lending standards. These influence how quickly monetary or financial shocks feed into house prices. Andrews (2010) shows leveraged mortgage markets amplify price swings, a finding further confirmed by Jordà et al. (2015, 2016); Andrews et al. (2011) show prudential regulation dampens cycles.
- **Tax and subsidy policies:** for instance, mortgage interest deductibility or capital gains tax relief on housing can fuel higher baseline prices and leverage, potentially amplifying booms. Glaeser (2010) and Ceriani et al. (2011) point to US tax system – which heavily biases the homeowners – as one of potential drivers of the housing bubble.
- **Tenure composition:** markets with high homeownership levels and mortgage debt tend to display more pronounced boom-bust patterns compared to more renter-heavy systems (Czerniak & Rubaszek, 2018; Kiyotaki et al., 2024).
- **Rental market regulation:** literature (e.g., Kholodilin, 2020) highlights that while strict rent control can stabilize rents in the short-run, overly rigid policies may constrict supply. “Second-generation” approaches – moderate caps paired with eviction protections – strike a better balance (Pastor et al., 2018).

Because of such differences, even broadly similar macroeconomic conditions can yield different housing market dynamics across countries. However, isolating the effect of any single policy remains difficult, since countries often implement housing

policies as bundles (and these coincide with other structural factors) and can differ from region to region across the same country.

Institutional differences

To analyse how housing structure affects housing market volatility and valuation metrics, I group six Western European economies into three institutional types: rental-oriented, owner-oriented and balanced/mixed. Countries are categorized based on tenure composition, mortgage finance structure, rental regulation, and the presence of social housing.

Rental-oriented systems: Austria, Germany. These countries maintain long-established rental markets supported by tenant-friendly regulation and balanced housing policies.

Austria combines a multi-tier rent control system – particularly for older buildings – with a strong non-profit and municipal housing sector. Both fixed- and variable-rate mortgages are used,

and for a brief period foreign-currency variable loans (e.g. in Swiss francs) were popular, until regulators eventually curbed this practice due to its risks (Albacete & Lindner, 2015). Homebuyers often rely on savings-based instruments (Bauspar), and mortgage interest is tax-deductible for owners renting their property.

Germany remains renter-dominated, with about half of households renting. Regulation includes long-term tenancy security and rent caps in designated areas. Mortgage lending is highly conservative, and savings schemes (Bauspar) are widely used. Landlords offering below-market rents receive subsidies (Schmidt, 2021); mortgage interest is tax-deductible for all rented properties. Recent homebuyer subsidies (e.g., Baukindergeld) were limited in scope.

Owner-oriented systems: Ireland, Spain, the UK. These countries followed a policy-led expansion of homeownership through liberalized credit, tax incentives, and support schemes, often at the

Table 1. Comparative housing system characteristics (selected Western economies)

Country	Dominant tenure type	Rental regulation strength	Social housing (% out of total housing stock)	Mortgage type	LTV/ leverage level	Key policies
Austria	Mixed, renter-leaning	Strong rent control in certain buildings and tenant protections	High (~20%)	Fixed & variable	Conservative	Mieterschutz, non-profit housing, Bauspar schemes
France	Balanced	Moderate urban rent caps; strong tenant protections	Moderate (~14%)	Long-term fixed	Conservative	Encadrement des loyers, PTZ, low-interest purchase loans
Germany	Renter-dominant	Moderate rent regulation, strong tenant protections	Very Low (~2–3%)	Long-term fixed	Conservative	Bauspar schemes, Mietpreisbremse, rental subsidies, conservative lending
Ireland	Owner-dominant	Weak rent regulation until 2016; zone caps thereafter	Moderate (~9%)	Variable	High	Rent Pressure Zones, Help to Buy, mortgage interest relief
Spain	Owner-dominant	Strong and imbalanced; recent caps on rent increases in some areas	Very low (~2%)	Variable	High	Urban Leasing Law, VPO social housing, 95%-100% LTV loans
United Kingdom	Owner-dominant	Deregulated	Moderate (~17%)	Short-term fixed + variable	High	Right to Buy, Help to Buy, Renters' Rights Bill reforms

Sources: Action Logement, n.d.; Acolin, 2021; Ahrens et al., 2019; Albertazzi et al., 2024; Althoff, n.d.; Bank of England, 2025; Bar-dhan et al., 2012; BBVA, n.d.; City of Vienna, n.d; CCPC, 2017; Euronews, 2023; Eurostat, 2024; Feantsa , 2021; Fernandez de Lis, 2013; Fitchratings, 2023; Gov.uk, n.d.-a, n.d.-b; ; Hallissey & Durante, 2023; Hilber & Schoni, 2021; Hoekstra et al., 2010; House of Commons, 2001; Mortgages.ie, 2011; OECD, 2024a, 2024b; Office for National Statistics, 2015; Ouasbaa & Viladecans-Marsal, 2021; PAP, 2025; Pwc, 2024, 2025; RSM Global, n.d.; Schmidt, 2021, Sgfgas.fr, n.d.; Shelter England, n.d.; Spanish Property Insight, 2024;

expense of long-term rental alternatives. These systems exhibit higher financialization, greater exposure to interest rate shocks, and historically more cyclical volatility in housing markets.

Ireland liberalized credit during the 2000s boom, fuelling volatility. Rent regulation was introduced only in 2016 via Rent Pressure Zones, and remains limited. Homeownership remains a policy goal, supported by tax rebates and shared equity programs (“Help to Buy” program).

Spain presents an unusual case: strong tenant protections exist, but limited landlord incentives have led to limited supply. Until 2018, mortgage interest was tax-deductible for owner-occupiers. While lending tightened after 2008, some banks still offer up to 100% LTV loans to young, first-time buyers.

The United Kingdom’s formerly extensive social housing stock has been progressively reduced through sales and limited replacement², while tenants’ rights have been eroded, resulting in what is nowadays one of Europe’s most deregulated rental systems. No-fault evictions remain legally possible. Homeownership has long been promoted through schemes like “Right to Buy” (1980) and “Help to Buy” (2013), while short-term fixed and variable-rate mortgages dominate.

Mixed/Balanced system: France. France features moderate rent regulation, with caps in high-demand areas, and sizable public renting sector. Mortgage lending is conservative, dominated by long-term fixed rates. At the same time, policies encouraging homeownership are in effect (e.g., zero-interest loans, state-backed insurance), and homeowners constitute a substantial share of the tenure mix.

Table 1 summarizes key institutional features for each country, based on the typology discussed above.

Data description and methodology

My analysis uses panel data on housing market volatility and structural characteristics for a selection of Western economies over recent decades. I compile data for six countries – Austria, Germany, France, Ireland, Spain, and the United Kingdom – spanning from 1975Q1 to 2024Q4. I use quarterly indicators from the OECD Analytical House Price Database, which includes the Real House Price Index (RHPI), price-to-rent (PTR), and price-to-income (PTI) ratios. All indicators are expressed as real, seasonally adjusted indices, with 2015 set as the base year.

I define volatility as the unconditional standard deviation of each indicator’s log-level series. This captures medium- to long-run fluctuations – often associated with boom-bust cycles – while filtering out high-frequency noise. A higher volatility value

implies that real house prices have experienced larger and more frequent swings over time. However, even substantial volatility in real house price indices (RHPI) does not, on its own, indicate the presence of a bubble. As noted by Himmelberg et al. (2005) and Girouard et al. (2006), bubbles are typically characterized not just by price instability but by a significant decoupling of prices from economic fundamentals such as incomes or rents.

For this reason, I also employ the analysis to the two valuation indicators: the price-to-rent (PTR) and price-to-income (PTI) ratios. The PTR compares a housing price index to a rent index (analogous to a price/dividend ratio for housing; Davis et al., 2008), while the PTI compares housing prices to household incomes, serving as an affordability metric. These ratios tend to rise during bubbles and fall during corrections; their volatility can signal how erratic the relationship between prices and fundamentals. This approach follows several previous studies that utilize these indices as core metrics for analysing housing market dynamics. For example, Banks et al. (2015) calculated the standard deviation of log-transformed price-to-rent indices in the United States and the United Kingdom to examine how the index’s volatility affects homeownership timing, housing consumption, and refinancing decisions. Moreover, the price-to-rent and price-to-income ratios are commonly used inputs in one of the most widely recognized bubble detection methods, the GSADF test (Phillips et al., 2015; Phillips & Shi, 2018). This method has been adopted by studies such as Pavlidis et al. (2016), Engsted et al. (2016), Gomez-Gonzalez et al. (2017), and Bago et al. (2021).

Additionally to volatility, I am also interested in the long-term persistence of RHPI and overvaluation indicators. If a price is persistent, it means that past price movements have a lasting impact on future prices, and prices do not immediately reflect new information or changes in demand and supply. To measure trend persistence in housing indicators, I estimate the first-order autoregressive coefficient (AR(1)) from each log-level series. This provides a straightforward gauge of how slowly deviations from trend revert over time: a high AR(1) value indicates strong persistence. While more sophisticated methodologies, such as fractional integration or unit root tests, have been used to model persistence and long-memory behaviour in housing markets (e.g., Canarella et al., 2019), I opt for the AR(1) measure due to its interpretability and ease of comparison across countries. Given my focus on descriptive cross-national patterns rather than structural estimation, this approach provides a suitable and intuitive benchmark.

Table 2. Summary statistics (count, max, mean, median, min, SD) of structural variables for selected countries

Variable	Statistic	AUT	DEU	ESP	FRA	GBR	IRL
Owner	Count	72.0	64.0	72.0	80.0	56.0	88.0
	Max	59.2	53.4	80.6	65.1	73.3	81.8
	Mean	55.7	51.1	77.6	63.3	67.7	72.5
	Median	55.4	51.6	77.8	63.5	67.3	70.1
	Min	51.4	46.5	73.7	60.5	63.4	68.4
	SD	2.0	2.2	2.0	1.3	3.4	4.2
Owner_lev	Count	72.0	64.0	72.0	80.0	56.0	88.0
	Max	29.4	31.4	34.4	31.8	46.9	37.4
	Mean	25.1	26.5	31.1	29.7	40.9	34.5
	Median	25.3	26.4	31.1	30.6	40.1	34.6
	Min	22.1	21.7	28.4	23.9	35.5	31.4
	SD	1.8	2.3	1.5	2.1	4.0	1.8
Tenant_mrktprc	Count	72.0	64.0	72.0	80.0	56.0	88.0
	Max	32.6	47.3	17.6	20.3	29.7	16.4
	Mean	29.2	41.6	13.8	17.7	15.3	11.8
	Median	29.7	40.0	13.5	18.9	15.6	12.7
	Min	26.1	36.8	10.7	14.9	8.3	2.8
	SD	1.8	3.3	1.9	2.0	5.2	3.4
Tenant_rdcprc	Count	72.0	64.0	72.0	80.0	56.0	88.0
	Max	18.5	9.9	9.6	22.6	19.1	21.9
	Mean	15.2	7.3	8.6	19.0	17.0	15.7
	Median	14.9	7.8	8.5	18.8	18.1	15.4
	Min	12.1	3.6	7.8	15.7	5.1	11.6
	SD	1.4	1.5	0.4	2.5	3.5	2.2

Source: own calculations, based on Eurostat (2024).

Housing structure and policy variables

I construct a Structural Housing Index based on a Principal Component Analysis (PCA) of structural indicators from household surveys and national statistics compiled by Eurostat (2024):

- **Total Homeownership (Owner):** the share of households owning with or without a mortgage.

- **Mortgaged homeownership (Owner_lev):** the share of households owning with a mortgage, which proxies for leverage exposure.

- **Market-rate renting (Tenant_mrktprc):** the share of households renting without subsidies, reflecting rental depth under market conditions.

- **Subsidized renting (Tenant_rdcprc):** the share of households in social or below-market housing, capturing the size of the policy-buffered rental sector.

Summary statistics for these structural variables can be found in Table 2.

I extracted the first principal component (PC1), which explains the largest share of variance, using total homeownership, leveraged ownership, market-price renting and subsidized renting to construct Structural Housing Index. Prior to the estimation, the variables were standardized by deducing the whole sample mean from each observation. The loadings of each variable on PC1 are reported

in the second column of Table 3. For robustness, I also present the loadings obtained in case the subsidized renting was excluded (column 3), as its initially unexpected positive sign warranted further examination.

PC1 captures variation along the ownership-rental spectrum of countries in my sample. In general, higher values of the index reflect more ownership-dominated systems with limited depth of rental market. Subsidized renting has a modest

Table 3. Principal component analysis of key structural variables

Variable	PC1	PC1 (without subsidized renting)
Total homeownership (standardized)	0.55	0.60
Mortgaged homeownership (standardized)	0.51	0.53
Market-rate renting (standardized)	−0.60	−0.61
Subsidized renting (standardized)	0.28	—
Explained variance	64.5%	82.5%

Source: own calculations.

positive loading, reflecting cases such as the United Kingdom and Ireland where reduced-price renting remains meaningful despite high ownership rates and considerable leverage, as well as Germany where the social housing sector is small.

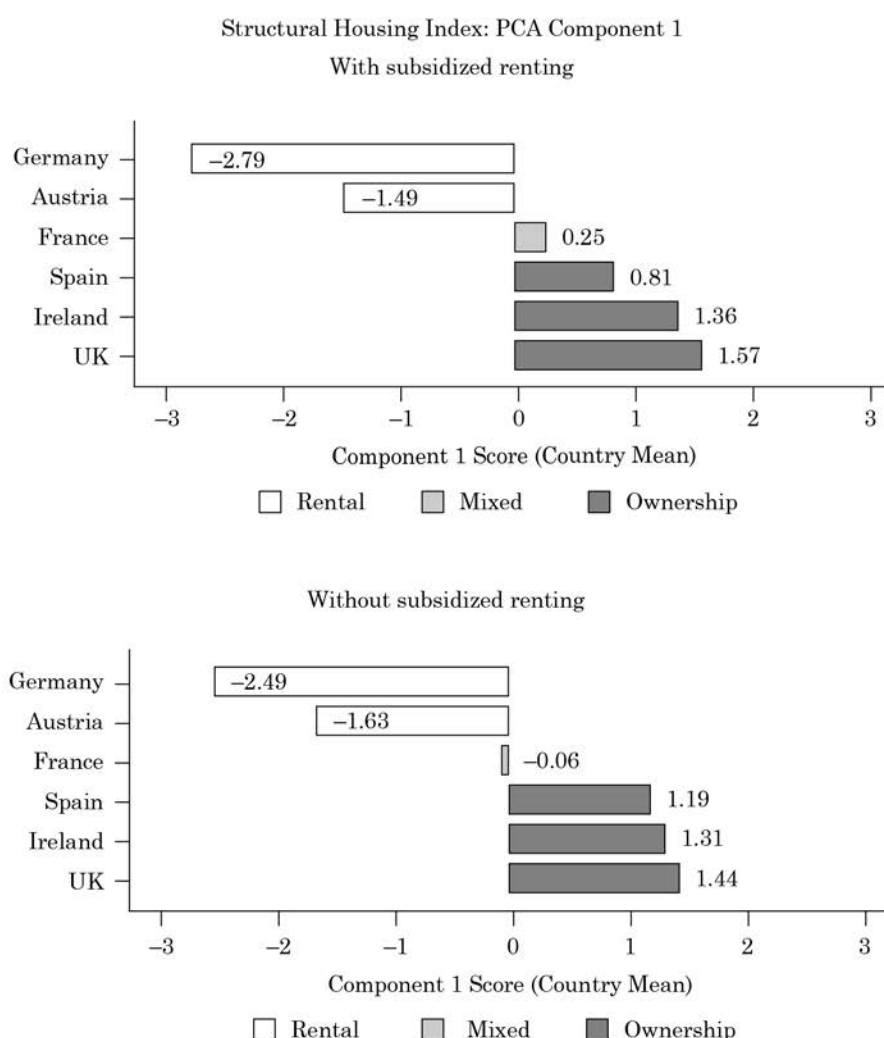
When all four structural variables are included, PC1 explains 64.5% of the total variance. Excluding subsidized renting increases this share to 82.5%, as its weaker correlation with the other variables reduces the coherence of the four-variable set. In other words, total homeownership, leveraged ownership, and market-price renting together yield a more internally consistent index.

The exclusion of subsidized renting does not materially alter the classification of countries, although it does shift certain positions: Spain appears more ownership-oriented, France moves closer to the midpoint, and the gap between Germany and Austria narrows. These changes reflect the influence of subsidized renting, particularly in countries where the

social housing sector is either substantial (France, Austria) or minimal (Spain, Germany). Figure 1 presents mean PC1 scores for each country, with and without the inclusion of subsidized renting.

While the PCA yields a continuous index, I group countries into three categories – renter-oriented, balanced, and ownership-oriented – to facilitate discussion based on institutional features. As expected, Germany and Austria register the lowest scores, reflecting their renter-oriented structures. Their ownership and leveraged ownership shares are similar, but a substantially larger share of Austrian tenants occupy reduced-price rental housing compared to Germany, which accounts for Austria's higher index value. France's substantial social housing provision and otherwise balanced tenure composition position it near the middle of the spectrum. In contrast, Spain's lower score relative to the United Kingdom and Ireland is largely attributable to its scarce social housing provision.

Figure 1. Means per country of the first principal component: with and without subsidized renting



Source: Author's calculations based on Eurostat (2024) data.

Table 4. Summary statistics (mean and standard deviation) for log-series of key measures (RHPI, PTR and PTI)

Indicator	Statistic	AUT	DEU	ESP	FRA	GBR	IRL
PTI	Mean	4.54	4.78	4.52	4.45	4.46	4.65
	SD	0.20	0.18	0.27	0.18	0.25	0.19
PTR	Mean	4.61	4.75	4.47	4.43	4.35	4.42
	SD	0.12	0.18	0.41	0.24	0.30	0.44
RHPI	Mean	4.55	4.66	4.38	4.26	4.07	4.31
	SD	0.21	0.10	0.47	0.35	0.53	0.50

Source: own calculations based on the data from OECD (2024).

The resulting classification is as follows:

- Renter-oriented: Germany and Austria,
- Owner-oriented: Ireland, Spain and the United Kingdom,
- Balanced/Mixed: France.

Table 4 provides summary statistics for the log-series of prices and valuation indicators. In brief, there is substantial variation in both volatility measures and structural characteristics across the sample. For example, the standard deviation of log-transformed RHPI ranges from 0.1 (in stable markets like Germany) to over 0.53 in boom-prone markets like Ireland. Interestingly, in all countries besides Germany, the volatility is higher in indicators than in prices. This suggests that house prices fluctuate more sharply than underlying fundamentals, which may adjust more slowly or be institutionally constrained. The pattern reinforces my second hypothesis: market structures – particularly rental protections and income-linked affordability regimes – help buffer valuation metrics against rapid swings, even when prices themselves remain volatile. This highlights the importance of pairing

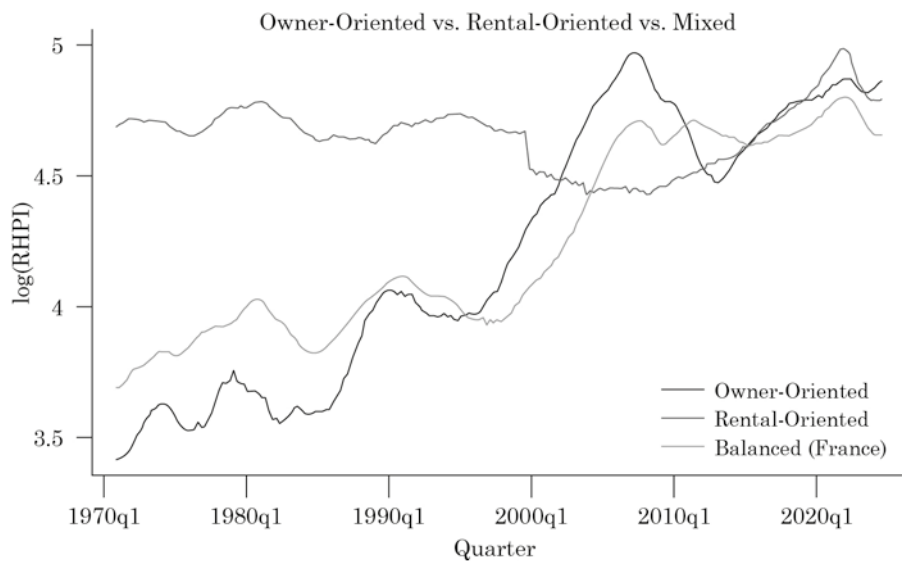
price-level analysis with structural valuation indicators when diagnosing market instability.

Used methodology is based on comparative visual analysis. My approach centres on examining the dynamics of three housing price indicators – the Real House Price Index (RHPI), the price-to-rent ratio (PTR), and the price-to-income ratio (PTI) – in relation to proposed typology of housing system structures. In addition to descriptive visual comparisons, I conduct formal statistical tests where visual interpretation alone is insufficient. These include a two-sample *t*-test to compare persistence between systems for PTR, where group means provide a meaningful basis for comparison, and Zivot–Andrews tests to identify potential structural breaks underlying spuriously high volatility in France’s RHPI and PTR series.

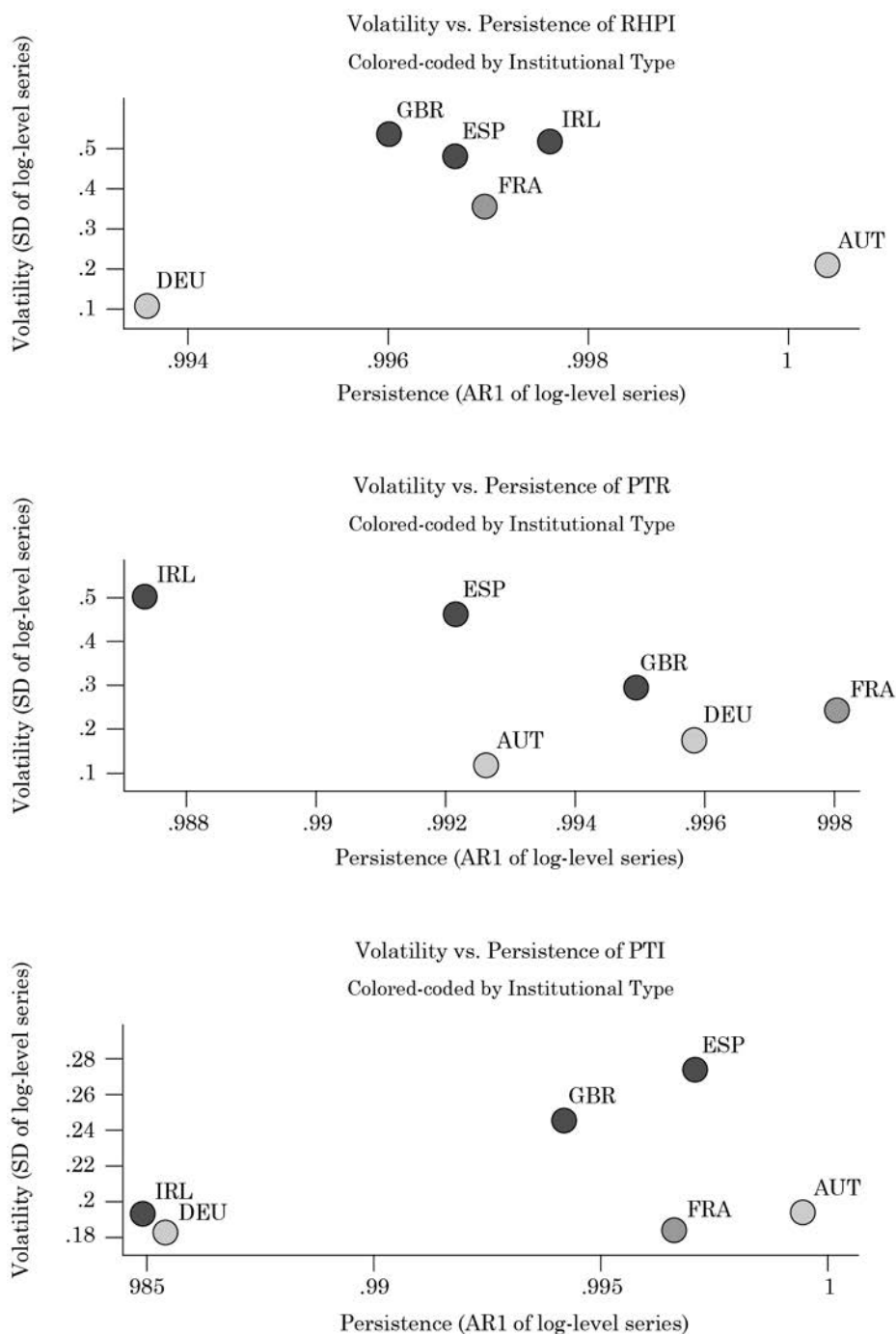
Results

In this section, I examine descriptive patterns in the data to illustrate how housing market volatility manifests across countries. Figure 2 compares the

Figure 2. Log of Real House Price Index (RHPI) trends for selected Western economies, 1975Q1–2024Q4



Source: author’s calculations based on OECD data.

Figure 3. Volatility against persistence of index/indicator's log-level series

Each point represents a country.

Volatility = SD of log-level series; Persistence = AR(1) of log-level series.

Source: author's calculations based on OECD data.

average real housing price index (RHPI) over time for countries classified according to outlined typology. As discussed, the owner-dominated group includes countries such as Ireland, Spain, the United Kingdom, renter-oriented countries include Austria and Germany, and France stands as an example of a mixed/balanced system.

A key insight from both the summary statistics (Table 4) and Figure 2 is the relationship between volatility and prevalent tenure type. The owner-dominated markets (Ireland, Spain and the UK) demonstrate pronounced cyclicity and greater volatility in housing prices, particularly observable in the significant boom-bust cycle surrounding the

Global Financial Crisis (GFC). Real housing prices in owner-dominated markets surged substantially leading up to the GFC, peaking around 2007–2008, followed by a sharp correction thereafter. This aligns with the historical liberalization of mortgage markets, high leverage, and prevalent variable-rate financing: the combination of relaxed lending standards, fiscal incentives for homeownership, and limited rental alternatives created the environment for this extreme price volatility. In rental-oriented markets – Austria and Germany – real housing prices can be considered stable in the whole analysed period. Interestingly, the rate of price growth appears to accelerate starting around 2014, likely reflecting increased housing demand due to heightened immigration inflows, especially in Germany. France presents a distinctive case: the upward trend that began after 2000 shows no significant subsequent reversal, indicating that these increases were driven primarily by underlying economic fundamentals rather than temporary exuberance, as in the case of ownership-oriented countries. Nonetheless, all analysed housing systems experienced more rapid price appreciation around the COVID-19 pandemic, fuelled by demand for larger living spaces and accommodative monetary conditions marked by historically low interest rates (OECD, 2020). While rental-oriented countries and France have since experienced a meaningful correction to this temporary demand shift, owner-oriented countries continue to see rising index values, albeit at a more moderate pace.

To explore indicator dynamics more systematically, I plot volatility against persistence for each of three core indicators: the real house price index (RHPI), price-to-rent ratio (PTR), and price-to-income ratio (PTI), all log-transformed. These scatterplots reveal the structural “signature” of each housing market, illustrating how volatility and persistence interact within different institutional contexts.

Figure 3 presents these results, illustrating that traditional overvaluation metrics (PTR and PTI) may indeed perform differently, depending on the institutional context.

In the RHPI panel, persistence is relatively uniform across all countries ($AR(1) \approx 0.994$ to just above 1), indicating that once prices deviate from trend, they tend to remain elevated or depressed for extended periods. Volatility, therefore, becomes the key differentiator. Ownership-dominated markets (Ireland, Spain, and the UK, in blue) display consistently high volatility, reflecting substantial departures from long-run averages – consistent with my hypothesis that ownership-heavy systems are more prone to large price swings. Historical policies such as the UK’s *Right to Buy*, Spain’s homeowner subsidies, and Ireland’s *Help to Buy* fostered credit-fuelled booms followed by protracted corrections.

In contrast, Germany and Austria (grey) exhibit low volatility, suggesting only modest deviations from fundamentals. Their persistence levels, however, are at opposite ends of the spectrum, likely reflecting differences in social housing provision. Another factor may be Austria’s brief but significant exposure to foreign-currency mortgages, which could have prolonged the adjustment to housing price shocks. France (orange) occupies an intermediate position on both dimensions. Its post-2000 price increases appear to reflect a structural shift rather than cyclical mispricing. Consistent with the literature and historical evidence, Zivot–Andrews test detects a structural break in 2002Q2, indicating a long-run re-anchoring of prices. Pre- and post-break standard deviations (≈ 0.09 and 0.13 , respectively) are comparable to Germany’s (≈ 0.10), suggesting that absent the shift, France’s volatility would be lower. The full-series volatility of 0.35 is thus driven largely by this regime change rather than repeated boom–bust cycles (Tables 5 and 6).

In the PTI panel, volatility again differentiates countries, but the overall spread is narrower than in the RHPI or PTR panels (≈ 0.18 to 0.28 , vs. ≈ 0.10 to 0.50). This compressed range likely reflects the broader economic effects of housing busts, as illustrated by GFC. Downturns often depress not only house prices, but also household incomes – through rising unemployment and reduced labour demand, as well as wealth and credit-constraint effects – tending to move both in the same direction

Table 5. Results of Zivot–Andrews structural break test for France’s RHPI and PTR log-series

Country	Indicator	Break type	Break date	Min t -statistic	5% Critical value
France	RHPI	Intercept	2002Q2	–5.16	–4.80
France	PTR	Intercept	2002Q2	–4.07	–4.80

Source: own calculations.

Table 6. Mean and standard deviation of France’s RHPI and PTR log-series: full sample, before, and after the break identified by Zivot–Andrews test

Period	Mean (log RHPI)	Standard deviation (log RHPI)	Mean (log PTR)	Standard deviation (log PTR)
Full sample	4.262	0.346	4.43	0.24
Pre-2002Q2	3.962	0.09	4.24	0.09
Post-2002Q2	4.622	0.13	4.67	0.12

Source: own calculations.

Table 7. Results of *t*-test of persistence of PTR indicator between balanced, owner-oriented and non-rental-oriented countries

Group	Obs.	Mean persistence	Std. err.	Std. dev.	<i>t</i> -test: rental vs. mixed	<i>p</i> -value	<i>t</i> -test: rental vs. owner	<i>p</i> -value	<i>t</i> -test: owner vs. mixed	<i>p</i> -value
Owner-oriented (ESP, IRL, GBR)	648	0.992	0.000	0.003	-34.98	0.00	-16.91	0.00	-30.64	0.00
Rental-oriented (AUT, DEU)	432	0.994	0.000	0.002						
Mixed (FRA)	216	0.998	0.000	0.000						

Source: own calculations.

and thereby partially offsetting movements in the ratio. Persistence varies somewhat more than for the other indicators, though values remain close to unity.

The UK remains in the upper volatility range, while Ireland is positioned closer to Germany, with both showing particularly low volatility and persistence. Austria and France pair low volatility with high persistence. Spain stands out for exceptionally high PTI volatility, despite the severe consequences of GFC for overall economy. One contributing factor might be Spain's attractiveness to foreign buyers, which channels international capital into the housing market. Following the 2008 bust, foreign purchasers accounted for roughly 4% of residential transactions in 2009, rising to 12–20% by 2017³, thereby amplifying price pressures despite domestic credit constraints.

These patterns align with my second hypothesis: PTR tends to be the more volatile – and often more informative – indicator in ownership-heavy markets, as prices can quickly decouple from market rents. PTI is generally less susceptible to short-term distortions, but still reveals substantial volatility differences in two of the three ownership-oriented countries (Spain and the UK). In Ireland, PTI appears to understate volatility despite a well-documented history of mispricing, likely because the global financial crisis simultaneously reduced both prices and incomes.

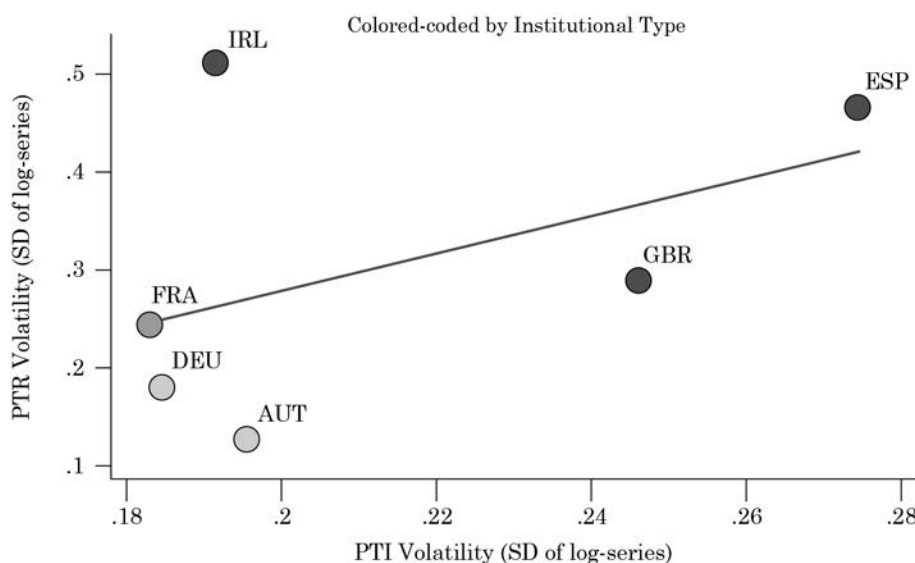
This highlights a broader limitation of PTI: in highly cyclical economies, it can mask housing market stress when macroeconomic shocks affect both sides of the ratio. PTI may also lose reliability where income distribution is highly unequal, or foreign investors exert significant demand pressure (as in Spain). Nonetheless, PTI remains useful where rents are heavily regulated and PTR may give misleading signals; it is well suited to capturing long-run affordability trends linked to wage growth and borrowing capacity, particularly

in economies with more equal income distribution and conservative credit standards.

Overall, my findings reinforce that no single indicator is universally reliable: the informativeness of PTR or PTI depends on the underlying housing system, and their comparative value is conditional on institutional features such as rent regulation, tenure structure, the responsiveness of household income to housing market cycles, as well as foreign investment.

Volatility emerges as the main dimension along which structural differences between housing systems are most visible. Ownership-heavy, highly leveraged markets – such as Ireland, Spain, and the United Kingdom – show markedly higher volatility in all three indicators, with the exception of Ireland's PTI, consistent with credit-amplified boom–bust cycles. In contrast, tenure-balanced markets with robust rental sectors (Austria, France, Germany) exhibit much lower volatility. By comparison, persistence, measured as the AR(1) coefficient of the indicator log-series, varies less across countries. Most indicators display high persistence overall, indicating that once price trends take hold, they tend to continue regardless of institutional setting. To assess whether persistence differences are statistically meaningful, I apply a two-sample *t*-test to PTR, the only indicator where variation in persistence is substantive and where countries with similar institutional characteristics – unlike in other indicators – do not occupy opposite ends of the persistence scale (as is otherwise the case for Germany and Austria). Table 7 summarizes these results.

When formally comparing PTR persistence across balanced, ownership-oriented, and renter-oriented systems, I find modest but statistically significant differences. In both balanced and renter-oriented countries, PTR tends to be more persistent than in ownership-heavy markets, likely reflecting institutional constraints such as rent regulation or grad-

Figure 4. Volatility of PTR vs. PTI Ratios (log-series)

Source: author's calculations based on OECD data.

ual affordability adjustments over time. France's persistence in PTR also exceeds that of Austria and Germany, a result that may partly reflect the structural break identified in its series. Overall, while persistence is a less sensitive discriminator than volatility – with most values close to unity – it can still capture meaningful structural effects in the case of PTR.

To further confirm my finding that volatility in valuation indicators vary systematically, I plot Figure 4 to illustrate the direct comparison between price-to-rent (PTR) and price-to-income (PTI) volatility.

While a strong, general positive association is observed, significant variation emerges Ireland stands out with exceptionally high PTR volatility but relatively low PTI volatility, indicating that income movements masked underlying price swings in affordability measures. Spain and the UK record high volatility in both indicators, consistent with ownership-dominated systems where limited rental regulation amplifies cycles. France occupies a mid-range position in PTR volatility, shaped by its structural break, while its PTI volatility is the lowest in the sample. Germany and Austria cluster in the lower left, confirming that rental-oriented systems with strong institutional anchors generate the most subdued affordability volatility.

Conclusion and policy implications

This study demonstrates that housing market volatility, far more than persistence, is closely

linked to the structural characteristics of housing systems. My empirical results support and refine my hypotheses: in a cross-country analysis of six European nations from 1975Q1 to 2024Q4, I find that markets defined by high rates of homeownership, elevated mortgage leverage, and mostly weak rental protections – such as those in Spain and the UK – experience significantly greater volatility in both house prices and valuation indicators. Ireland broadly follows this pattern in RHPI and PTR, but diverges in PTI: despite extreme house price swings, its price-to-income volatility remains comparatively low, possibly due to regulatory interventions, changes in credit conditions, and the interplay between housing supply and demand (Egan et al., 2024).

Second, I find that trend persistence – measured as the AR(1) coefficient of indicator log levels – varies only modestly across countries. Overall, persistence remains high and clustered near unity, suggesting that once trends are established, they tend to continue regardless of institutional setting. Balanced and renter-oriented systems such as Austria and France combine low volatility with relatively high persistence, particularly in PTR and PTI, consistent with gradual adjustment under institutional constraints. Germany, despite its renter-majority profile, records the lowest persistence in the sample for all indicators except PTR, a pattern that may reflect its relatively small social housing sector. Statistical tests confirm that PTR persistence is significantly higher in France than in the rental-oriented group, while ownership-oriented countries (UK, Ireland, Spain) display high-

er volatility but and lowest average persistence, in line with the prolonged booms typical of leveraged markets. I conclude that volatility, rather than persistence, is the more sensitive marker of structural housing differences.

Third, I confirm that valuation metrics behave differently across regimes: PTR ratios are notably more volatile in ownership-heavy, credit-driven markets, supporting their use as bubble indicators in these contexts. In countries with more balanced or rental-oriented structures, PTI can serve as a more reliable indicator, since incomes provide a more appropriate anchor in markets where rents are institutionally constrained. Yet, PTI is not without limitations: as illustrated by Ireland, PTI may understate volatility in contexts where a housing bust spills over into the broader economy, depressing both prices and incomes and thereby masking housing stress. The measure is also sensitive to income distribution: when inequality is high, aggregate incomes become a poor proxy for affordability constraints faced by the median household.

Policy implications and limitations

Given these findings, policy frameworks should differentiate between housing regimes rather than apply uniform valuation thresholds. In ownership-heavy, credit-driven systems, regulators should prioritize monitoring PTR volatility and address cyclical excesses through macroprudential

tools such as loan-to-value or debt-to-income caps. In rental-oriented systems, even where ownership still represents a large share, PTI provides a more reliable diagnostic, and affordability policies should be explicitly tied to income dynamics. More broadly, expanding access to stable rental housing and enforcing balanced mortgage regulation can temper boom–bust cycles and contribute to more resilient housing systems across Europe.

While my analysis offers insights into cross-country differences in housing market dynamics, it has limitations. Institutional housing policies are often implemented as packages, with effects that may be non-linear and contingent on complementary measures. For instance, in Spain, tenant protections proved less effective when not accompanied by adequate incentives for landlords. Moreover, my typology – constructed from Eurostat tenure statistics – captures volatility differences well but is less effective in explaining persistence. Germany and Austria frequently appear at opposite ends of my charts despite broadly similar tenure structures, underscoring this limitation. A formal regression framework, controlling for multiple institutional and policy variables, could help disentangle these overlapping effects. Finally, many housing regulations are enacted at the regional rather than national level, and the aggregate nature of OECD data may obscure important subnational variation. A more granular, regionally disaggregated analysis – given the right data – would provide a deeper understanding of these dynamics.

Notes/Przypisy

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² <https://www.theguardian.com/society/2023/oct/29/right-to-buy-housing-crisis-home-ownership-britain-property-rowan-moore> (accessed: 12 June 2025)

³ <https://www.globalpropertyguide.com/europe/spain/price-history>

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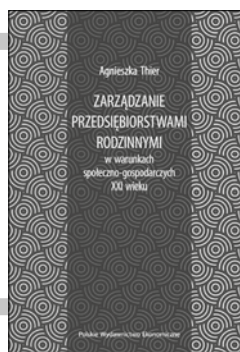
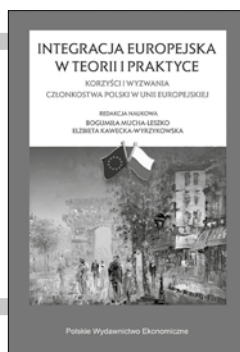
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