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# Cross-National Mortgage Rate Pass-Through, Residential Permitting, and Housing Rental Dynamics Across Euro Area Tenure Regimes

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## Abstract

Standard user-cost models of housing transmission predict that higher mortgage borrowing rates cool owner-occupied dwelling valuations and residential construction while shifting marginal shelter demand into private rental markets, generating sticky or accelerating rental inflation. We evaluate whether this conditional three-market divergence holds across a balanced quarterly panel of 10 Euro Area economies from 2015Q1 to 2026Q2 (N = 460 country-quarters), co-anchored by 12- and 18-country sensitivity panels, by pairing harmonized bank lending rates for new house purchases with consistently reclassified consumer price indices for actual housing rentals, disaggregated dwelling price indices, and residential building permits. Orthogonal sum-of-squares decomposition across 450 quarterly mortgage-rate transitions shows that common calendar-quarter variation accounts for 80.03% of total variation, leaving 19.19% within-quarter cross-country variation alongside 0.78% persistent country mean differences. Conditional on country and calendar-quarter fixed effects and four lags of domestic macroeconomic and construction-cost states, a 100-basis-point quarterly increase in new mortgage rates is associated over eight quarters (N = 330) with a -12.78 log percentage point cumulative decline in total nominal dwelling prices (enumerated wild cluster bootstrap p = 0.0059; eight-outcome Holm-adjusted p = 0.0469), spanning newly built (-12.81, pointwise p = 0.0078), existing (-11.99, p = 0.0313), and real consumer-price-deflated dwellings (-8.58, p = 0.0488). The conditional joint rental-surge prediction lacks empirical support: eight-quarter nominal actual housing rentals exhibit a pointwise negative slope (-5.30 log percentage points, p = 0.0430, 95% bootstrap interval [-9.49, -0.48]) that softens under Holm multiplicity adjustment (p = 0.2148), lagged demographic controls (p = 0.1328), and 2026Q3 endpoint extension (p = 0.0645), while rentals relative to headline consumer prices remain indistinguishable from zero (-2.60, p = 0.1777). Residential permit contractions are imprecisely estimated in the 10-country construction-cost baseline (-24.89, p = 0.4375) yet reach -21.72 log percentage points at four quarters in an 18-country producer-price panel retaining France, Italy, Belgium, and Ireland (N = 652, p = 0.0281), whereas post-2022 interactions with predetermined 2019–2021 short-fixation mortgage and market-rent tenant shares remain inconclusive under small-sample lag saturation.

**Keywords:** mortgage rate pass-through; housing rental inflation; residential building permits; housing tenure regimes; Euro Area monetary transmission; local projections


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## 1. Introduction

Monetary policy tightening transmits asymmetrically across owner-occupied housing valuations, residential construction pipelines, and tenant shelter costs. In canonical user-cost models of durable housing, higher mortgage borrowing rates raise the discount factor applied to future housing services, depressing asset valuations for both newly built and existing dwellings while eroding developer profitability relative to replacement construction costs (Iacoviello, 2005; Glaeser et al., 2008; Jordà et al., 2015). Yet household shelter demand is price-inelastic over short and medium horizons. A prominent strand of recent monetary-housing research argues that when tighter mortgage credit prices marginal homebuyers out of ownership and slows residential permitting, displaced households crowd into private rental markets, generating sticky or accelerating housing rental inflation that partially offsets headline disinflation (Dias & Duarte, 2019; Dias & Duarte, 2022; European Central Bank, 2025). Evaluating whether within-union cross-country mortgage rate pass-through differentials generate this three-market divergence across heterogeneous European mortgage and tenure institutions is directly informative for post-2022 inflation governance across the Euro Area (Corsetti et al., 2022; Slacalek et al., 2020).

Empirical evaluation of the mortgage-to-rent substitution channel within a monetary union confronts three institutional and econometric challenges. First, structural vector autoregressions identified on United States aggregate series (Dias & Duarte, 2016; Dias & Duarte, 2019) operate under a housing finance structure dominated by long-term prepayable fixed-rate mortgages and comparatively flexible market-rate rental repricing (Garriga et al., 2017; Benetton et al., 2025). Across Euro Area Member States, mortgage origination structures span near-complete adjustable or short-fixation lending in Finland and Lithuania to predominantly long-fixation contracts in Germany and the Netherlands, alongside wide cross-national dispersion in market-rate private tenancy versus regulated or reduced-rent occupancy (Musso et al., 2011; Calza et al., 2013; Albertazzi et al., 2024). Second, official harmonized consumer price indices measure actual rentals paid across the entire stock of incumbent and newly signed leases, which evolve differently from newly listed asking rents when multi-year lease protections and post-2022 statutory indexation ceilings—such as temporary 2% to 3% annual adjustment caps in Spain and Portugal, France's 3.5% rent shield, and Ireland's 2% Rent Pressure Zone ceiling—decouple incumbent rents from headline inflation spikes (Sommer et al., 2013; Mineshima et al., 2021). Third, under a single currency, common policy rate adjustments dominate raw mortgage rate co-movement, requiring explicit separation of union-wide calendar-quarter variation from conditional cross-country retail pass-through differentials (Auclert, 2019; Cloyne et al., 2020).

This essay evaluates the joint conditional dynamics of dwelling prices, residential building permits, and actual housing rentals across a balanced quarterly panel of 10 Euro Area economies with complete residential construction-cost histories from 2015Q1 through 2026Q2 ($N = 460$ country-quarters), co-anchored by broader 12-country composite-rate and 18-country producer-price panels that retain major regulated-rental jurisdictions including France, Italy, Belgium, and Ireland, alongside a 2026Q3 rental extension. We assemble classification-consistent backcasted consumer price series for actual housing rentals and all-items consumer prices (Eurostat, 2026), bank lending rates and initial-fixation volumes on new loans for house purchase (European Central Bank, 2026), quarterly house price indices disaggregated between newly built and existing dwellings (Eurostat, 2026), residential building permit and construction cost indices, and predetermined 2019–2021 population tenure distributions (Eurostat, 2026). Using local projections (Jordà, 2005; Plagborg-Møller & Wolf, 2021) with country and calendar-quarter fixed effects, four lags of domestic macroeconomic and construction-cost controls, and null-imposed restricted Rademacher wild cluster bootstrap inference (Cameron et al., 2008; MacKinnon et al., 2023), we test two falsifiable hypotheses: whether a 100-basis-point quarterly increase in new mortgage borrowing rates is conditionally associated with dwelling price and permit contractions alongside lagged rental acceleration,

and whether predetermined short-fixation mortgage shares and market-rent tenant shares amplify these trajectories after 2022.

Three empirical findings emerge from the estimation. First, an orthogonal sum-of-squares decomposition across 450 country-quarter rate transitions shows that common Euro Area calendar-quarter variation accounts for 80.03% of total squared mortgage-rate variation, persistent country mean differences account for 0.78%, and within-quarter cross-country variation accounts for 19.19%. Conditional on common quarterly movements and lagged domestic states, cross-country mortgage rate increases exhibit a robust negative association with medium-run housing valuations: eight quarters after a 100-basis-point increase in new mortgage rates ($N = 330$), total nominal dwelling prices stand −12.78 log percentage points lower (country-clustered standard error 2.91; enumerated wild cluster bootstrap $p = 0.0059$; eight-outcome sequential Holm-adjusted $p = 0.0469$), with pointwise negative trajectories across newly built dwellings (−12.81, $p = 0.0078$, Holm $p = 0.0547$), existing dwellings (−11.99, $p = 0.0313$), and consumer-price-deflated real dwelling prices (−8.58, $p = 0.0488$). Second, the conditional joint prediction of a positive medium-run rental surge finds no empirical support. Over the eight-quarter horizon, nominal actual housing rentals exhibit a pointwise negative slope of −5.30 log percentage points (standard error 1.97, pointwise bootstrap $p = 0.0430$, 95% bootstrap interval [−9.49, −0.48]), whose upper confidence bound excludes positive acceleration even though pointwise significance does not survive eight-outcome Holm adjustment ($p = 0.2148$), lagged demographic controls ($p = 0.1328$), 2026Q3 endpoint extension (−3.95, $p = 0.0645$), or seven of 10 single-country deletions, while rentals relative to all-items consumer prices remain indistinguishable from zero (−2.60, bootstrap $p = 0.1777$, 95% interval [−6.32, 1.71]). Residential building permits are imprecisely estimated in the 10-country construction-cost baseline (−24.89 log percentage points for dwelling units at $h = 8$, bootstrap $p = 0.4375$), whereas the broader 18-country producer-price panel yields a statistically resolved four-quarter contraction of −21.72 log percentage points ($N = 652$, bootstrap $p = 0.0281$). Third, across post-2022 projection origins ($N_4 = 112$ with $K = 44$ parameters; $N_8 = 80$ with $K = 40$ parameters across eight complete-data countries), none of the 36 short-fixation mortgage interactions passes the 5% wild cluster bootstrap threshold, and negative house-price interactions with market-rent tenant shares (−3.47 at $h = 4$, conventional $p = 0.0138$; −2.88 at $h = 8$, conventional $p = 0.0499$) become statistically unresolved under eight-cluster bootstrap studentization ($p = 0.1094$ and $p = 0.1953$) amid tight residual degrees of freedom.

The remainder of the essay proceeds as follows. Section 2 formalizes the three-market user-cost and stock-flow rental accounting framework and states the falsifiable hypotheses. Section 3 details the official statistical sources, sample coverage trade-offs, and local-projection inference design. Section 4 reports descriptive distributions and baseline dynamic estimates across all eight housing, permitting, and rental outcomes. Section 5 examines institutional heterogeneity, variance structure, and sensitivity across broader country panels and subperiod origin windows, followed by methodological scope conditions. Section 6 concludes with implications for European inflation and housing surveillance.

## 2. Analytical Framework and Falsifiable Hypotheses

### *2.1. User Cost, Development Margins, and Stock-Flow Rental Friction*

Consider an open-economy national housing system populated by credit-constrained prospective owner-occupiers, competitive residential developers, and rental housing suppliers (Sommer et al., 2013; Glaeser et al., 2014). Let $P_{it}$ denote the nominal transaction price index of owner-occupied dwellings in economy $i$ at quarter $t$, $R_{it}$ denote the average actual rental price paid across the occupied tenant stock, and $r_{it}$ denote the annualized nominal borrowing rate on newly originated house-purchase mortgages. Under a linearized user-cost parity condition (Glaeser et al., 2008; Kuttner & Shim, 2016), marginal buyers equate the imputed rental value of ownership to financing, maintenance, and expected appreciation costs:

$$\frac{R_{it}^{\text{new}}}{P_{it}} = r_{it} + \omega_i - \mathbb{E}_t[\Delta \ln P_{i,t+1}] + \xi_{it}, \tag{1}$$

where $R_{it}^{\text{new}}$ is the shadow market rent on marginal newly traded shelter, $\omega_i$ captures time-invariant property taxation, depreciation, and risk premia, and $\xi_{it}$ represents credit-rationing or loan-to-value wedges (Iacoviello, 2005; Cloyne & Surico, 2017). Holding expected capital gains and marginal rents constant when borrowing costs rise ($\Delta r_{it} > 0$), asset market equilibrium requires $P_{it}$ to decline, reinforced if credit constraints tighten or expected appreciation revises downward (Jordà et al., 2015).

On the supply side, residential developers apply for building authorizations $B_{it}$ by comparing prospective new-dwelling prices $P_{it}^{\text{new}}$ against nominal residential construction input costs $C_{it}$ and regulatory land-use constraints (Glaeser et al., 2006; Saiz, 2010; Glaeser & Gyourko, 2018). When $\Delta r_{it} > 0$ depresses $P_{it}^{\text{new}}$ while construction materials and labor costs $C_{it}$ remain rigid, the Tobin-$q$ ratio of residential development $P_{it}^{\text{new}}/C_{it}$ contracts, lowering administrative building permit filings $B_{i,t+h}$. Because residential permitting records municipal authorizations ahead of physical completions, permit contractions precede physical supply adjustments by multiple quarters.

In the rental market, shelter substitution operates alongside statutory indexation smoothing and domestic demand channels of opposite sign. Along the tenure-choice margin emphasized by Dias and Duarte (2019) and Dias and Duarte (2022), higher mortgage payments induce marginal prospective buyers to delay homeownership and remain in private rental tenancy, lifting new-lease rental demand $R_{it}^{\text{new}}$, while slower residential construction constrains medium-run rental supply. Two institutional and macroeconomic mechanisms counteract this positive pressure in cross-country Euro Area data. First, actual housing rentals $R_{it}$ recorded in harmonized consumer price statistics aggregate payments across newly signed contracts and the much larger stock of existing tenancies:

$$\ln R_{it} \approx \lambda_i \ln R_{it}^{\text{new}} + (1 - \lambda_i) \ln R_{it}^{\text{inc}}, \tag{2}$$

where $\lambda_i \in (0, 1)$ is the quarterly tenant turnover weight and $R_{it}^{\text{inc}}$ reflects incumbent contract rents governed by multi-year lease protections, social or reduced-rent governance, and statutory indexation caps (Mineshima et al., 2021). During the 2022–2024 European inflation surge, several Euro Area governments enacted binding statutory ceilings on incumbent lease indexation—including Spain's 2% (2022–2023) and 3% (2024) annual rent-update caps and Portugal's 2% (2023) ceiling, alongside regulated indexation shields in France, Ireland, and Belgium—mechanically decoupling $R_{it}^{\text{inc}}$ from headline inflation spikes. Second, conditional on calendar-quarter fixed effects that sweep out union-wide European Central Bank policy shocks, country-specific increases in retail mortgage rates $\Delta r_{it}$ reflect national bank funding spreads, borrower credit-risk repricing, and domestic income or shelter-demand cooling (Di Maggio et al., 2017; Auclert, 2019; Cloyne et al., 2020). Where domestic demand moderation and statutory incumbent-rent smoothing outweigh marginal buyer-to-renter inflows, conditional cross-country mortgage rate increases will fail to generate positive cumulative paths for actual paid rents.

### *2.2. Institutional Regimes and Falsifiable Hypotheses*

Institutional heterogeneity across Euro Area mortgage and housing systems motivates two potential conditioning channels (Rubio, 2011; Calza et al., 2013; Corsetti et al., 2022). Let $S_i$ denote the predetermined pre-tightening share of new house-purchase mortgage business originated at floating rates or initial rate fixation periods of up to one year, and let $T_i$ denote the predetermined share of the national population residing in market-price private rental housing. An exact measurement boundary applies: $S_i$ captures the rate-fixation mix of new mortgage originations (including renegotiated contracts under European Central Bank reporting rules), governing marginal borrower rate sensitivity and bank pricing conventions (Albertazzi et al., 2024), whereas repricing of the outstanding mortgage debt stock depends on historical maturity

schedules not directly observed in new-business flows (Slacalek et al., 2020). Similarly, a higher market-price tenant population share $T_i$ enlarges the household segment exposed to private rental repricing relative to owner-occupiers and reduced-rent social tenants.

To discipline empirical evaluation, we test two prespecified falsifiable hypotheses:

- **Hypothesis 1 (Three-market conditional dynamic divergence).** Controlling for country fixed effects, calendar-quarter fixed effects, and four lags of domestic macroeconomic and construction-cost states, a 100-basis-point quarterly increase in new mortgage borrowing rates is conditionally associated with cumulative contractions in nominal and real dwelling prices and residential building permits over horizons $h = 1, \dots, 8$ quarters, accompanied by a positive cumulative increase in nominal actual housing rentals and rentals relative to headline consumer prices at horizons $h = 4, \dots, 8$.
- **Hypothesis 2 (Predetermined fixation and tenure amplification).** Across post-2022 projection origins, Euro Area economies with higher predetermined 2019–2021 short-fixation new mortgage shares ($S_i$) and higher predetermined market-price tenant population shares ($T_i$) exhibit steeper cumulative house-price contractions and stronger positive rental divergence following mortgage rate increases.

## 3. Data Sources and Econometric Specification

### *3.1. Official Statistical Sources and Coverage Trade-Offs*

All empirical series were retrieved from official European Central Bank and Eurostat dissemination databases on or before the evidence cutoff of 13 November 2026 (European Central Bank, 2026; Eurostat, 2026; Eurostat, 2026; Eurostat, 2026). Only completed historical reference periods with verified observations enter the analysis. Monthly mortgage lending rates and consumer price series span January 2015 through September 2026; empty October 2026 time-period placeholders containing zero observed cells in the consumer price feed are excluded, and quarterly aggregation requires all three constituent months to be observed prior to computing arithmetic quarterly index averages and natural logarithms. Quarterly dwelling prices, residential building permits, residential construction costs, and seasonally adjusted unemployment rates (ages 15–74) cover the 46 completed quarters from 2015Q1 through 2026Q2.

Candidate sample membership begins from the 19 Member States that shared the euro continuously from 2015 onward (Croatia adopted the euro in January 2023 and enters dedicated post-2023 checks). Enforcing complete non-missing coverage across all baseline variables—including the quarterly residential construction-cost index required to hold developer cost conditions constant across the three-market system—yields a balanced 10-country panel of 460 country-quarters comprising Austria, Cyprus, Germany, Estonia, Spain, Finland, Lithuania, the Netherlands, Portugal, and Slovenia. Country exclusions stem strictly from missing official series: Belgium, France, Ireland, Luxembourg, and Slovakia lack the official quarterly residential construction cost index; Italy reports only 36 quarters of construction costs ending in 2023Q4; Greece lacks the quarterly house price index alongside 31 suppressed monthly mortgage rate cells; and Latvia and Malta exhibit four and 28 suppressed monthly cells, respectively, in the headline new-business mortgage rate series. Because excluding France, Italy, Belgium, and Ireland removes major European economies with prominent lease-indexation regimes even from existing-dwelling and rental equations where construction costs are an indirect control, we co-anchor external validity in Section 5 using a balanced 12-country composite-rate panel (retaining Latvia and Malta, $N_8 = 396$) and an 18-country construction producer-price panel (retaining France, Italy, Belgium, Ireland, Luxembourg, Slovakia, Latvia, and Malta, $N_0 = 724$, $N_4 = 652$, $N_8 = 580$).

Our primary mortgage rate variable $r_{it}$ is the annualized agreed rate on total new house-purchase lending to households (inclusive of renegotiations), paired in robustness checks with the composite cost-of-borrowing indicator weighted by 24-month moving-average volumes (European Central Bank, 2026). The predetermined short-fixation institutional share $S_i$ equals the 36-month average over 2019–2021 of

the official European Central Bank risk-assessment ratio of floating and up-to-one-year initial-fixation new mortgage volumes to total new mortgage business. Because Cyprus and Estonia each have three confidentiality-suppressed monthly cells during 2019–2021, joint institutional regressions retain the eight baseline countries with complete 36-month pre-tightening histories without imputing suppressed cells. Actual housing rentals and all-items consumer prices come from Eurostat's consistently reclassified back-casted consumer price dataset (2015 = 100), avoiding splice breaks across consumption-classification revisions (Eurostat, 2026). Predetermined housing tenure shares ($T_i$, reduced-rent or free-housing occupancy, and owner-occupancy, closing the 100% population simplex) are averaged over 2019–2021 from income and living conditions surveys, and annual crude net migration (including statistical adjustment) and population growth rates from 2013–2025 enter demographic robustness models with a two-calendar-year lag (Eurostat, 2026).

### *3.2. Local Projection Specification and Small-Cluster Inference*

For country $i \in \{1, \dots, G\}$, rate-change origin quarter $t$, and forecast horizon $h \in \{0, 1, \dots, 8\}$, we estimate horizon-specific ordinary least squares local projections (Jordà, 2005):

$$100\left(\ln Y_{i,t+h} - \ln Y_{i,t-1}\right) = \alpha_i^h + \tau_t^h + \beta_h \Delta r_{it} + \sum_{\ell=1}^{4} \phi_{h\ell} \ln Y_{i,t-\ell} + \sum_{\ell=1}^{4} \mathbf{\Gamma}_{h\ell}' \mathbf{X}_{i,t-\ell} + \varepsilon_{i,t+h}, \tag{3}$$

where $\Delta r_{it} = r_{it} - r_{i,t-1}$ is measured in percentage points so that $\Delta r_{it} = 1$ corresponds to a 100-basis-point quarterly increase, and $\beta_h$ measures the cumulative conditional change in outcome $Y$ in log percentage points from quarter $t-1$ through $t+h$ (spanning $h+1$ quarterly transitions). The predetermined control vector $\mathbf{X}_{i,t-\ell} = (r_{i,t-\ell}, u_{i,t-\ell}, \pi_{i,t-\ell}, \ln C_{i,t-\ell})'$ comprises four quarterly lags of the mortgage borrowing rate level, the unemployment rate $u$, non-annualized quarterly consumer price inflation $\pi_{it} = 100\Delta \ln \mathrm{HICP}_{it}$, and the log nominal residential construction cost index $\ln C$. Note an exact algebraic feature of Equation (3): because $\pi_{i,t-1}, \dots, \pi_{i,t-4}$ span consumer price differences without entering the lagged log price level $\ln \mathrm{HICP}_{i,t-1}$ separately, nominal equations (total dwelling prices and actual rentals) condition on lagged nominal outcome levels whereas consumer-price-deflated equations (real dwelling prices and relative rentals) condition on $\ln Y_{i,t-\ell} - \ln \mathrm{HICP}_{i,t-\ell}$, so nominal-minus-deflated slope differences across distinct outcomes need not be identically equal. Country fixed effects $\alpha_i^h$ absorb time-invariant national housing institutions and index base levels, and calendar-quarter fixed effects $\tau_t^h$ absorb common Euro Area monetary policy announcements, union-wide energy shocks, and common seasonality. Rental equations exclude contemporaneous residential permits so that supply-side responses are not partialled out.

Consuming one quarter to form $\pi_{it}$ and four further quarters for the lag polynomial sets the earliest projection origin at 2016Q2 ($N_0 = 410$ across 10 countries and 41 quarters, estimating $K = 71$ parameters including fixed effects). Retaining realized outcomes through 2026Q2 reduces usable observations by 10 per horizon step, yielding $N_4 = 370$ ($K = 67$) and $N_8 = 330$ ($K = 63$). To test Hypothesis 2 without look-ahead bias from 2019–2021 institutional averages, post-2022 institutional specifications restrict origins to $t \geq$ 2022Q1 and augment Equation (3) with centered interactions:

$$\theta_{S,h} \Delta r_{it} \left(\frac{S_i - \bar{S}}{10}\right) + \theta_{T,h} \Delta r_{it} \left(\frac{T_i - \bar{T}}{10}\right), \tag{4}$$

where $\bar{S} = 52.74\%$ and $\bar{T} = 18.10\%$ denote equal-weighted means across the eight complete-data countries and each interaction coefficient measures the differential cumulative response per 10-percentage-point higher institutional share.

Because asymptotic cluster-robust $t$-tests over-reject when country clusters are few ($G = 7$ to 12), primary inference relies on null-imposed restricted Rademacher wild cluster bootstrap tests studentized

by re-estimated CR1 cluster-robust standard errors (Cameron et al., 2008; MacKinnon et al., 2023). For all models with $G \leq 12$—specifically $G = 7$ (64 unique sign permutations up to global sign symmetry), $G = 8$ (128 permutations), $G = 9$ (256 permutations), $G = 10$ (512 permutations), and the 12-country composite-rate panel ($2^{12-1} = 2{,}048$ permutations)—we enumerate the complete permutation space exactly; larger 18- and 19-country panels use 9,999 fixed-seed Rademacher draws with add-one $p$-value adjustment. All 95% wild cluster bootstrap confidence sets are obtained by exact polynomial test inversion. Every one of the 72 baseline horizon estimates yields a single connected bounded interval, whereas 14 small-sample projections across the auxiliary institutional and subperiod checks (10 of 360 interaction estimates in Section 5.1 and four subperiod or sample-break rows in Section 5.2) return disconnected confidence sets due to tight residual degrees of freedom and few clusters. To account for multiplicity across the eight correlated outcomes at the focal two-year horizon ($h = 8$), we report sequential Holm family-wise error-adjusted bootstrap $p$-values alongside pointwise $p$-values, two-way country-and-quarter clustered standard errors, and Driscoll and Kraay (1998) spatial-correlation-consistent standard errors with Bartlett bandwidth $\max(4, h)$.

## 4. Baseline Three-Market Local Projections

### *4.1. Descriptive Distributions Across Euro Area Housing Systems*

Table 1 reports summary statistics for all 20 harmonized variables in the 10-country balanced panel (2015Q1–2026Q2) and country-level institutional regime distributions. New house-purchase mortgage rates average 2.54% per annum (standard deviation 1.07 percentage points), ranging from 0.73% at the low-rate trough to 6.08% during post-2022 monetary tightening. Quarterly mortgage rate changes average +0.02 percentage points (standard deviation 0.24 percentage points) and span −0.68 to +1.20 percentage points across 450 transitions.

**Table 1.** Summary statistics for the balanced 10-country Euro Area panel (2015Q1–2026Q2) and predetermined 2019–2021 institutional shares.

| Variable | Unit | *N* | Mean | SD | P25 | Median | P75 | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| New mortgage borrowing rate | %/year | 460 | 2.54 | 1.07 | 1.86 | 2.32 | 3.28 | 0.73 | 6.08 |
| Quarterly mortgage rate change | pp | 450 | 0.02 | 0.24 | -0.08 | -0.02 | 0.05 | -0.68 | 1.20 |
| Total dwelling price index | 2015 = 100 | 460 | 143.07 | 42.25 | 108.21 | 131.01 | 165.14 | 96.27 | 301.43 |
| Newly built dwelling price index | 2015 = 100 | 460 | 142.71 | 38.70 | 112.50 | 131.11 | 164.66 | 92.19 | 286.93 |
| Existing dwelling price index | 2015 = 100 | 460 | 142.45 | 44.17 | 105.60 | 128.68 | 167.05 | 92.47 | 327.49 |
| Residential permits: dwelling count | 2021 = 100 | 460 | 90.16 | 41.35 | 65.90 | 86.50 | 101.83 | 23.80 | 297.80 |
| Residential permits: floor area | 2021 = 100 | 460 | 85.67 | 29.05 | 66.00 | 84.95 | 100.00 | 28.60 | 198.40 |
| Actual housing rental index | 2015 = 100 | 460 | 118.99 | 20.44 | 104.74 | 112.56 | 124.71 | 89.70 | 192.40 |
| All-items consumer price index | 2015 = 100 | 460 | 113.92 | 15.56 | 102.02 | 107.28 | 122.41 | 97.09 | 167.10 |
| Log real dwelling prices | Log level | 460 | 0.20 | 0.18 | 0.06 | 0.18 | 0.32 | -0.25 | 0.85 |
| Log relative housing rentals | Log level | 460 | 0.04 | 0.08 | -0.00 | 0.03 | 0.08 | -0.12 | 0.34 |

*(continued)*

*Table 1 (continued)*

| Variable | Unit | *N* | Mean | SD | P25 | Median | P75 | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| Residential construction cost index | 2021 = 100 | 460 | 101.86 | 15.57 | 89.50 | 94.60 | 115.90 | 78.30 | 143.30 |
| Unemployment rate | % labor | 460 | 7.15 | 3.53 | 4.78 | 6.40 | 8.10 | 2.90 | 23.20 |
| Quarterly consumer price inflation | Log pp | 450 | 0.75 | 1.35 | -0.19 | 0.57 | 1.51 | -2.42 | 8.38 |
| Crude net migration rate | Per 1,000 | 460 | 5.35 | 6.88 | 2.10 | 4.60 | 7.40 | -8.70 | 34.50 |
| Population growth rate | Per 1,000 | 460 | 4.23 | 6.98 | 0.80 | 3.30 | 6.60 | -12.70 | 30.70 |
| Pre-tightening short-fixation share | % loans | 8 | 52.74 | 36.20 | 27.58 | 40.89 | 90.00 | 10.43 | 97.71 |
| Market-rent tenant share | % pop. | 10 | 16.32 | 12.86 | 7.17 | 14.17 | 19.98 | 1.23 | 43.87 |
| Reduced-rent or free-housing share | % pop. | 10 | 12.27 | 4.00 | 9.25 | 12.65 | 14.65 | 5.90 | 19.23 |
| Owner-occupier population share | % pop. | 10 | 71.42 | 11.58 | 69.70 | 72.95 | 76.30 | 50.23 | 89.30 |

*Notes.* Time-varying levels cover $N = 460$ country-quarters across Austria, Cyprus, Germany, Estonia, Spain, Finland, Lithuania, the Netherlands, Portugal, and Slovenia; quarterly differences cover $N = 450$. Log real dwelling prices and log relative housing rentals equal $\ln(\text{Index}_{it}/\text{HICP}_{it})$ (2015 = 0). Predetermined institutional shares are country-level 2019–2021 means ($n = 8$ complete 36-month histories for short-fixation new mortgage shares; $n = 10$ for the three-part population tenure simplex summing to 100.00%). Index means describe cumulative changes relative to national base years (2015 = 100 or 2021 = 100).

Predetermined institutional structures display pronounced polarization across the currency union. Pre-tightening short-fixation new mortgage shares average 52.74% (standard deviation 36.20 percentage points), spanning long-fixation systems in Germany (10.43%) and the Netherlands (15.13%), intermediate systems in Spain (31.73%), Austria (39.72%), and Slovenia (42.06%), and predominantly adjustable-rate origination systems in Portugal (87.44%), Finland (97.67%), and Lithuania (97.71%). Across the full 10-country tenure simplex, market-price rental tenancy averages 16.32% of the population (ranging from 1.23% in Lithuania and 4.80% in Estonia to 30.40% in Austria and 43.87% in Germany), reduced-rent or free-housing occupancy averages 12.27%, and owner-occupancy averages 71.42%.

### *4.2. Dynamic Trajectories of House Prices, Permits, and Actual Rentals*

Table 2 and Figure 1 present the baseline local-projection estimates across all eight housing, construction-permitting, and rental outcomes at impact ($h = 0$), one year ($h = 4$), and two years ($h = 8$). Across owner-occupied valuation metrics (Figure 1, Panel a), conditional associations with a 100-basis-point quarterly mortgage rate increase are small and statistically unresolved at impact (−0.37 log percentage points for total nominal dwelling prices, bootstrap $p = 0.6738$) and build progressively over subsequent quarters. By $h = 4$ ($N = 370$), total nominal dwelling prices stand −3.91 log percentage points lower (standard error 2.51, bootstrap $p = 0.1777$), newly built dwelling prices stand −2.67 lower (bootstrap $p = 0.0645$), and existing dwelling prices stand −5.49 lower (bootstrap $p = 0.1719$).

**Table 2.** Baseline local-projection estimates of cumulative responses (in log percentage points) to a 100-basis-point quarterly increase in new mortgage borrowing rates across 10 balanced Euro Area economies.

| Outcome variable | $h = 0$ (SE) | WCB $p_0$ | $h = 4$ (SE) | WCB $p_4$ | $h = 8$ (SE) | WCB $p_8$ | 95% CI |
|---|---|---|---|---|---|---|---|
| Total nominal dwelling prices | -0.37 (0.84) | 0.6738 | -3.91 (2.51) | 0.1777 | -12.78 (2.91) | 0.0059 | [-19.39, -5.29] |
| Newly built nominal dwelling prices | 0.96 (0.70) | 0.1250 | -2.67 (1.37) | 0.0645 | -12.81 (3.26) | 0.0078 | [-19.94, -4.91] |

*(continued)*

*Table 2 (continued)*

| Outcome variable | $h = 0$ (SE) | WCB $p_0$ | $h = 4$ (SE) | WCB $p_4$ | $h = 8$ (SE) | WCB $p_8$ | 95% CI |
|---|---|---|---|---|---|---|---|
| Existing nominal dwelling prices | -1.49 (1.18) | 0.2871 | -5.49 (3.26) | 0.1719 | -11.99 (3.66) | 0.0313 | [-20.19, -1.90] |
| Total real dwelling prices | 0.18 (0.92) | 0.8438 | -1.98 (2.84) | 0.5059 | -8.58 (3.51) | 0.0488 | [-18.41, -0.001] |
| Permits: number of dwellings | -14.74 (17.05) | 0.3887 | -20.31 (18.55) | 0.3477 | -24.89 (27.53) | 0.4375 | [-101.19, 35.41] |
| Permits: useful floor area | -9.69 (15.64) | 0.5820 | -18.64 (15.91) | 0.3262 | -19.75 (20.11) | 0.3887 | [-74.47, 25.21] |
| Nominal actual housing rentals | -0.12 (1.09) | 0.9063 | -2.74 (2.02) | 0.3027 | -5.30 (1.97) | 0.0430 | [-9.49, -0.48] |
| Rentals relative to headline prices | 0.21 (0.79) | 0.8418 | -1.68 (1.72) | 0.4063 | -2.60 (1.84) | 0.1777 | [-6.32, 1.71] |

*Notes.* Each cell estimates a separate horizon-specific local projection including country fixed effects, calendar-quarter fixed effects, four lags of the log outcome level, and four lags each of new mortgage rates, unemployment rates, quarterly consumer price inflation, and log nominal residential construction costs. Sample sizes and fitted parameter counts are $N_0 = 410$ ($K = 71$, origins 2016Q2–2026Q2), $N_4 = 370$ ($K = 67$, origins 2016Q2–2025Q2), and $N_8 = 330$ ($K = 63$, origins 2016Q2–2024Q2, outcomes through 2026Q2) across $G = 10$ country clusters. Country-clustered CR1 standard errors appear in parentheses; pointwise WCB $p_h$-values and connected 95% confidence intervals at $h = 8$ come from exact enumeration of all 512 null-imposed Rademacher sign permutations. Sequential Holm family-wise error-adjusted WCB $p$-values across all eight outcomes at $h = 8$ are 0.0469 (total nominal prices), 0.0547 (newly built prices), 0.1875 (existing prices), 0.1953 (total real prices), 0.2148 (nominal rentals), 0.7109 (relative rentals), and 0.7773 (both permit outcomes).

At the two-year horizon ($h = 8$, $N = 330$), total nominal dwelling price contraction is economically substantial and survives family-wise multiplicity control. Total nominal dwelling prices decline cumulatively by $-12.78$ log percentage points per 100-basis-point mortgage rate increase (country-clustered standard error 2.91; conventional $p = 0.0017$; pointwise enumerated bootstrap $p = 0.0059$; eight-outcome Holm-adjusted bootstrap $p = 0.0469$; 95% bootstrap interval $[-19.39, -5.29]$; Driscoll & Kraay, 1998 $p = 0.0438$; two-way clustered $p = 0.0058$). Pointwise negative valuation adjustments appear across newly built nominal dwelling prices ($-12.81$ log percentage points, pointwise bootstrap $p = 0.0078$, Holm $p = 0.0547$), existing nominal dwelling prices ($-11.99$, pointwise $p = 0.0313$, Holm $p = 0.1875$), and consumer-price-deflated real dwelling prices ($-8.58$, standard error 3.51, pointwise $p = 0.0488$, 95% bootstrap interval $[-18.41, -0.001]$, Holm $p = 0.1953$), indicating co-movement across developer pricing of new units and secondary-market resale transactions.

By contrast, residential building authorizations (Figure 1, Panel b) and actual housing rentals (Figure 1, Panel c) fail to support the joint three-market divergence postulated in Hypothesis 1. Point estimates for authorized dwelling counts are negative at every horizon—reaching $-14.74$ log percentage points at $h = 0$, $-20.31$ at $h = 4$, and $-24.89$ at $h = 8$—while authorized useful floor area briefly crosses $+2.25$ at $h = 2$ ($p = 0.7988$) before moving to $-18.64$ at $h = 4$ and $-19.75$ at $h = 8$; across both series, country-clustered standard errors (15.91 to 27.53 at $h = 4, 8$) and enumerated bootstrap confidence intervals ($[-101.19, 35.41]$ for dwelling counts and $[-74.47, 25.21]$ for floor area at $h = 8$) remain wide amid lumpy municipal permitting across the 10 baseline economies. In the rental market, actual housing rentals exhibit no positive shelter-substitution surge. Nominal actual housing rentals move from $-0.12$ log percentage points at $h = 0$ ($p = 0.9063$) to $-2.74$ at $h = 4$ ($p = 0.3027$) and $-5.30$ at $h = 8$ (standard error 1.97, conventional $p = 0.0249$, pointwise enumerated bootstrap $p = 0.0430$, 95% bootstrap interval $[-9.49, -0.48]$). Although this negative nominal rental slope does not survive family-wise Holm correction across all eight outcomes ($p = 0.2148$) or across the three primary market outcomes ($p = 0.0859$), its

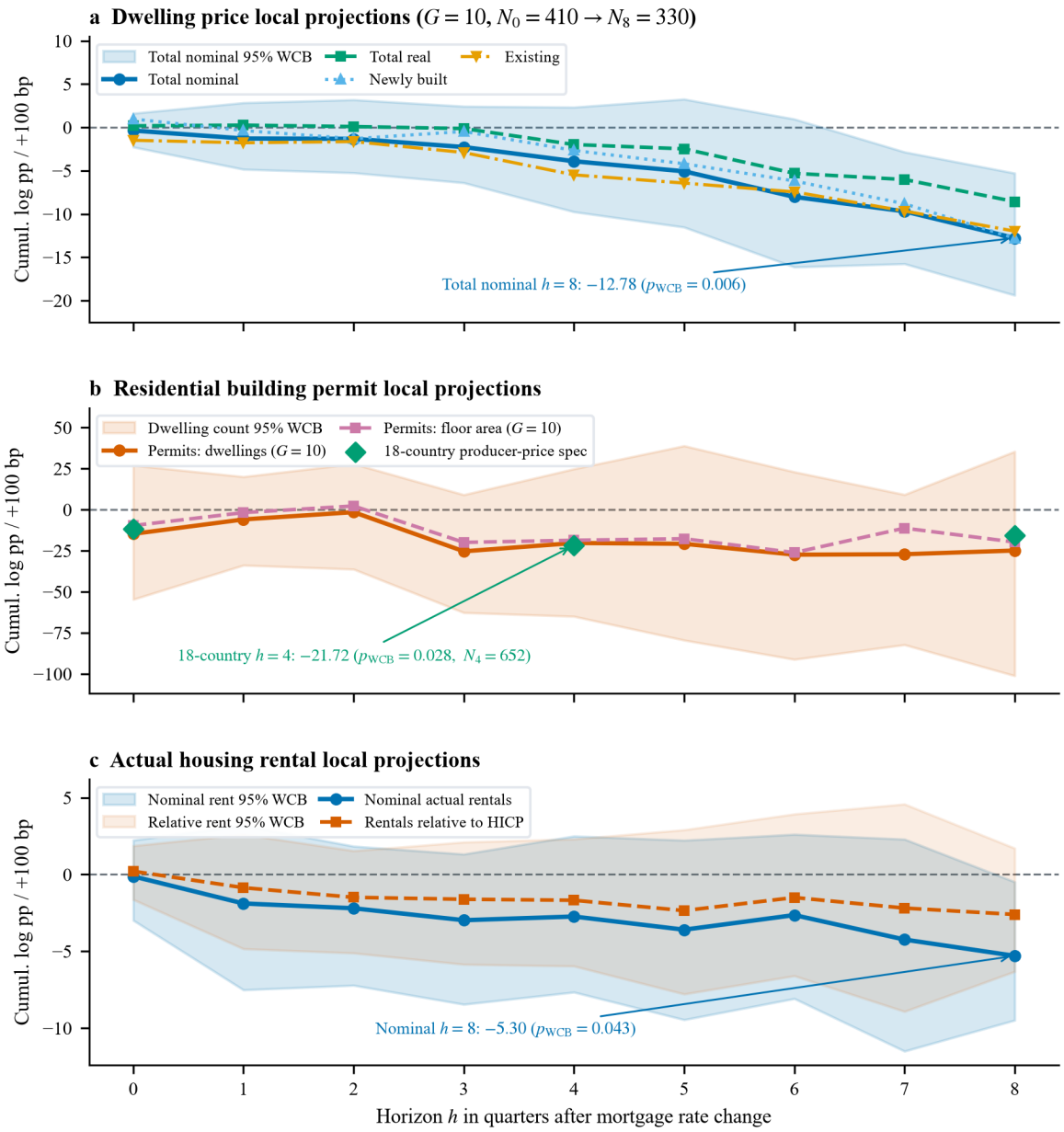



**Figure 1.** Three-market local-projection responses to a 100-basis-point mortgage rate increase.

*Notes.* Panels show cumulative log percentage point coefficients ($h = 0, \ldots, 8$ quarters) per +100 basis points in quarterly new house-purchase mortgage rates across the balanced 10-country Euro Area panel ($N_0 = 410$ to $N_8 = 330$). Shaded bands depict exact enumerated 95% null-imposed Rademacher wild cluster bootstrap confidence intervals. Panel b overlays diamond markers from the broader 18-country specification replacing missing construction-cost indices with construction producer prices ($N_0 = 724$, $N_4 = 652$, $N_8 = 580$).

upper 95% bootstrap confidence bound of −0.48 log percentage points rules out meaningful medium-run nominal rent acceleration, and rentals relative to all-items consumer prices are likewise non-positive at −1.68 ($h = 4$, $p = 0.4063$) and −2.60 ($h = 8$, standard error 1.84, bootstrap $p = 0.1777$, 95% interval $[-6.32, 1.71]$). Conditional on common Euro Area calendar-quarter movements, steeper domestic mortgage rate increases coincide with broader domestic shelter-demand cooling in which nominal rent growth moderates alongside dwelling valuations.

## 5. Institutional Regimes, Variance Structure, and Robustness

### *5.1. Mortgage Fixation, Market-Rent Tenure, and Variance Decomposition*

Figure 2 clarifies why conditional cross-country local projections within the Euro Area behave differently from aggregate single-country monetary shock estimates. First, Figure 2 (Panels a and b) documents an inverse cross-sectional alignment across the eight complete-data baseline economies between pre-tightening short-fixation mortgage origination shares and market-price rental tenancy: Germany (10.43% short fixation, 43.87% market tenants) and the Netherlands (15.13% short fixation, 21.43% market tenants) pair long-fixation mortgage markets with large private rental sectors, whereas Finland (97.67% short fixation, 14.73% market tenants), Lithuania (97.71% short fixation, 1.23% market tenants), and Portugal (87.44% short fixation, 11.87% market tenants) pair variable-rate origination dominance with high owner-occupancy. Estimating single-institution interactions in isolation would therefore confound mortgage fixation structure with rental tenure depth, motivating the joint specification in Table 3.

Second, Figure 2 (Panel c) decomposes the total sum of squares (25.99 $pp^2$) of raw quarterly mortgage rate transitions ($N = 450$) into three orthogonal variation components: persistent country mean differences account for 0.78% (SS = 0.20), common calendar-quarter variation accounts for 80.03% (SS = 20.80), and residual within-quarter cross-country variation accounts for 19.19% (SS = 4.99). This descriptive two-way variance partition confirms that calendar-quarter fixed effects $\tau_t^h$ sweep out four-fifths of raw rate co-movement, leaving $\beta_h$ identified from the remaining within-quarter cross-national pass-through and retail credit-pricing differentials after further conditioning on horizon-specific sample windows and predetermined domestic lags.

**Table 3.** Post-2022 joint institutional interaction estimates per 10-percentage-point increase in predetermined 2019–2021 short-fixation mortgage share and market-rent tenant population share across eight complete-data Euro Area economies.

| Outcome variable | $h$ | Fixation (SE) | WCB $p$ | Tenant (SE) | Conv. $p$ | WCB $p$ | $N$ ($K$) |
|---|---|---|---|---|---|---|---|
| Total nominal dwelling prices | 4 | -0.28 (0.34) | 0.4297 | -3.47 (1.06) | 0.0138 | 0.1094 | 112 (44) |
| Total nominal dwelling prices | 8 | 0.18 (0.53) | 0.7813 | -2.88 (1.22) | 0.0499 | 0.1953 | 80 (40) |
| Permits: number of dwellings | 4 | -1.72 (3.46) | 0.6484 | -4.48 (5.17) | 0.4153 | 0.4922 | 112 (44) |
| Permits: number of dwellings | 8 | 4.48 (1.81) | 0.0859 | -7.96 (4.34) | 0.1090 | 0.2891 | 80 (40) |
| Nominal actual housing rentals | 4 | -0.22 (0.53) | 0.7266 | 0.38 (1.22) | 0.7652 | 0.8438 | 112 (44) |
| Nominal actual housing rentals | 8 | 0.11 (0.24) | 0.5781 | 0.91 (0.83) | 0.3090 | 0.2500 | 80 (40) |
| Rentals relative to headline prices | 4 | -0.14 (0.50) | 0.8828 | 0.33 (0.94) | 0.7320 | 0.7656 | 112 (44) |
| Rentals relative to headline prices | 8 | 0.02 (0.27) | 0.9297 | 0.66 (0.70) | 0.3765 | 0.3359 | 80 (40) |

*Notes.* Projection origins begin in 2022Q1 so that 2019–2021 institutional averages are predetermined ($G = 8$ countries: Austria, Germany, Spain, Finland, Lithuania, the Netherlands, Portugal, and Slovenia; $N_4 = 112$ with $K = 44$ fitted parameters; $N_8 = 80$ with $K = 40$ fitted parameters). Fixation and Tenant report interactions of $\Delta r_{it}$ with 2019–2021 short-fixation mortgage shares and market-rent tenant shares, respectively, centered at equal-weighted eight-country means (52.74% and 18.10%) and scaled per 10 percentage points. Country-clustered CR1 standard errors appear in parentheses; WCB $p$-values enumerate all 128 restricted Rademacher sign permutations (10 of the 360 total horizon-by-term estimates across $h = 0, \ldots, 8$ yield disconnected 95% WCB confidence sets due to small-sample lag saturation).

Table 3 reports the post-2022 joint institutional estimates testing Hypothesis 2. Across all four focal outcomes and all nine horizons ($h = 0, \ldots, 8$), none of the 36 short-fixation mortgage share interactions

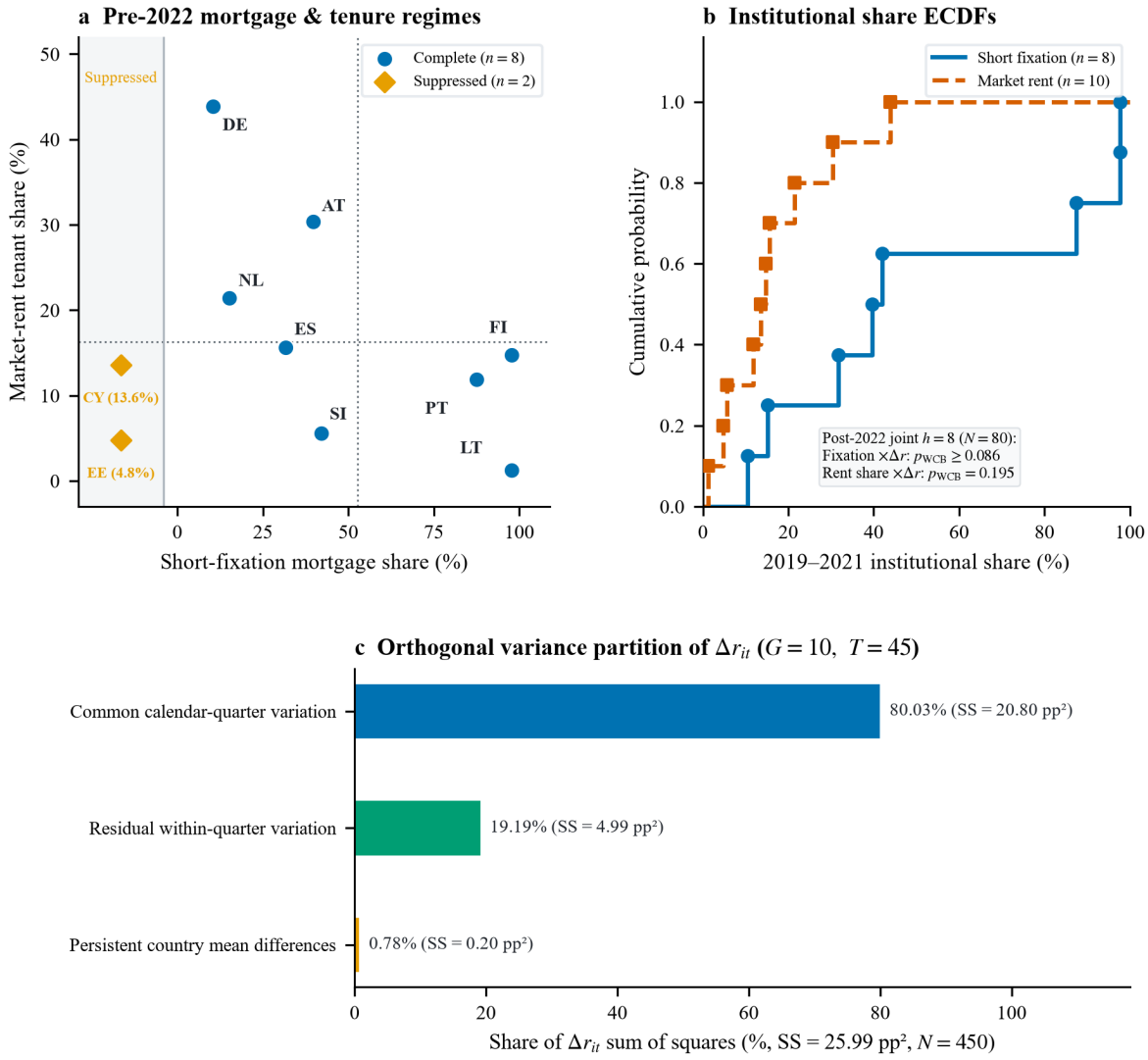



**Figure 2.** Pre-tightening mortgage and tenure regimes, cumulative distributions, and mortgage rate variance decomposition.

*Notes.* Panel a plots 2019–2021 predetermined short-fixation new mortgage shares ($n$ = 8, vertical dotted mean 52.7%) against market-rent tenant population shares ($n$ = 10, horizontal dotted mean 16.3%; $n$ = 8 mean 18.1%), placing Cyprus (13.6%) and Estonia (4.8%), which have three suppressed monthly fixation cells, in the separated left margin. Panel b displays empirical cumulative distribution functions and summarizes post-2022 joint interaction bootstrap $p$-values at $h$ = 8 ($N$ = 80, $K$ = 40). Panel c decomposes total squared variation in quarterly mortgage rate changes ($N$ = 450, total sum of squares 25.99 pp$^2$) orthogonally into common calendar-quarter variation, residual within-quarter variation, and country mean differences.

passes the 5% enumerated wild cluster bootstrap threshold. At $h$ = 8 ($N$ = 80, $K$ = 40), the short-fixation interaction is 0.18 log percentage points per 10-percentage-point higher fixation share for nominal house prices (bootstrap $p$ = 0.7813), 0.11 for nominal actual rentals ($p$ = 0.5781), and 4.48 for dwelling permits (conventional $p$ = 0.0431, bootstrap $p$ = 0.0859, carrying a positive sign opposite to supply amplification). A 10-percentage-point higher market-rent tenant share is associated with steeper negative nominal house-price slopes of −3.47 log percentage points at $h$ = 4 (conventional $p$ = 0.0138) and −2.88 at $h$ = 8 (conventional $p$ = 0.0499), yet enumerated eight-cluster bootstrap studentization widens both $p$-values to 0.1094 and 0.1953, while rental interactions remain small (0.91 at $h$ = 8, bootstrap $p$ = 0.2500; 0.66 for relative rents, $p$ = 0.3359). Removing Germany or Portugal ($G$ = 7, 64 enumerated

permutations) to check 2020–2021 tenure survey breaks leaves these patterns unchanged. Because fitting $K = 40$ to 44 parameters on $N = 80$ to 112 observations across eight clusters absorbs substantial degrees of freedom, these null interactions represent inconclusive post-2022 evidence under heavy autoregressive lag saturation as opposed to precise proof of institutional invariance.

### *5.2. Sensitivity Across Controls, Country Coverage, and Policy Subperiods*

Table 4 and Figure 3 summarize sensitivity across alternative controls, rate and cost definitions, expanded Euro Area country coverage, leave-one-country-out deletions, and subperiod origin windows. First, the eight-quarter negative conditional association for total nominal dwelling prices (Figure 3, Panel a) remains stable across full-period specification and coverage expansions: adding lagged net migration and population growth yields −13.62 log percentage points ($K = 65$, bootstrap $p = 0.0039$), replacing log construction cost levels with construction-cost growth yields −12.68 ($K = 63$, $p = 0.0059$), substituting the European Central Bank composite cost-of-borrowing indicator yields −10.46 on the baseline 10 countries ($p = 0.0391$) and −8.16 when Latvia and Malta enter the balanced 12-country panel ($N = 396$, $K = 65$, enumerated 2,048-permutation $p = 0.0254$), and expanding coverage to 18 Euro Area Member States—retaining France, Italy, Belgium, and Ireland via construction producer-price controls—yields −9.87 ($N = 580$, $K = 71$, $p = 0.0028$). Across all 10 leave-one-country-out deletions at $h = 8$, the nominal house-price slope remains strictly negative, passing the 5% bootstrap threshold in nine of 10 deletions ($p = 0.0508$ when Finland is omitted).

**Table 4.** Sensitivity of cumulative local-projection estimates across alternative controls, rate definitions, country coverage, subperiod origin windows, and lead placebos.

| Specification check | $h$ | $N$ ($G$/$K$) | Prices [$p$] | Permits [$p$] | Rents [$p$] | Rel.-rents [$p$] |
|---|---|---|---|---|---|---|
| Baseline specification | 8 | 330 (10/63) | -12.78 [0.0059] | -24.89 [0.4375] | -5.30 [0.0430] | -2.60 [0.1777] |
| Lagged migration and pop. growth | 8 | 330 (10/65) | -13.62 [0.0039] | -35.73 [0.3125] | -5.33 [0.1328] | -3.40 [0.2383] |
| Construction-cost growth controls | 8 | 330 (10/63) | -12.68 [0.0059] | -26.43 [0.4160] | -6.40 [0.0410] | -3.04 [0.1094] |
| Composite borrowing rate (baseline) | 8 | 330 (10/63) | -10.46 [0.0391] | -19.25 [0.4648] | -3.63 [0.0723] | -1.47 [0.3164] |
| Composite borrowing rate (broader) | 8 | 396 (12/65) | -8.16 [0.0254] | -16.97 [0.1636] | -3.78 [0.0156] | -3.47 [0.0742] |
| Producer-price control (18 countries) | 4 | 652 (18/75) | -4.80 [0.0177] | -21.72 [0.0281] | -3.33 [0.1039] | -2.55 [0.1748] |
| Producer-price control (18 countries) | 8 | 580 (18/71) | -9.87 [0.0028] | -15.55 [0.2782] | -4.25 [0.0312] | -2.63 [0.1114] |
| Rental series extended to 2026Q3 | 8 | 340 (10/64) | — | — | -3.95 [0.0645] | -1.97 [0.2637] |
| Pre-2022 sample (outcomes ≤ 2021Q4) | 8 | 150 (10/45) | -8.28 [0.2070] | -7.49 [0.8594] | -2.59 [0.2949] | -3.77 [0.2871] |
| Tightening origins (2022Q1–2024Q2) | 8 | 100 (10/40) | -3.46 [0.2090] | 24.15 [0.4063] | -1.95 [0.1465] | -1.32 [0.2852] |
| Easing origins (2024Q3–2026Q2) | 0 | 80 (10/38) | -2.88 [0.0430] | -69.76 [0.0566] | 2.07 [0.0254] | 1.87 [0.1621] |
| Easing origins (overparameterized) | 4 | 40 (10/34) | 0.38 [0.8789] | 56.14 [0.5918] | 4.63 [0.1934] | 5.46 [0.1543] |
| Future rate change $\Delta r_{i,t+1}$ placebo | 0 | 400 (10/70) | 0.06 [0.9453] | -11.07 [0.1836] | -0.83 [0.3926] | -1.00 [0.1836] |

*Notes.* $N$ ($G$/$K$) denotes usable country-quarter observations, country clusters, and total estimated parameters including fixed effects. Columns report cumulative log percentage point slopes $\hat{\beta}_h$ for total nominal dwelling prices, authorized dwelling counts, nominal actual housing rentals, and rentals relative to headline consumer prices, with wild cluster boot-

strap $p$-values in brackets (exact enumeration of 512 permutations for $G = 10$ and 2,048 permutations for $G = 12$; 9,999 fixed-seed Rademacher draws for $G = 18$). Easing origins at $h = 4$ ($N = 40$, $K = 34$, six residual degrees of freedom) are quarantined as over-parameterized and yield disconnected WCB confidence sets for permits and both rental outcomes; easing origins at $h = 8$ ($t \geq$ 2024Q3) have zero realized outcomes prior to 2026Q2 and are unestimable, as are residential construction-cost specifications adding Croatia.

Second, Figure 3 (Panel b) shows how sample breadth governs residential permit precision. While 10-country permit specifications remain imprecise, expanding coverage to 18 Euro Area Member States via construction producer-price controls ($N = 652$ at $h = 4$; $N = 580$ at $h = 8$) yields a statistically resolved four-quarter contraction in authorized dwelling counts of −21.72 log percentage points (standard error 7.87, bootstrap $p = 0.0281$), moderating to −15.55 at $h = 8$ ($p = 0.2782$). In short post-2023 producer-price checks incorporating Croatia ($N = 190$, $K = 49$ at $h = 0$; $N = 114$, $K = 45$ at $h = 4$), dwelling-price (+0.07 vs. +0.55 at $h = 0$; −0.14 vs. −0.64 at $h = 4$) and permit estimates (−19.11 vs. −21.51 at $h = 0$; +12.91 vs. +13.86 at $h = 4$) align closely with matched 18-country post-2023 models excluding Croatia ($N = 180$ and $N = 108$), whereas rental slopes shift substantially when Croatia enters: nominal rentals jump from +1.44 ($p = 0.0060$) to +5.01 ($p = 0.0237$) at $h = 0$ and flip from +0.05 ($p = 0.9450$) to −3.43 ($p = 0.1680$) at $h = 4$, and relative rentals shift from +2.26 ($p = 0.0092$) to +6.01 ($p = 0.0097$) at $h = 0$ and from +1.06 ($p = 0.2746$) to −2.37 ($p = 0.3184$) at $h = 4$. Post-2023 eight-quarter models ($N = 38$ across 19 countries) lack sufficient degrees of freedom and are left unestimated.

Third, Figure 3 (Panel c) confirms that the negative eight-quarter nominal rental tendency is directionally consistent across full-sample 10-, 12-, and 18-country panels (−5.30, −3.78 with $p = 0.0156$, and −4.25 with $p = 0.0312$, respectively) while remaining sensitive in the 10-country panel to demographic controls, endpoint extension, single-country deletions, and subperiod saturation. Controlling for lagged net migration and population growth leaves the point estimate at −5.33 log percentage points while raising the standard error to 2.81 ($p = 0.1328$); extending the rental endpoint to 2026Q3 ($N = 340$) yields −3.95 ($p = 0.0645$); and across leave-one-country-out deletions all 10 slopes remain negative, with three of 10 achieving $p < 0.05$ (omitting Cyprus, the Netherlands, Finland, Lithuania, Germany, Slovenia, or Estonia yields $p \in [0.0547, 0.1523]$). Splitting origins by monetary phase compresses within-window degrees of freedom: across pre-2022 origins ($N = 150$, $K = 45$), eight-quarter house-price and nominal-rent slopes are −8.28 ($p = 0.2070$) and −2.59 ($p = 0.2949$); across 2022Q1–2024Q2 tightening origins ($N = 100$, $K = 40$), four-lag saturation attenuates both slopes to −3.46 ($p = 0.2090$) and −1.95 ($p = 0.1465$). During 2024Q3–2026Q2 easing origins, impact regressions ($N = 80$, $K = 38$) show a positive cross-country association of +2.07 ($p = 0.0254$) for nominal rentals and +1.87 ($p = 0.1621$) for relative rentals—indicating that Member States with slower quarterly rate cuts exhibited firmer contemporaneous nominal rent readings—whereas four-quarter easing projections ($N = 40$, $K = 34$, six residual degrees of freedom) are severely over-parameterized. Finally, regressing impact outcomes on next quarter's mortgage rate change $\Delta r_{i,t+1}$ ($N = 400$, $K = 70$) yields null lead placebos across all four outcomes (bootstrap $p \in [0.1836, 0.9453]$).

### 5.3. *Methodological Boundaries and Scope Conditions*

Four empirical boundaries govern interpretation of these results. First, because calendar-quarter fixed effects sweep out union-wide European Central Bank policy announcements, our local projections identify conditional dynamic associations with within-quarter cross-country mortgage rate differentials as distinct from causal responses to an external union-wide monetary shock. Cross-national retail mortgage pricing reflects bank funding structures, borrower credit risk, and domestic housing demand alongside pass-through speed; accordingly, the absence of a conditional cross-country rental surge differs in estimand from aggregate structural monetary shock identifications (Dias & Duarte, 2019; European Central Bank, 2025) and cannot directly identify union-wide rental inflation persistence absorbed by $\tau_t^h$. Second, enforcing complete quarterly residential construction-cost coverage narrows the continuous currency union

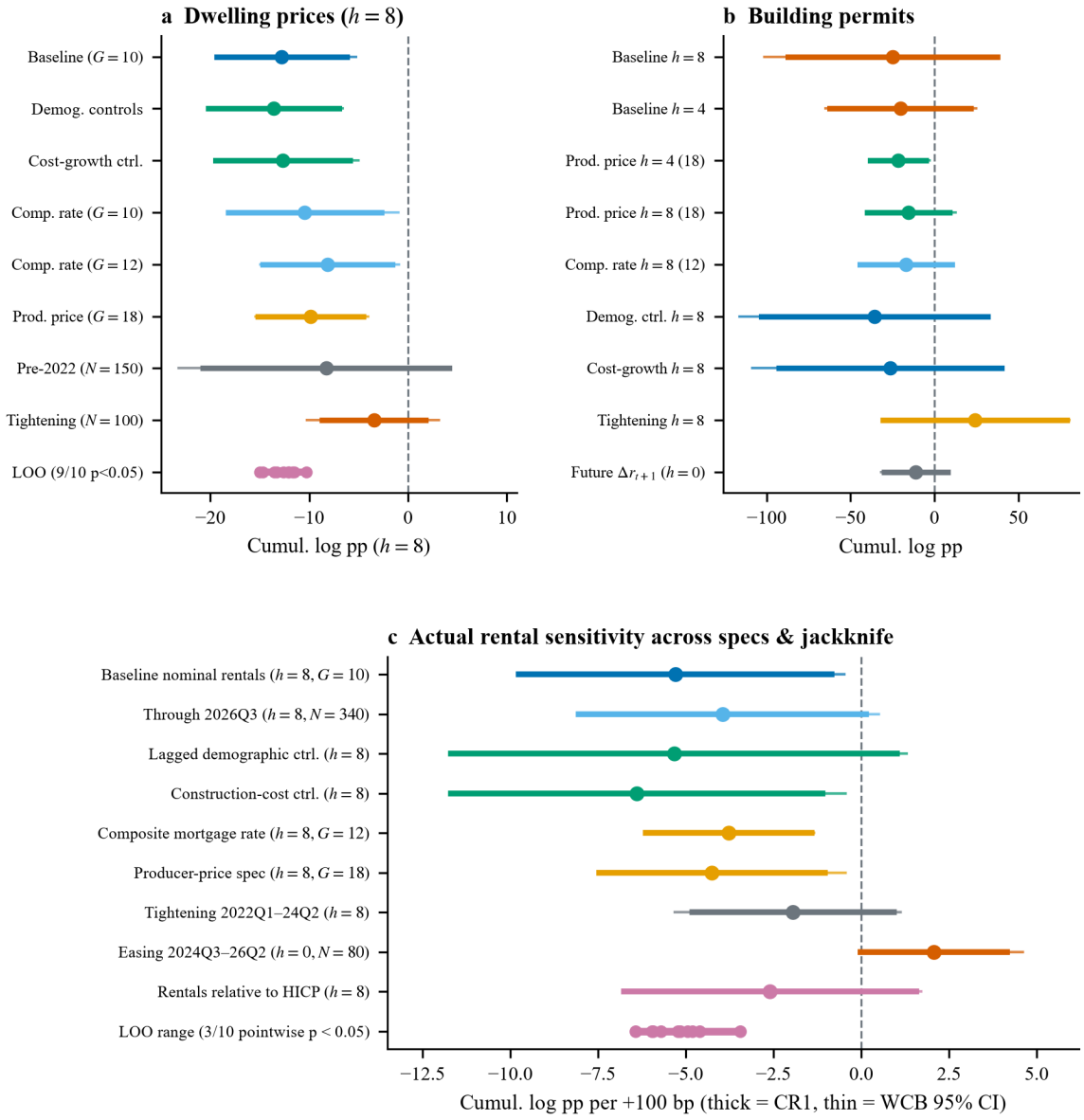



**Figure 3.** Specification, sample-coverage, regime-window, and leave-one-country-out stability across housing markets.

*Notes.* Thick horizontal segments depict country-clustered CR1 95% confidence intervals and thin overlaid segments depict 95% null-imposed wild cluster bootstrap confidence intervals (which can be wider or slightly narrower on individual tails under asymmetric small-cluster distributions). Bottom rows in Panels a and c show the range and individual point estimates across all 10 leave-one-country-out deletions at $h = 8$ ($N = 297$ each).

to 10 baseline economies and eight economies in joint institutional models, motivating our 12- and 18-country sensitivity panels while leaving post-2022 interaction and subperiod regressions constrained by high parameter-to-observation ratios ($K/N$ reaching 0.50 to 0.85). Third, administrative building permits measure municipal authorizations upstream of physical completions, harmonized consumer-price rentals blend regulated incumbent contracts with newly signed leases instead of isolating unobserved new-lease asking rents, and unadjusted permit and cost indices may retain country-specific seasonal variation beyond common calendar-quarter effects. Fourth, sequential Holm multiplicity control confirms the eight-quarter nominal house-price contraction ($p = 0.0469$) while rendering individual secondary sub-index and nominal rental $p$-values exploratory, and all series reflect official vintages available on 13 November 2026.

## 6. Policy Implications and Conclusion

Harmonized Euro Area housing, construction-permitting, and backcasted consumer-price rental panels across 2015–2026 demonstrate that conditional within-union cross-country mortgage rate increases robustly foreshadow substantial medium-run nominal dwelling price contractions without generating the positive cross-country housing rental surge predicted by frictionless tenure-substitution models. Over an eight-quarter horizon, a 100-basis-point higher quarterly change in new house-purchase borrowing rates is conditionally associated with a −12.78 log percentage point contraction in total nominal dwelling prices (pointwise bootstrap $p = 0.0059$, eight-outcome Holm-adjusted $p = 0.0469$), corroborated across 12-country composite-rate (−8.16) and 18-country producer-price (−9.87) panels. Over the same horizon, nominal actual housing rentals exhibit an unadjusted negative tendency (−5.30 log percentage points, pointwise $p = 0.0430$, 95% bootstrap interval $[-9.49, -0.48]$) that softens under multiplicity and demographic controls, rentals relative to consumer prices remain statistically indistinguishable from zero ($-2.60$, $p = 0.1777$), and post-2022 interactions with predetermined short-fixation mortgage and market-rent tenant shares remain inconclusive under small-cluster lag saturation.

For European monetary and macroprudential surveillance, these findings carry two institutional lessons. First, central bank inflation forecasters monitoring harmonized consumer price indices must avoid extrapolating single-country aggregate rent-surge elasticities to cross-national mortgage pass-through differentials within the currency union: conditional on union-wide policy movements, steeper domestic retail mortgage rate increases reflect broader local shelter-demand cooling while statutory European lease-indexation caps and low tenant turnover insulate incumbent consumer-price rental indices from marginal buyer-to-renter substitution. Tracking marginal rental market pressure separately from regulated stock-rent inertia therefore requires dedicated euro-area-wide harmonized indices of new-lease asking rents. Second, because medium-run contractions in residential building authorizations become statistically resolved only when coverage expands to 18 Member States via producer-price controls (−21.72 log percentage points at four quarters), completing harmonized quarterly residential construction-cost reporting across France, Italy, Belgium, Ireland, and newer Member States is essential for real-time monitoring of European housing supply bottlenecks.

## Statements

**Data availability.** Quarterly and monthly bank lending rates, residential building permits, dwelling price indices, actual housing rental price series, and tenure indicators analyzed here are drawn from official public databases of the European Central Bank and Eurostat. The bundled source extracts, harmonized Euro Area panels, and end-to-end estimation and plotting code can be accessed openly on Zenodo (https://doi.org/10.5281/zenodo.24199847).

**Author contributions.** Catherine Lau conceptualized the study, designed the empirical strategy, and drafted the manuscript. Samuel Tay assembled the harmonized cross-national datasets and conducted the econometric estimation. Irina Meshkova verified all primary statistical series, institutional classifications, and replication scripts. All authors reviewed and approved the final manuscript.

**AI declaration.** Auxiliary assistance from OpenAI Codex was confined to routine dataset cleaning and implementation-level verification of the estimation code. Every assisted step was independently reviewed and validated by all authors, who carried out all remaining research and writing and bear sole responsibility for the manuscript.

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**Competing interests.** Catherine Lau, Samuel Tay, and Irina Meshkova are affiliated with the Academy of Public Policy and Economics, which publishes Commentary and Critique. No external competing interests are declared.

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