Eesti Pank
EUROSÜSTEEM

Is there club convergence in the European housing markets?

Fabio Canova[1] & Natalia Levenko[2]

[1]BI Norwegian Business School

[2]Tallinn University of Technology, Eesti Pank

All viewpoints are personal

National bank of Slovakia & SUERF workshop
17 November 2,26, Bratislava

Why does housing convergence matter?

- **EU integration**: Reducing economic disparities and facilitating labour mobility are key EU objectives.
  - Economic and technological integration remains incomplete (Bolea et al. 2018).
- **Labour mobility**: Large differences in house prices and affordability may discourage people from moving between countries.
- **Financial stability**: Excessively high house prices may signal growing imbalances and threaten financial stability.
- **Cross-country perspective**: Comparing housing markets can help identify disparities and potential vulnerabilities that country-level analysis may miss.

What do we study?

- **Residential property prices** in core EU countries over 50 years
- Convergence in **price levels**, not indexes or growth rates
  - Constructed new time series of house price levels
- Convergence in housing purchase **affordability**
- Factors behind cross-sectional dynamics

What do we find?

- Limited evidence of **long-run convergence**
  - Cross-country house price dispersion does not decline systematically
  - Phillips-Sul does not reject overall convergence
- Limited evidence of **club convergence**
  - No multiple-club structure supported over the full sample
  - Some evidence of clustering in shorter subperiods, but results are sensitive to modelling choices
- **Recessions** are associated with widening dispersion
- Macroprudential caps, interest rates, and population growth also matter in some specifications

Theory behind house price convergence

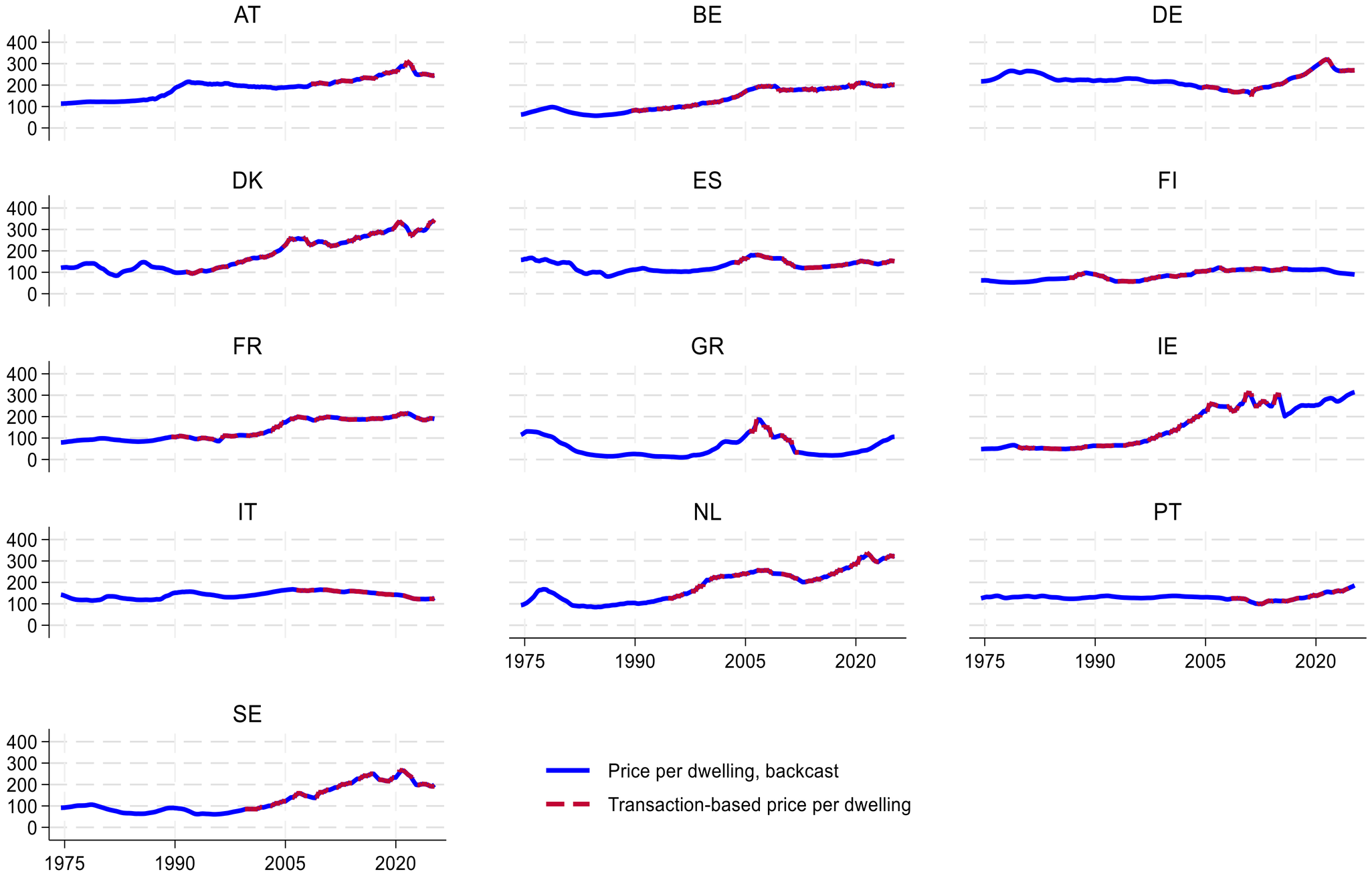
- Why might housing markets converge?
  - **Solow-Swan model**: economies with similar structural conditions tend to converge towards similar steady states.
  - Income convergence, financial integration and similar lending conditions may promote house price convergence.
- Why might housing markets diverge?
  - **Different economic conditions**: income, demographics, interest rates and business cycles.
  - **Country-specific factors**: land availability, taxation, housing preferences and regulations.

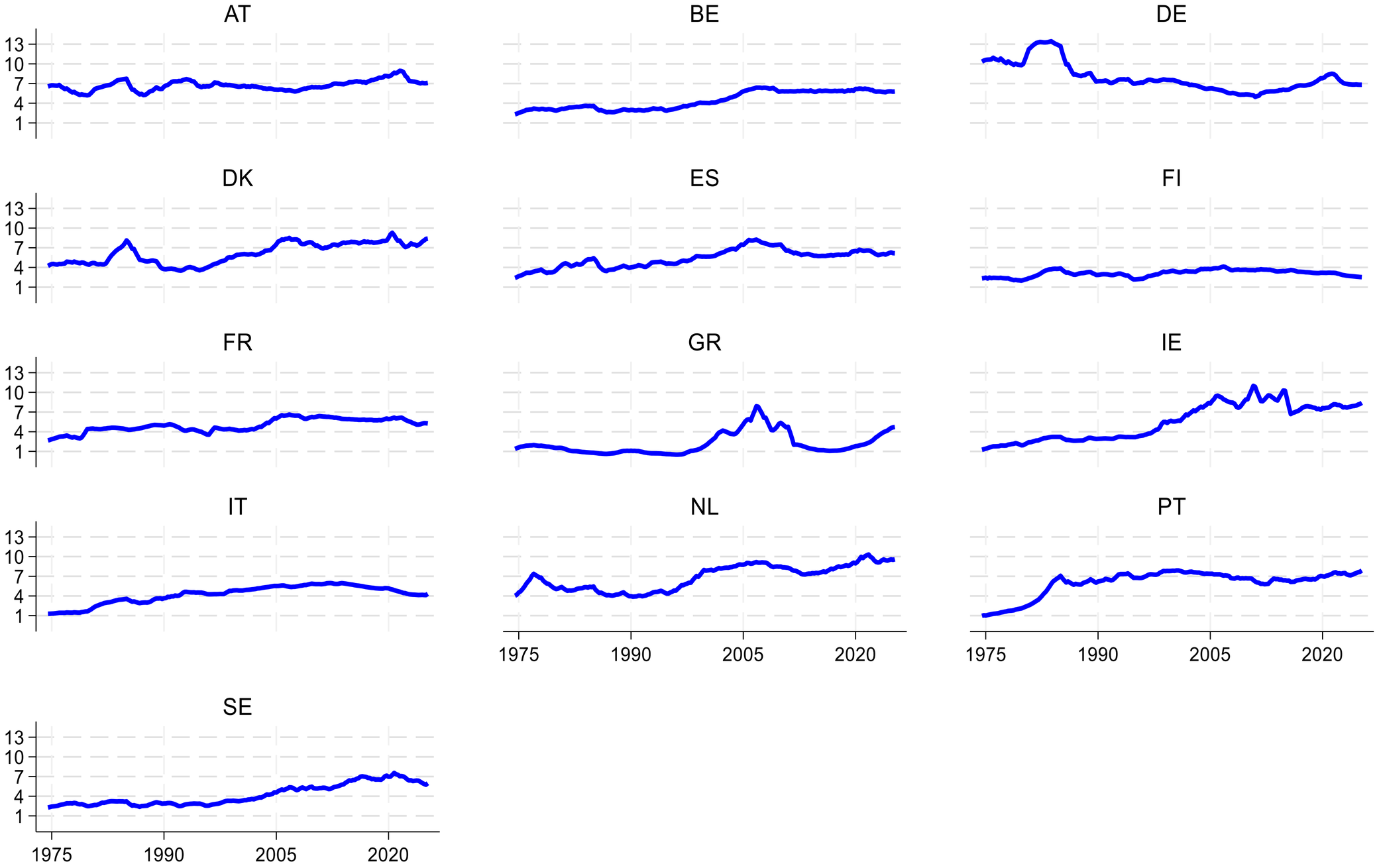
Empirical studies on (house) price convergence

- Price convergence
- Stronger during early stages of economic integration (Ogrokhina 2015)
- Evidence of a slowdown after 2000 or the GFC (Sosvilla-Rivero & Gil-Pareja 2004, Becker & Hall 2009, Halka & Leszczynska-Paczesna 2019)
- House price convergence
  - Relatively few cross-country studies
  - Most studies focus on price indexes (Maynou et al. 2021); some examine price levels (Tsai 2018, Andre et al. 2024: 18 OECD countries 1977Q1 to 2020Q4)

Data construction

- **Sample**: 13 European countries, quarterly data, 1975Q1-2025Q4.
- **House price levels**: Average price per dwelling (PDW), calculated as the total value of residential transactions divided by the number of transactions (ECB and national sources).
- **Backcasting**: Transaction-based price series extended to 1975 using house price indexes from the International House Price Database (Dallas Fed) and BIS.
- **Real house prices**: Nominal prices deflated using private consumption deflators.
- **Housing affordability**: Real price per dwelling divided by annual real disposable income per working-age person (Eurostat and World Bank).
  - Affordability can be calculated in many different ways…

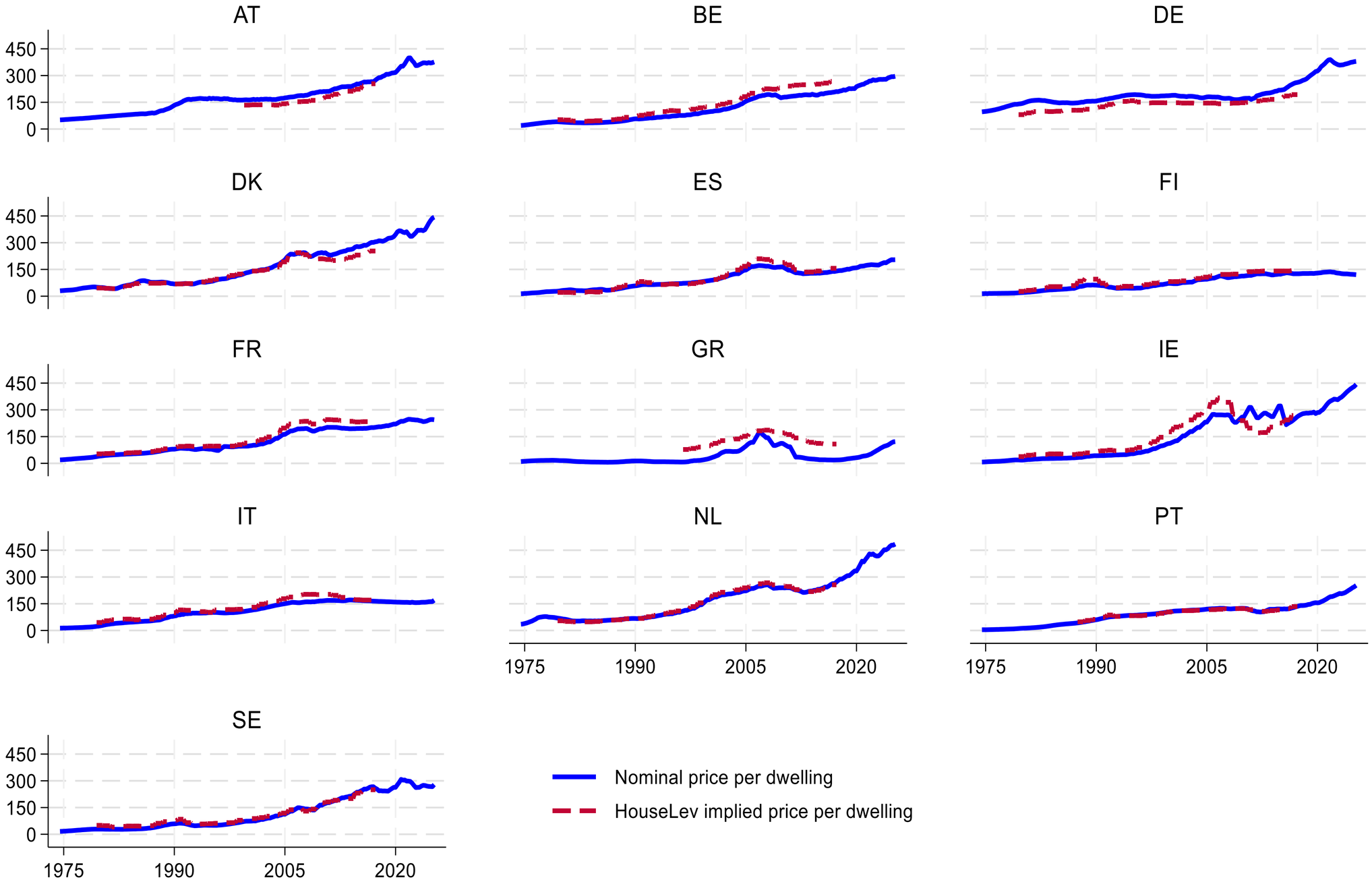

AT
BE
DE
DK
ES
FI
FR
GR
IE
IT
NL
PT
SE
400
300
200
100
0
1975
1990
2005
2020
Price per dwelling, backcast
Transaction-based price per dwelling


AT
BE
DE
DK
ES
FI
FR
GR
IE
IT
NL
PT
SE
13
10
7
4
1
1975
1990
2005
2020

Validation

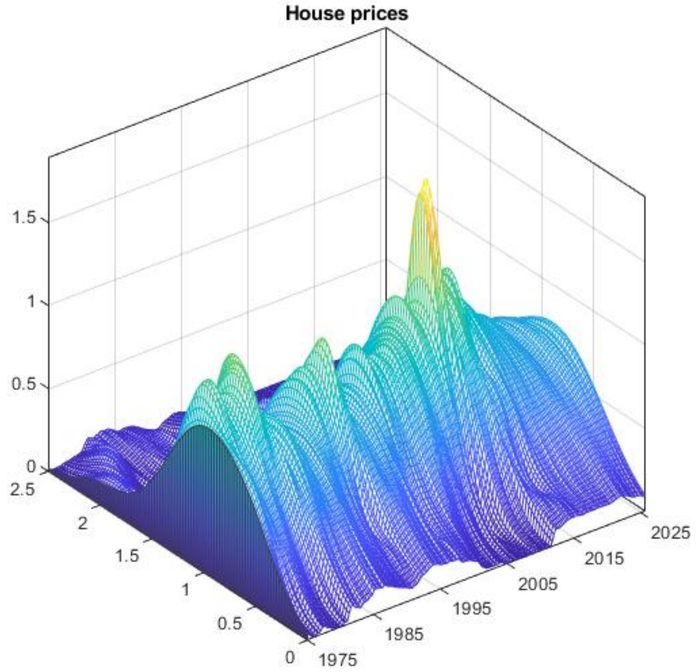
HouseLev (Bricongne et al., 2019) is a European Commission database providing estimates of residential property price levels in Europe; correlation from 0.88 to 0.99

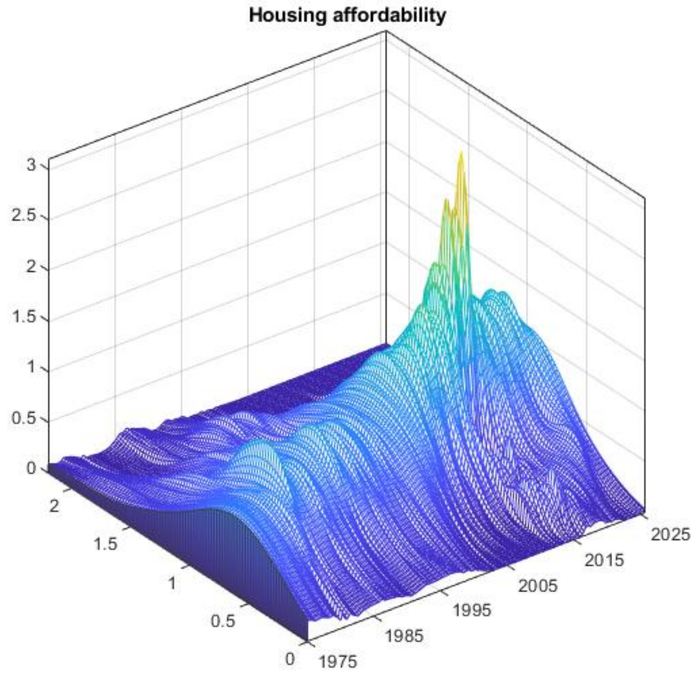
- Coverage: European countries, with data from 1980 (or later) to 2017; unbalanced panel.
- Measure: House prices in euros per square metre.
- Construction: Primarily based on estimates of the total value of the housing stock divided by its estimated floor area, rather than observed transaction prices.
- Limitation: Incomplete country and time coverage, not updated, with prices based on estimated housing stock values.
- **Gross value added** from real estate activities: correlation 0.56 for Greece; 0.86-0.98 for the other countries.


AT
BE
DE
DK
ES
FI
FR
GR
IE
IT
NL
PT
SE
450
300
150
0
1975
1990
2005
2020
Nominal price per dwelling
HouseLev implied price per dwelling

Steps of empirical analysis

- Sigma-convergence
- Dispersion analysis
- Club convergence using Canova’s (2004) procedure
- Phillips-Sul test
- Examine factors behind price dynamics

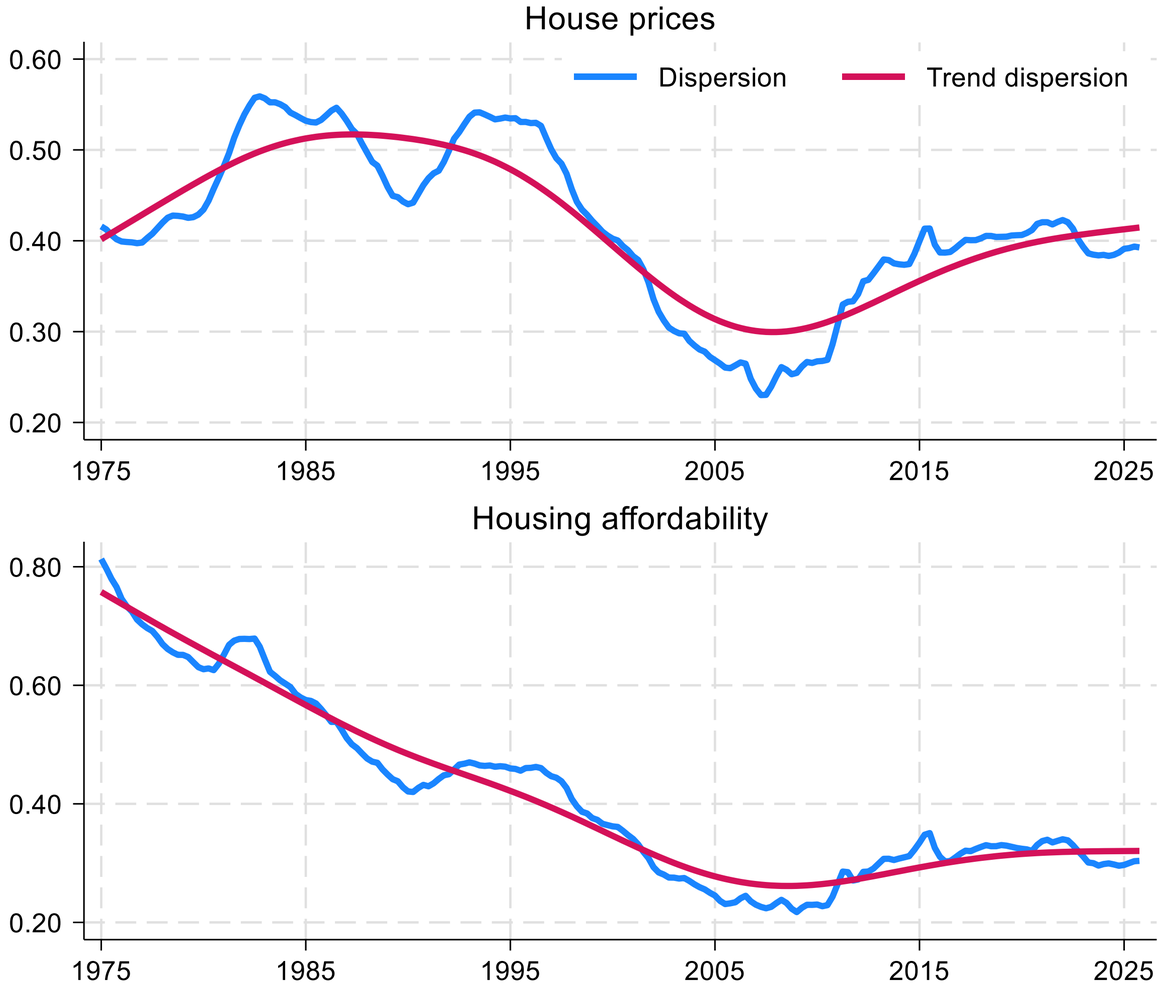




Evolution of house price and affordability distributions

- **House prices**: the distribution narrows around 2010-2015 but widens again by 2025.
- **Housing affordability**: the distribution narrows considerably around 2012-2015 but widens again by 2025.

Dispersion of house prices and affordability



Phillips-Sul convergence test

H_0: Overall convergence

Critical value at 5%: -1.65.

	Log-t statistic
House prices	18.44
Housing affordability	74.04

- Dispersion does not decline consistently over time.
- Phillips-Sul test does not reject overall convergence…
- but this does not rule out different convergence patterns across groups of countries.

Methodology: Bayesian club convergence (Canova, 2004)

- Countries may **converge to a** common **distribution**
- We test whether data are better described by **one or several groups** (clubs) with similar dynamics
- We use **Bayes factors** to compare models with different numbers of clubs
  - BF = ratio of the marginal likelihoods of two competing models
- We consider three **alternative country orderings**
- We use Monte Carlo simulations to calibrate the procedure

Algorithm

- **H_0**: All countries' parameters come from a single distribution.
- **H_1**: They come from two distinct distributions (clubs).
- Consider all admissible splits into two groups and compute their marginal likelihoods.
- Calculate the **Bayes factor** (BF) using average marginal likelihood to compare the two-club and one-club models.
- If BF exceeds the **threshold** (**3.2** or 10, Kass & Raftery 1995), select two clubs and test whether adding another club improves the model.
- Stop when the evidence no longer supports an additional club.

Bayes factors for house prices and affordability

	House prices			Affordability		
	Initial	Terminal	PCA	Initial	Terminal	PCA
1975-2025	0.6426	0.7294	0.4420	0.2505	0.4204	0.2376
1975-1999	1.1213	3.0016	2.4388	1.3305	1.1707	0.7141
2000-2025	0.6431	**6.5966**	0.8689	0.9685	**7.2489**	0.7217
2005-2025	0.3959	0.9336	0.3510	0.6377	**4.0530**	0.6250

Club composition

- The first club for **house prices** contains Finland, Italy, Greece, and Spain, while the second contains Portugal, France, Sweden, Belgium, Austria, Germany, Ireland, the Netherlands, and Denmark.
- For housing **affordability**, Finland and Italy form the first club, while all the other countries are in the second.

Pillips-Sul log-t test

Sample	Log-t statistics					Club-merging tests			Final clubs
	Full-sample	Club 1	Club 2	Club 3	Club 4	1+2	2+3	3+4	
House prices									
1975-2025	18.44	18.44							1
1975-1999	-25.71	-0.16	3.49			-12.03			2
2000-2025	-130.70	1.97	0.77			-80.07			2
2005-2025	-80.50	0.68	2.87	-0.77	-0.93	-12.23	-5.81	-12.61	4
Affordability									
1975-2025	74.04	74.04							1
1975-1999	20.58	20.58							1
2000-2025	-108.61	7.46							1
2005-2025	-61.44	4.84	3.90	0.92	-1.15	4.92	-66.66	-2.74	2

Explaining dynamics of cross-sectional dispersion

To understand whether economic downturns bring European housing markets closer together or increase differences between countries

$$\Delta sd_t^Y = \alpha + \beta \Delta sd_t^{INC} + \theta recession_t + X_t{}'\gamma + \varepsilon_t$$

where Δsd_t^Y is the change in the cross-sectional standard deviation of prices or affordability, Δsd_t^{INC} is the change in the cross-sectional standard deviation of income, $recession_t$ is a binary recession indictor from €ABCN, X_t is a vector of controls, and ε_t is an error term.

Drivers of house price dispersion

	(1)	(2)	(3)	(4)	(5)
Δ Income dispersion	-0.052	0.065	-0.088	0.194	0.145
	(0.050)	(0.098)	(0.066)	(0.127)	(0.124)
Recession	0.009***	0.008***	0.009***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Interest rate		0.010			
		(0.013)			
Population growth			-0.185		
			(0.193)		
Building permits				-0.003	
				(0.004)	
LTV cap					-0.031*
					(0.018)
R^2	0.166	0.179	0.170	0.096	0.100
Observations	202	183	199	122	140

Drivers of affordability dispersion

	(1)	(2)	(3)	(4)	(5)
Δ Income dispersion	0.198***	0.149	0.106	0.081	0.067
	(0.063)	(0.104)	(0.065)	(0.133)	(0.124)
Recession	0.005***	0.006***	0.005***	0.003	0.003*
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Interest rate		-0.030**			
		(0.014)			
Population growth			-0.581***		
			(0.213)		
Building permits				0.001	
				(0.004)	
LTV cap					-0.024
					(0.017)
R^2	0.125	0.117	0.174	0.028	0.035
Observations	202	183	199	122	140

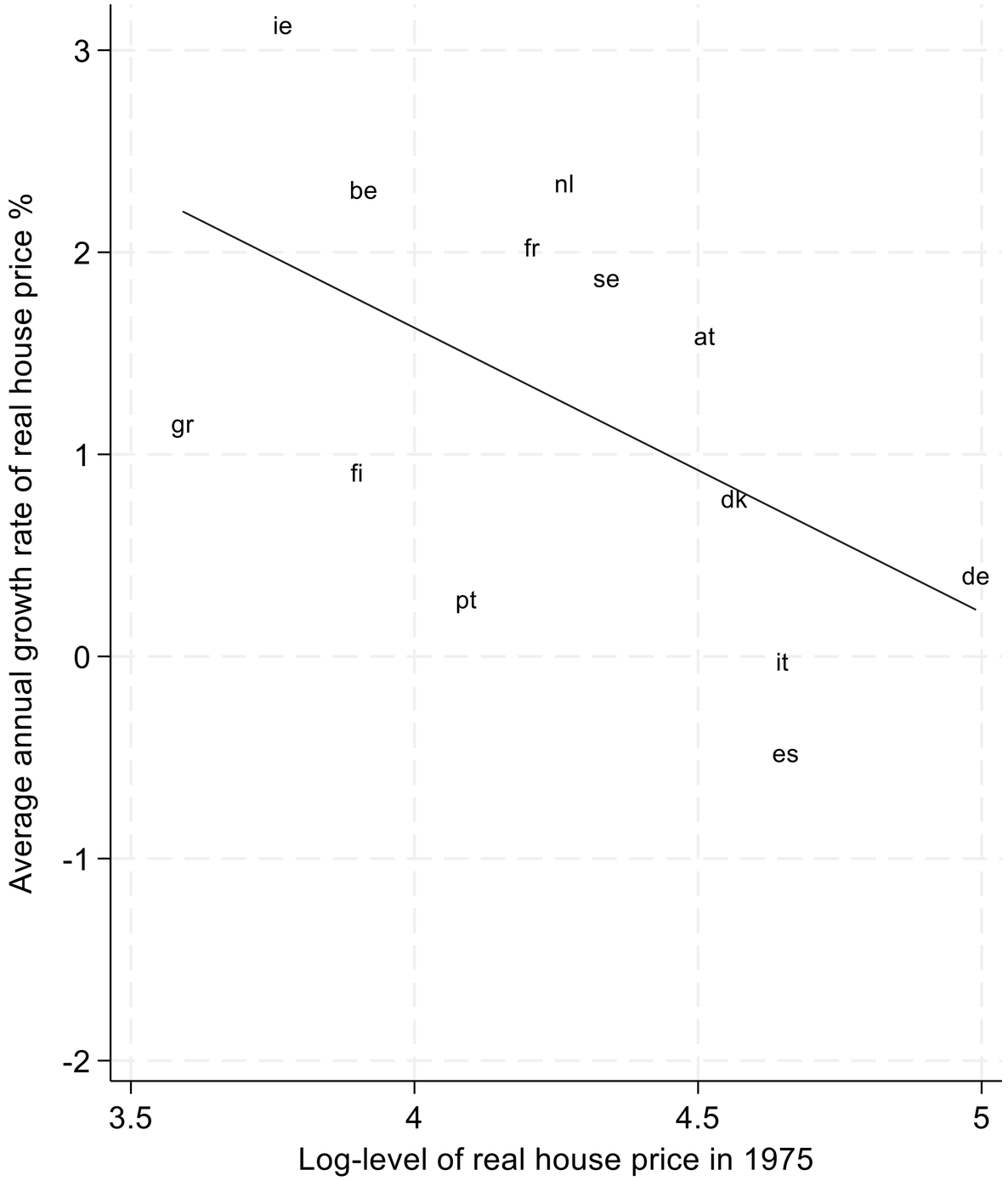
Final comments

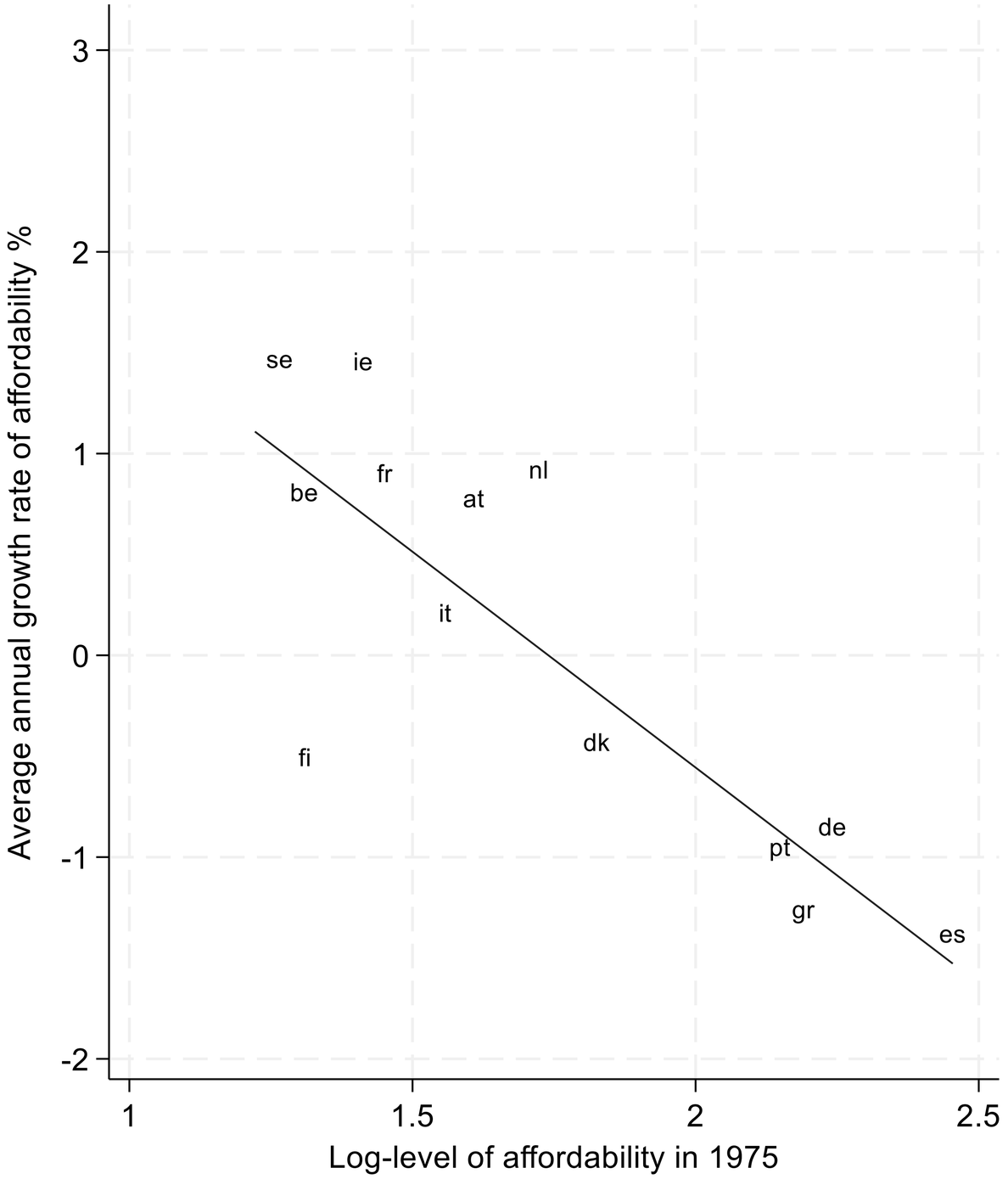
- House prices and affordability in 13 European countries over 50 years
- **Mixed evidence of long-run convergence**. The Phillips-Sul test does not reject convergence, but sigma-convergence points to persistent differences in cross-country dispersions.
- **No stable convergence clubs**. Groups of countries emerge in some periods, but their composition changes over time.
- **Recessions** tend to **widen** differences in house prices and housing affordability across countries.
- Persistent cross-country differences suggest that **local factors** are important.
- **Policy implication**: Persistent differences in housing affordability may limit labour mobility and economic integration in Europe.



natalia.levenko@taltech.ee

natalia.levenko@eestipank.ee


ie
be
nl
fr
se
at
gr
fi
dk
de
pt
it
es
3
2
1
0
-1
-2
3.5
4
4.5
5
Average annual growth rate of real house price %
Log-level of real house price in 1975


se
ie
fr
nl
be
at
it
dk
fi
de
pt
gr
es
3
2
1
0
-1
-2
1
1.5
2
2.5
Average annual growth rate of affordability %
Log-level of affordability in 1975

Bayes factors for house prices and affordability: aggregated data

	House prices			Affordability		
	Initial	Terminal	PCA	Initial	Terminal	PCA
1975-2025	1.0762	1.2262	0.6504	0.9835	0.4546	1.2376
1975-1999	17.6574	**4.0688**	**37.9502**	0.7732	1.6233	0.4836
2000-2025	0.8711	**7.5957**	1.0122	0.8561	2.9653	0.7160
2005-2025	1.3628	3.2520	0.7506	1.0253	2.6494	0.7885