Land Price Index for Austria & Application of the Builder's Model

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International Conference on Real Estate Statistics, 20 February 2026

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Context and Motivation

Supporting Eurostats OOH research agenda.

- The European Net-Acqusition **O**wner **O**ccupied **H**ousing **P**rice **I**ndex is sometimes argued to be incompatible with the consumer price index, due to the land component.

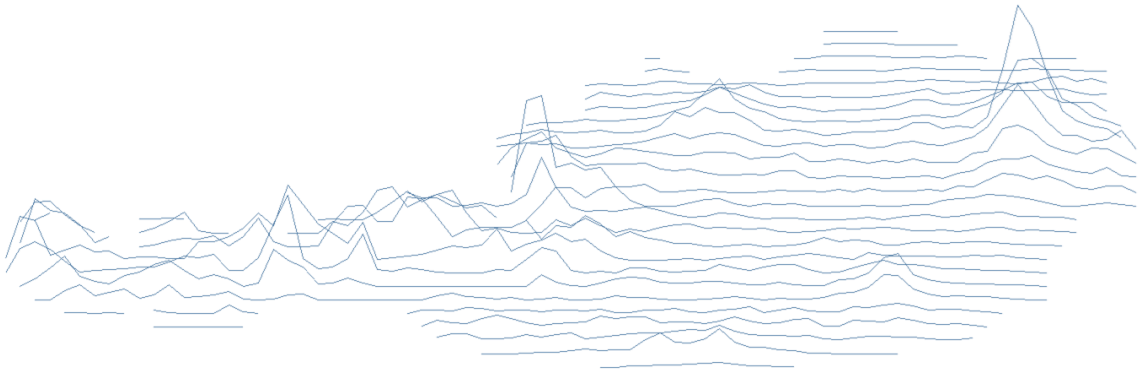
  ↳ **Isolating land (investment)** and **structure (consumption)** could be a solution!

- Investigation into the **relationship** of **dwelling price indices**, **land price indices** and the **construction output price index**.

No land price indices for Austria

- Infrastructure was created
- Know-How was there

  ↳ **Interesting Project ahead!**



Data for the project

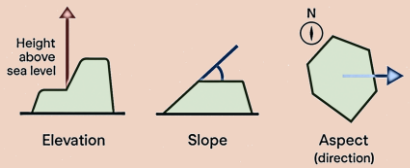
Administrative Dataset from contracts combined with the building and dwellings register & other sources

Contract

- Parties: Buyer/seller type
- Date of signature
- Sales Price
- Plot Numbers
- Relationship (Family)

Location

- Coordinates
- Proximity
  - Cities over 30k
  - Lakes
- Public Transit Quality
- Terrain data



- Municipality level info
  - Tourism, Inhabitants, Income

Characteristics

Dwellings

- Living area
- *Age*
- *Type*

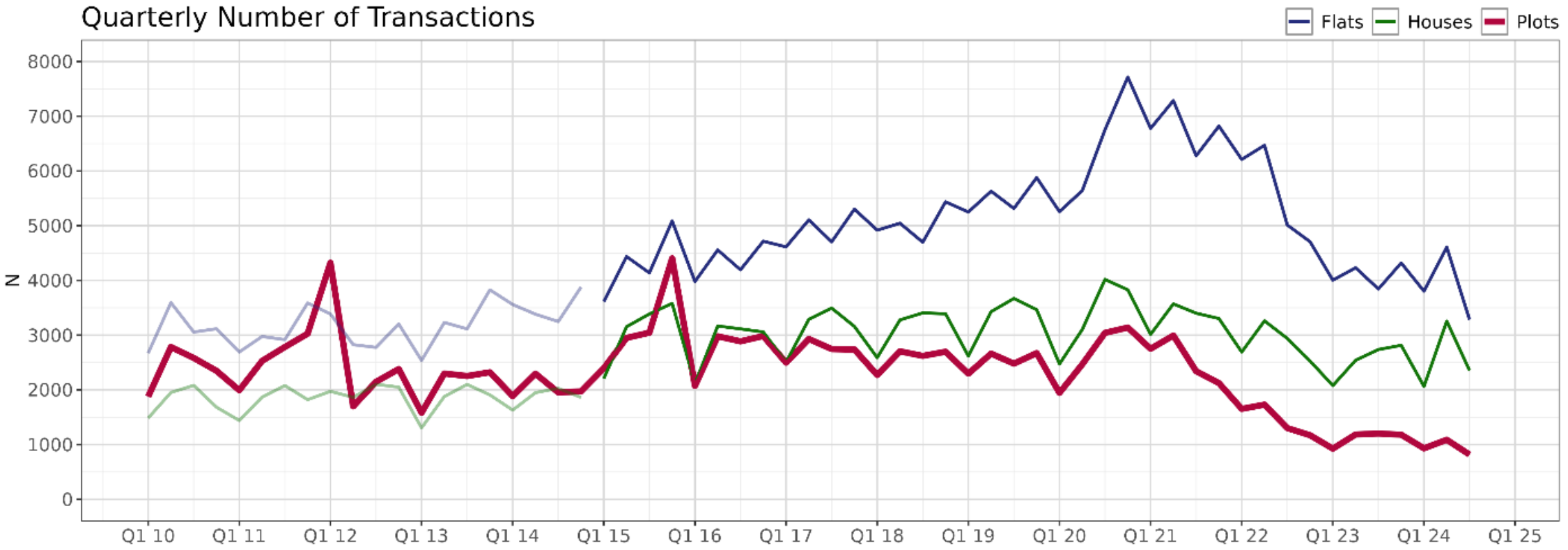
Hidden: Investment/Quality

Land

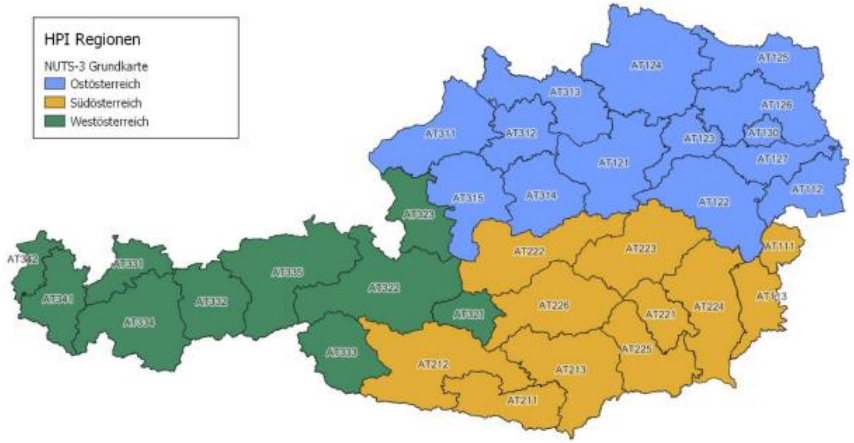
- Area
- *Construction permits*

Hidden: Infrastructure cost

Transaction Numbers



Methods



Two main methods tested – for three strata each:

1) Same as the HPI **– hedonic repricing**
2) **Rolling & full period time dummy** specifications.

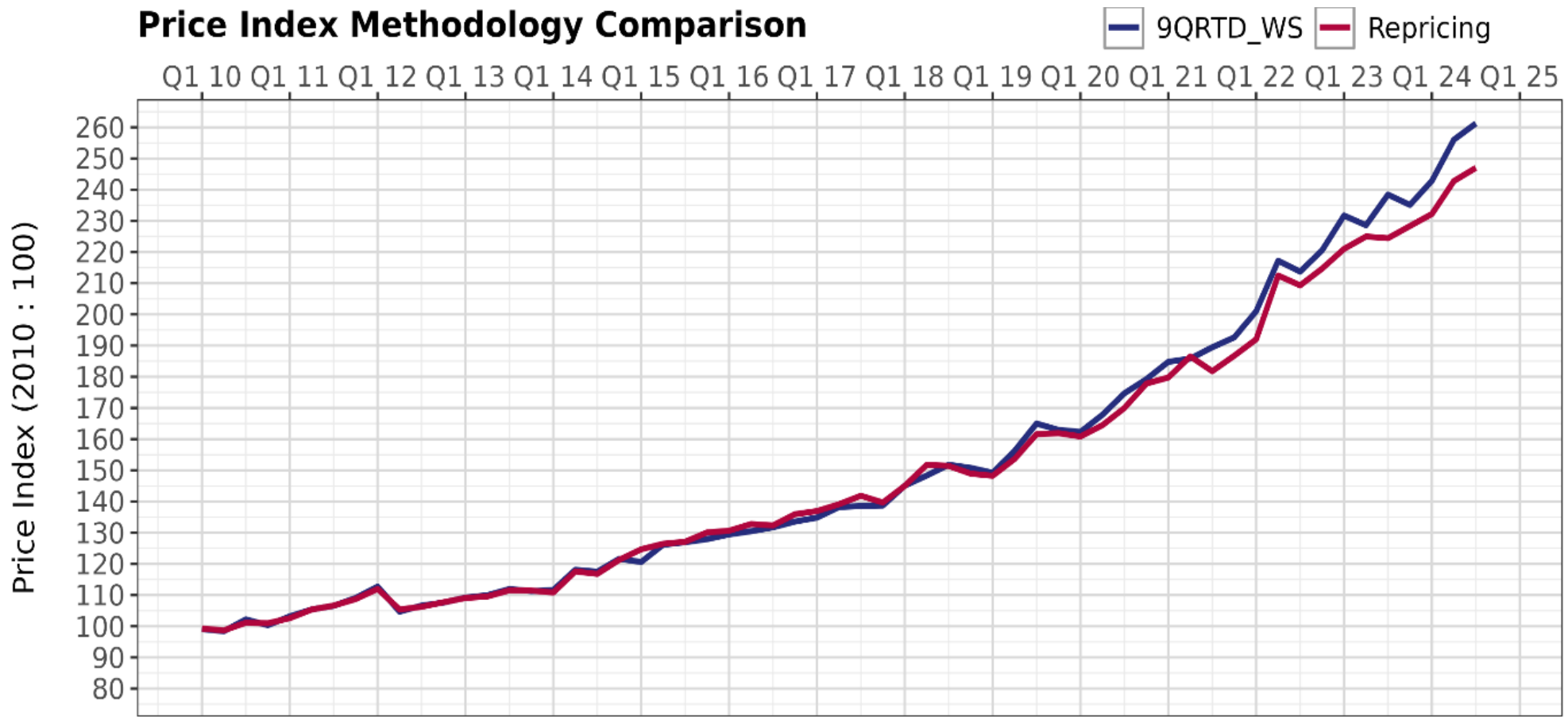
→ **Satisfactory model performance**

R^2 - District Level around 0.65 (+-0.05), Municipality around 0.75 (+-0.05)

Coefficients - generally following intuition – holding everything constant…

- close **proximity to lakes** generally adds ~40+ % value, distance to cities subtracts
- **Public transit grades** – example: **B** lowers value around 20 %, **F** around 45 % compared to **A**
- High **Tourism** added between 20-30 % to the value of plots.
- **Governmental** sales were around 20 % cheaper, companies 15 % more expensive than private sellers….

Methodological gap widens after 2021 – sample shifts



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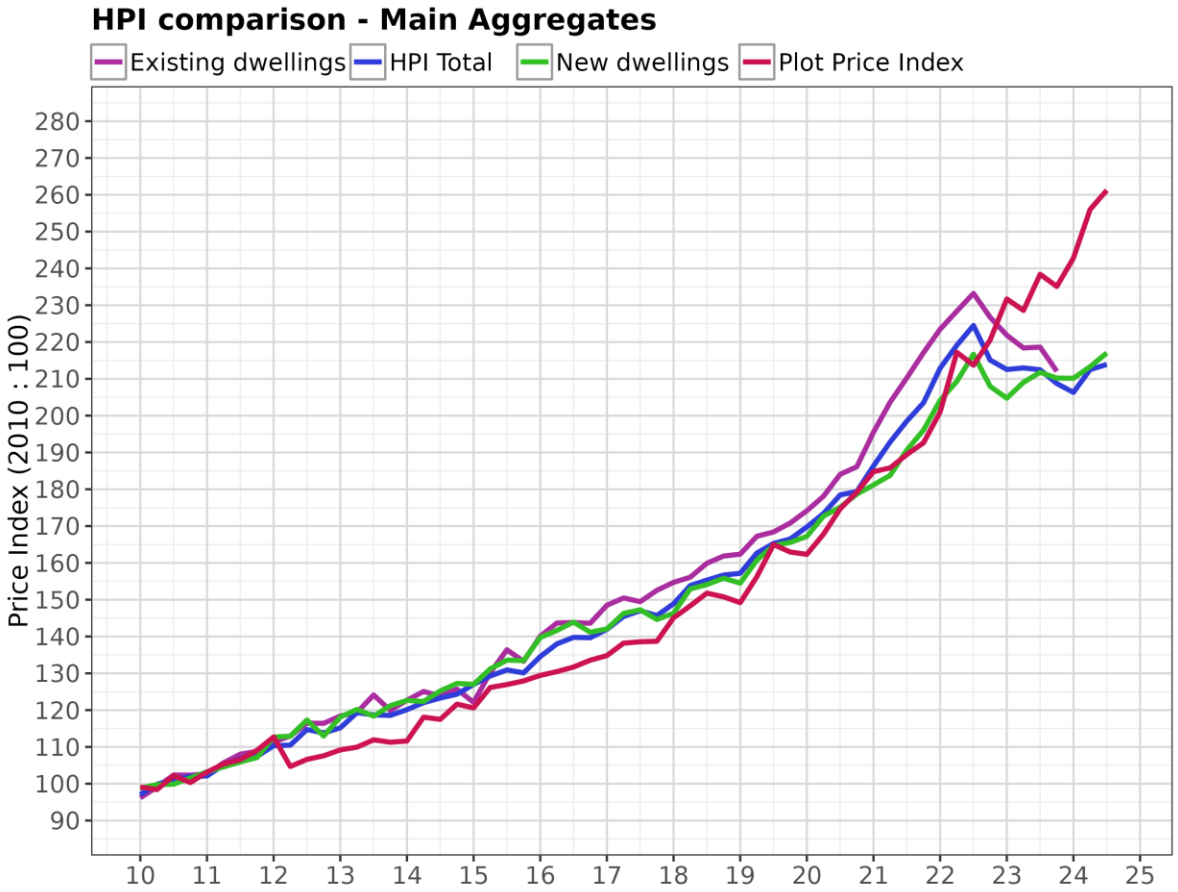
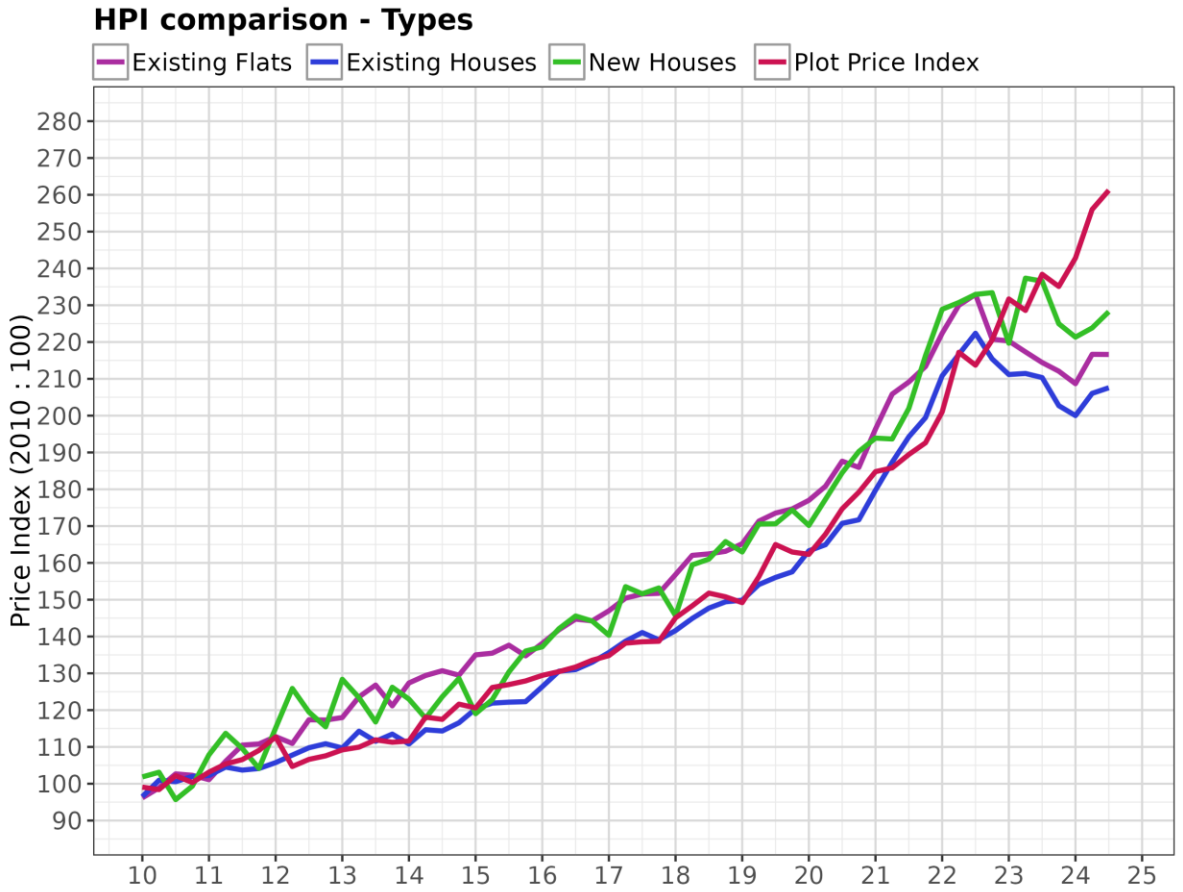
No turning point for land





Sample composition changed significantly after interest rate changes after mid-2022.

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Decomposition

Econometric decomposition

- Several approaches exist in the literature for the decomposition of property prices into land and structure components.

- Focus of this study on econometric (or hedonic regression) approach – “Builder’s model”:

$$p_i^t = \left(\sum_{s=1}^{T} \alpha^s Time_{i,s}^t \right) L_i^t + \left(\sum_{s=1}^{T} \beta^s Time_{i,s}^t \right) S_i^t + u_i^t,$$

which explains the price of property i in period t, p_i^t, by the land area, L_i^t, the structure area S_i^t,and the transaction period $Time_{i,s}^t$.

- For increased comparability of land price index and to simplify the model we focused on detached houses.

Model specifications (1)

1. **Base model** for decomposition:

$$p_i^t = \left(\sum_{s=1}^{36} \alpha^s Time_{i,s}^t\right)\left(\sum_{j=1}^{35} \theta_j Region_{i,j}^t\right)\left(\sum_{k=1}^{5} \gamma_k Distance_{i,k}^t\right)\left(\sum_{l=1}^{8} \kappa_l Transport_{i,l}^t\right) L_i^t + \left(\sum_{s=1}^{36} \beta^s Time_{i,s}^t\right)\left(\sum_{m=1}^{9} \varphi_m Province_{i,m}^t\right)(1-\delta)^{A_i^t} S_i^t + u_i^t$$

- Regression model must be estimated by non-linear least squares
- Estimations might suffer from multicollinearity between structure and land area

Model specifications (2)

2. **Builder's model, common form in literature**
   - Parameter for structurecomponent, β^t,in base model replaced with exogenous construction output prices → Estimates for land component

3. **Model with exogenous land price index**
   - Parameter for land component, α^t, in base model replaced with experimental land price index→ Estimates for structure component

4. **Normalized model** following Gong and de Haan (2018)
   - Division of both sides of the base model by the land area → Estimates for both land and structure component; no exogenous data required

Estimation approaches

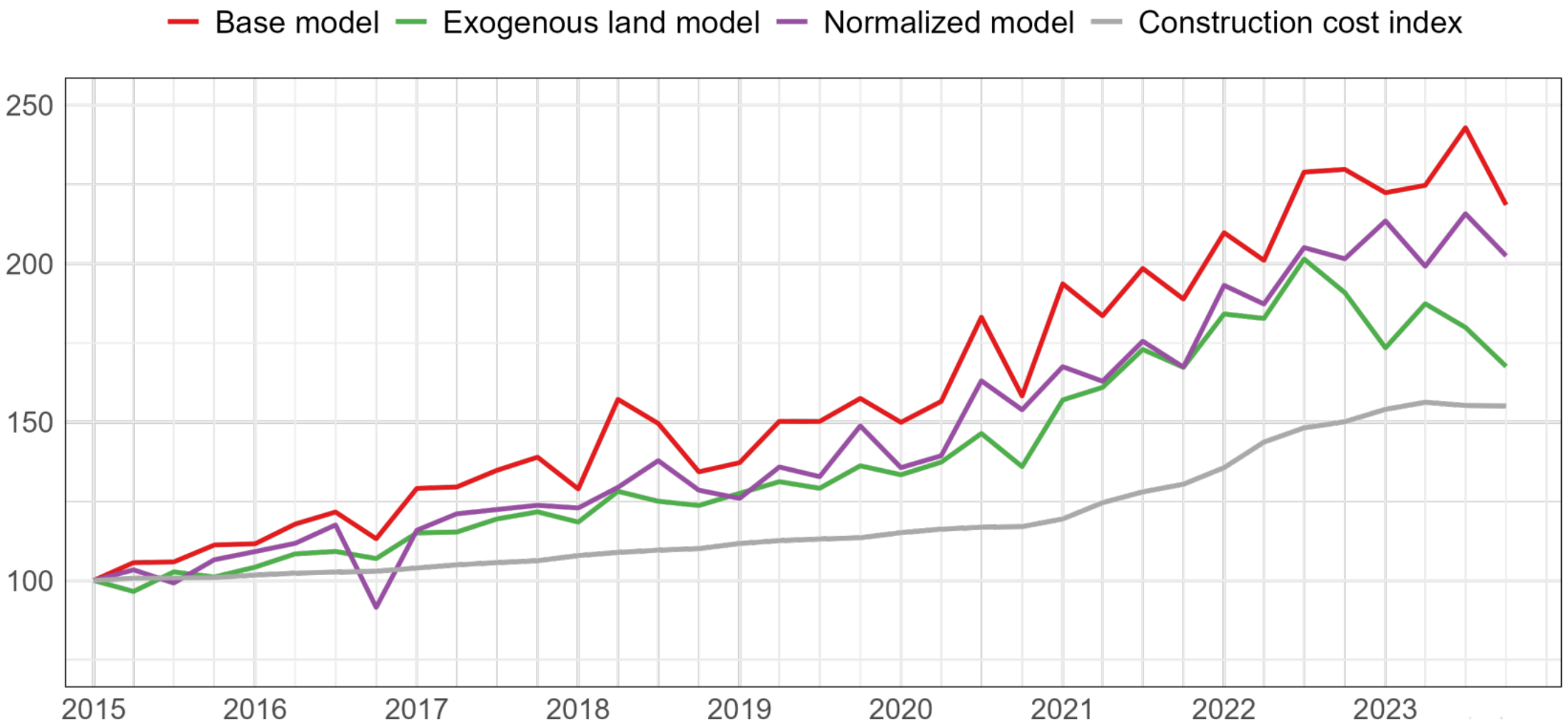
Estimation of each model over a full time window for:

1. **Quarterly transactions of detached houses**

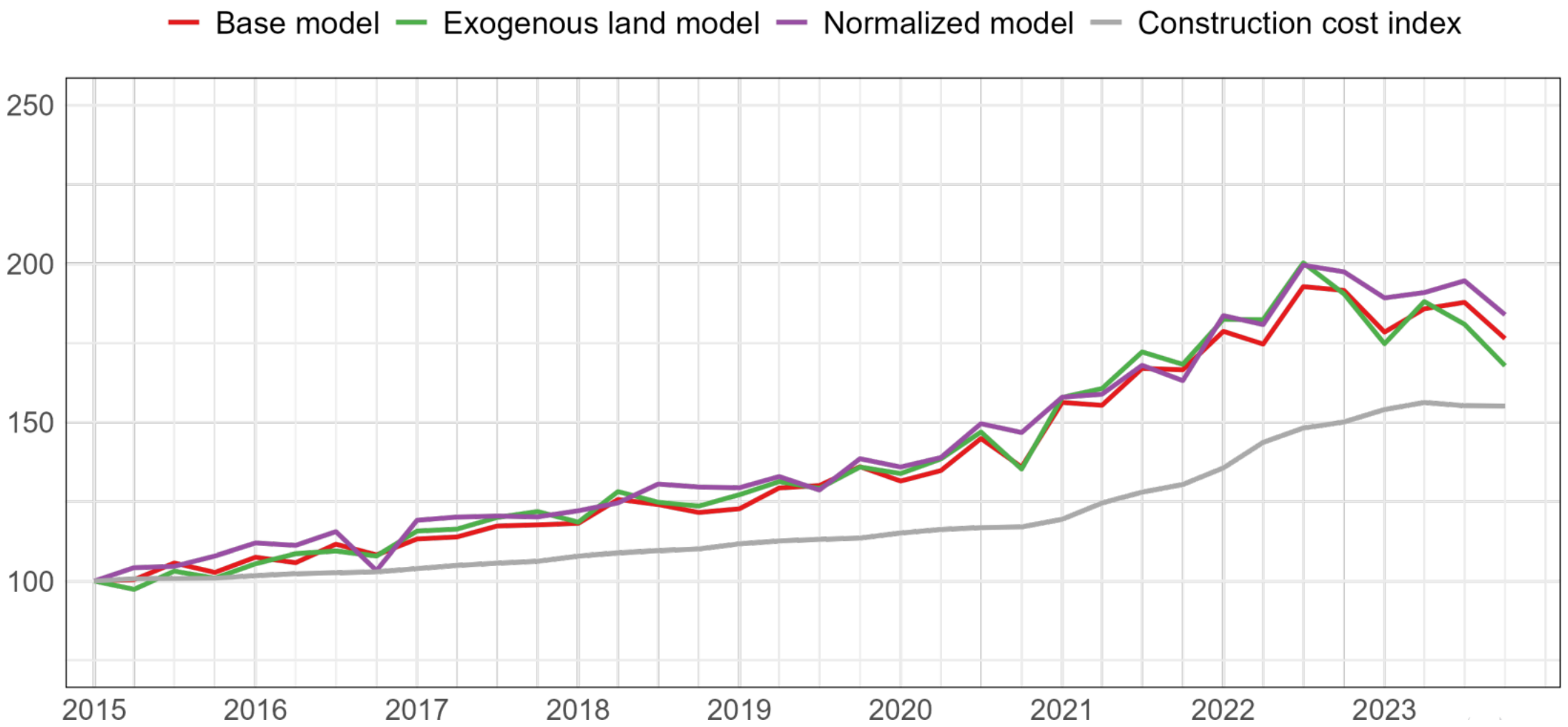
2. **Quarterly transactions of detached houses and plots of land**
   - For land transactions, structure area and age set to zero in regression

3. **Monthly transactions of detached houses and plots of land**
   - Dummy variables for quarters replaced with dummy variables for months in regression

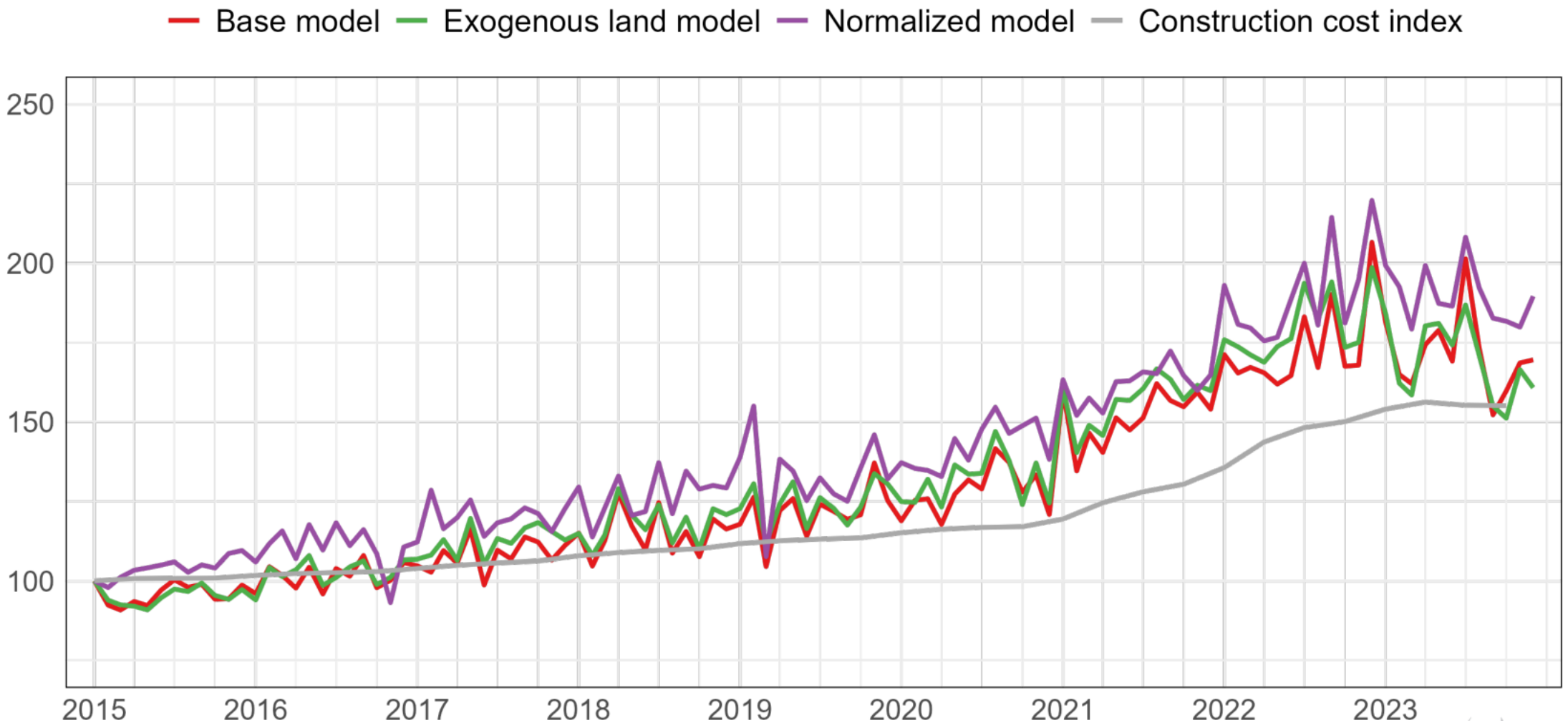
Quarterly structure component estimated from transactions of detached houses



Quarterly structure component estimated from transactions of detached houses and plots



Monthly structure component estimated from transactions of detached houses and plots



Main findings

- Empirical findings generally in line with expectations/existing literature.
  - Estimates for the depreciation rate around 1.5% per year
  - Estimates for the quality-adjusted land and structure price indices show strong increases in the period from 2015 to 2023
- Estimates for the two components sensitive to model specification.
  - Inclusion of pure land transactions in the regression improved/stabilized estimation

Next steps

Further research needed on the estimation approach:

- Number of transactions seems sufficient for a monthly decomposition (estimation based on a rolling time window)
- Dummy variables for the time periods, however, result in highly volatile price indices, not reflecting the price changes from one period to the next correctly
- Smoothening techniques (e.g., Rambaldi et al., 2015, with an application of the Kalman filter) could provide a solution

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