Regional Housing Market Connectivity and the Transmission of Macroeconomic Policies

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Motivation

- Knowledge of the structure and intensity of house price connectivity allows:

  1. Prediction of systemic risk exposures by identifying central or influential regions within a national housing network (Antonakakis et al., 2018).

  2. Investment and risk management decisions (e.g. optimizing regional portfolio diversification (Schindler, 2014)).

  3. Targeted policy interventions (e.g. lending criteria adjustments (Goodhart and Hofmann, 2008)).

- Long-standing discussion about the spatial economic disparities that characterize the UK economy (e.g. Stansbury et al. (2023)) and the ripple effect from London housing market to the rest of the country.

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- What is the role of each region within the UK housing network (transmitters vs receivers)?
- Is regional housing connectivity related to the house price cycle?
- Does housing connectivity align with regional synchronization of economic cycles?
- Does the transmission of national-level policy shocks vary with the degree of housing market connectedness?

UK Regions


Scotland
Northern Ireland
North East
Yorkshire & the Humber
North West
East Midlands
Wales
East
West Midlands
London
South West
South East

Methodology: Measuring Connectivity

- The bivariate VAR model is specified as follows:

$$y_{it} = \alpha_i + \sum_{k=1}^{p} \phi_{1k} y_{i,t-k} + \sum_{k=1}^{p} \phi_{2k} y_{j,t-k} + \varepsilon_{it},$$
$$y_{jt} = \alpha_j + \sum_{k=1}^{p} \psi_{1k} y_{i,t-k} + \sum_{k=1}^{p} \psi_{2k} y_{j,t-k} + \varepsilon_{jt},$$

  y_{it} and y_{jt} represent the growth rates of real house prices in regions i and j at time t.

- Time-varying Granger-causality test (Shi et al., 2018) based on a recursive evolving window algorithm that

  1. ensures robustness to structural breaks and volatility clustering.
  2. captures temporal variations in market connectivity (”real time” detection).
  3. Does not require identification of price shocks.

Connectivity Indices

The Granger causality statistics are calculated as follows:

$$SW_{i\to j}(t) = \max_{t_1\in[1,t-t_0+1]} W_{i\to j}(t_1,t), \quad \text{and} \quad SW_{j\to i}(t) = \max_{t_1\in[1,t-t_0+1]} W_{j\to i}(t_1,t),$$

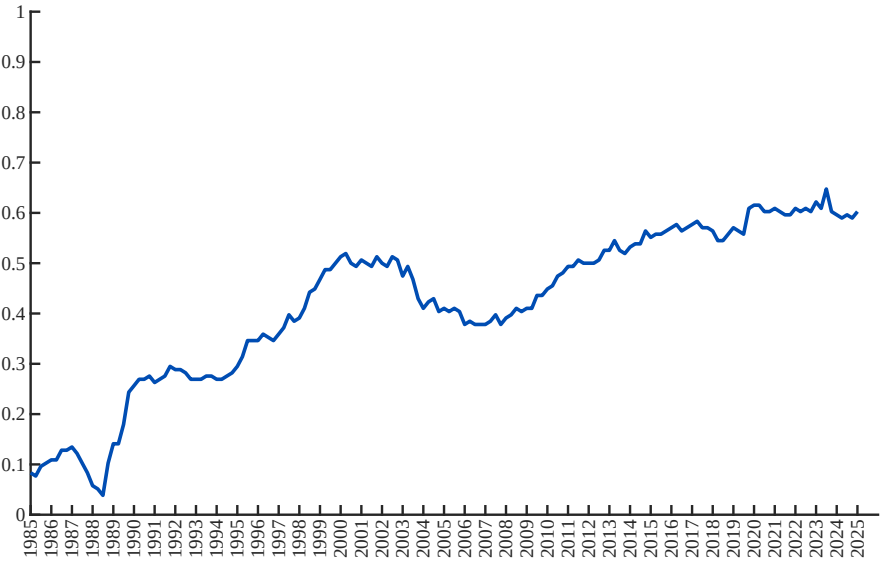
where t_0 is the minimum window size, and $W_{i\to j}(t_1,t)$ and $W_{j\to i}(t_1,t)$ are the Wald statistics for the sub-sample from t_1 to t.

Indicator $G_{i\to j}(t)$ takes value 1 if $SW_{i\to j}(t)$ is greater than 5% bootstrapped critical value

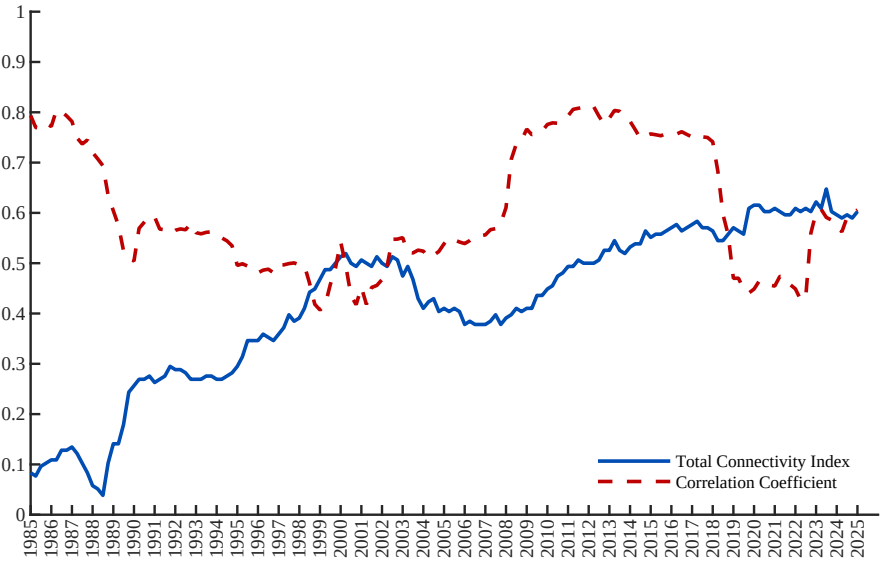
Total Connectivity Index (TCI)

$$TCI_i(t) = \frac{\sum_{i=1,i\neq j}^{N}\sum_{j=1}^{N} G_{i\to j}(t)}{N(N-1)}$$

Total Connectivity Index (TCI)



TCI and Correlation Coefficient



The Role of Regions

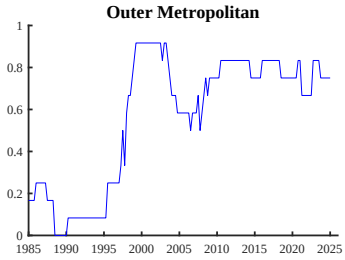
- Centrality Index (CI):

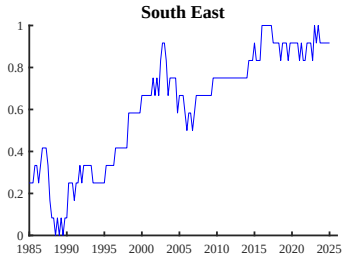
$$CI_i(t) = \frac{\sum_{j=1, j\neq i}^{N} G_{i\to j}(t)}{N-1}.$$

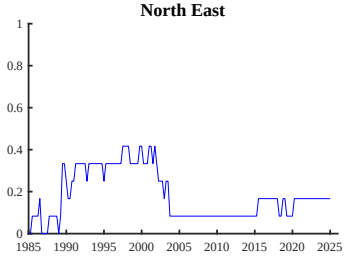
- Fragility Index (FI):

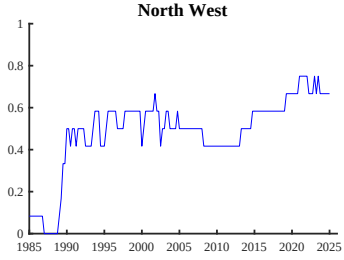
$$FI_i(t) = \frac{\sum_{j=1, j\neq i}^{N} G_{j\to i}(t)}{N-1}.$$

The Role of Regions: Centrality Index

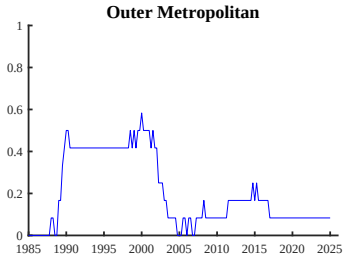


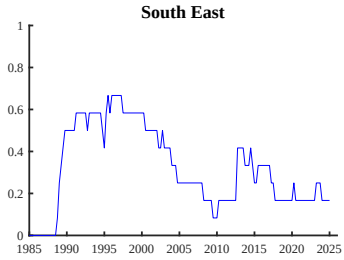


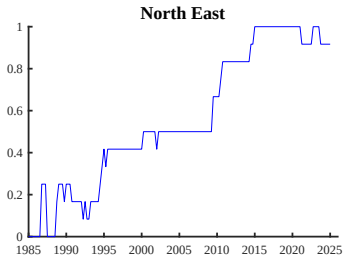


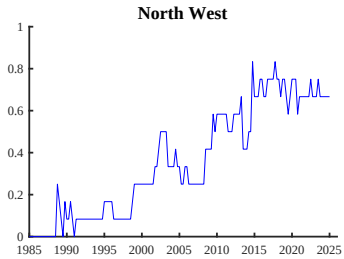


The role of regions: Fragility index





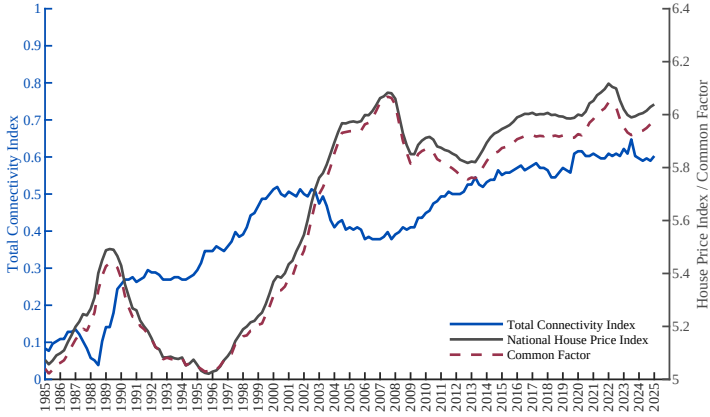




Cyclicality and Housing Market Connectivity

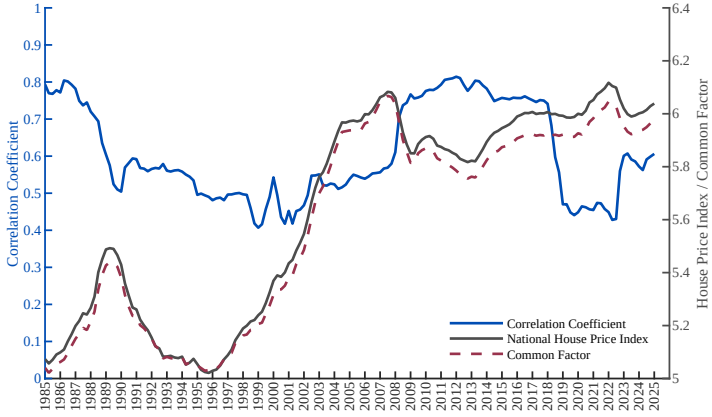
- Pro-cyclical: Markets are more connected when real house prices increase.
- Counter-cyclical: Markets are more closely related to each other during market downturns. In housing slumps, cross-regional interdependencies can magnify price declines.
  - From a policy standpoint, the tendency for market linkages to strengthen when conditions deteriorate is worrisome, as it raises systemic fragility precisely when valuations are already falling.
- A-cyclical: strength of the connection not systematically related to house prices.

Cyclicality and Housing Market Connectivity



	Corr($TCI^{HP\ cycle}$, $f_t^{HP\ cycle}$)	**Corr**($TCI^{HP\ cycle}$, $HP_t^{HP\ cycle}$)
United Kingdom	-0.1754**	-0.1734**

Cyclicality and Housing Market Connectivity



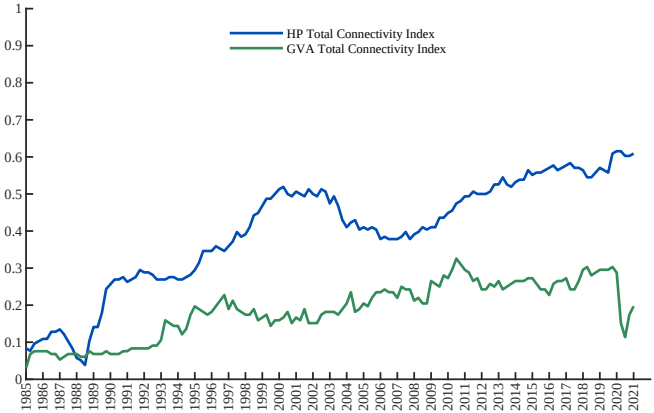
	Corr(ΔCC_t, Δf_t)	**Corr(ΔCC_t, ΔHP_t)**
United Kingdom	-0.1971**	-0.1701**

Economic Activity and Connectivity

- Is house price connectivity related to the degree of regional synchronization observed in economic cycles?

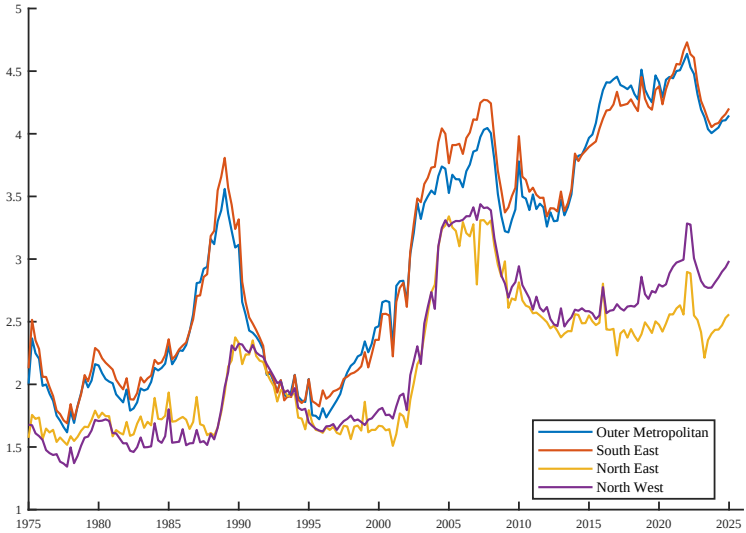
- We use the same Granger causality approach to identify the evolution of connectivity within regional economic activity interdependence over time.

Economic Activity and Connectivity



	Corr($\Delta TCI_t^{HP}, \Delta TCI_t^{GVA}$)	**Corr**($TCI_t^{HP\ cycle}, TCI_t^{GVA\ cycle}$)
United Kingdom	0.0446	-0.0121

Economic Activity and Connectivity



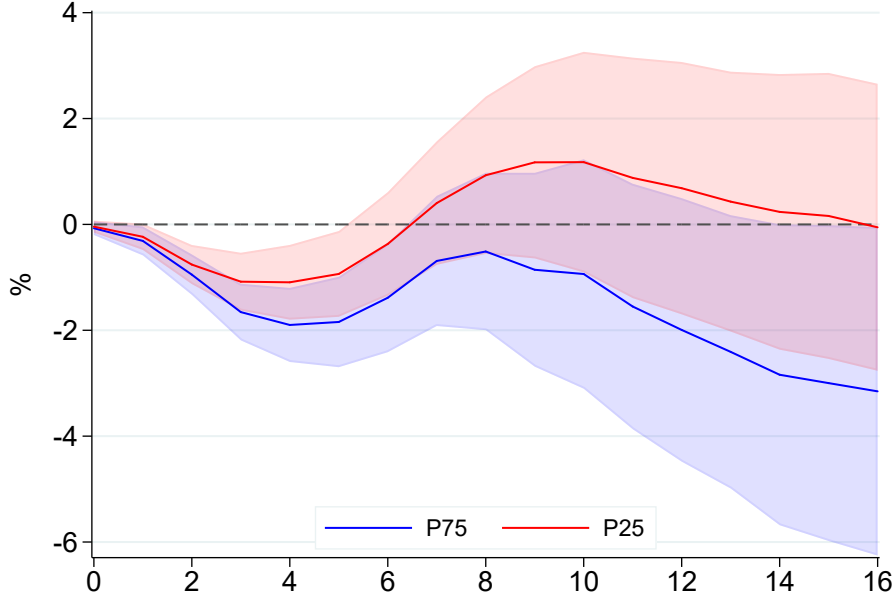
Connectivity and the transmission of macro policies

- Empirical Specification (Local Projection):

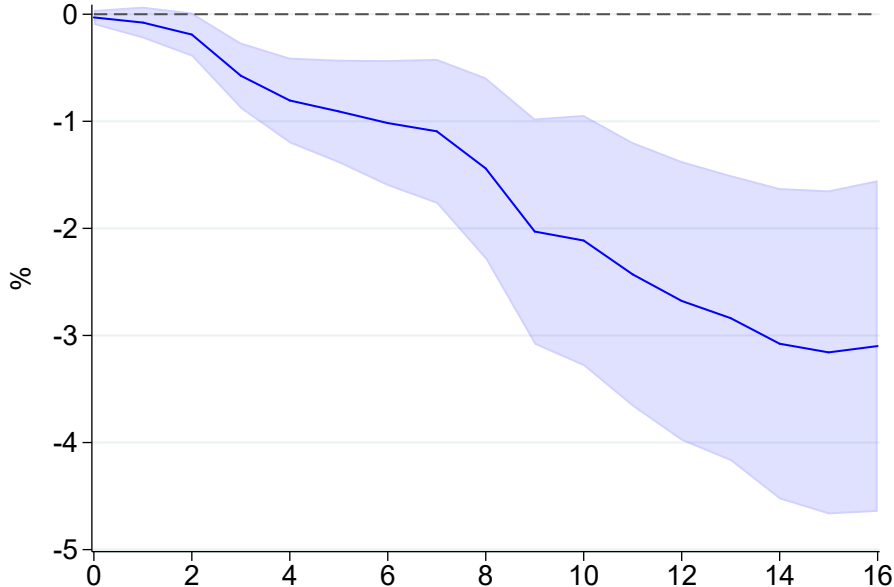
$$\Delta^h y_{t+h} = \alpha_h + \beta_{1,h}\text{shock}_t + \beta_{2,h}\text{shock}_t \times \text{connectivity}_t^{high} + \sum_{\ell=0}^{L} \Gamma_{h,\ell} X_{t-\ell} + \varepsilon_{t+h}$$

- Monetary policy (MP) shocks: IV high-frequency identification (Braun et al., 2025).
- Macroprudential policy (MaPP) shocks: Narrative identification (Fernández-Gallardo and Payá, 2025).
- Measures of the state of connectivity:
  - Growth rate and cyclical component percentiles.
  - High vs. Low: HP trend or median.

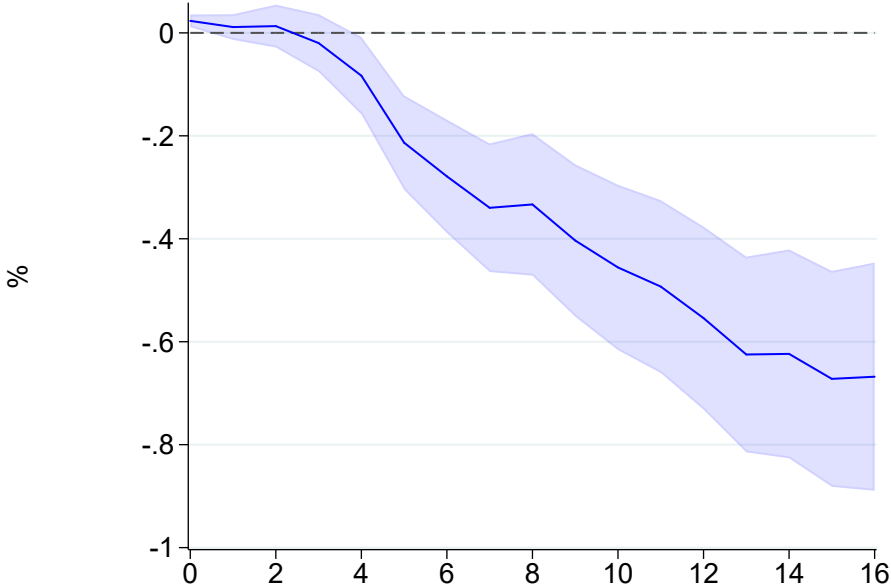
HP response to MP shocks



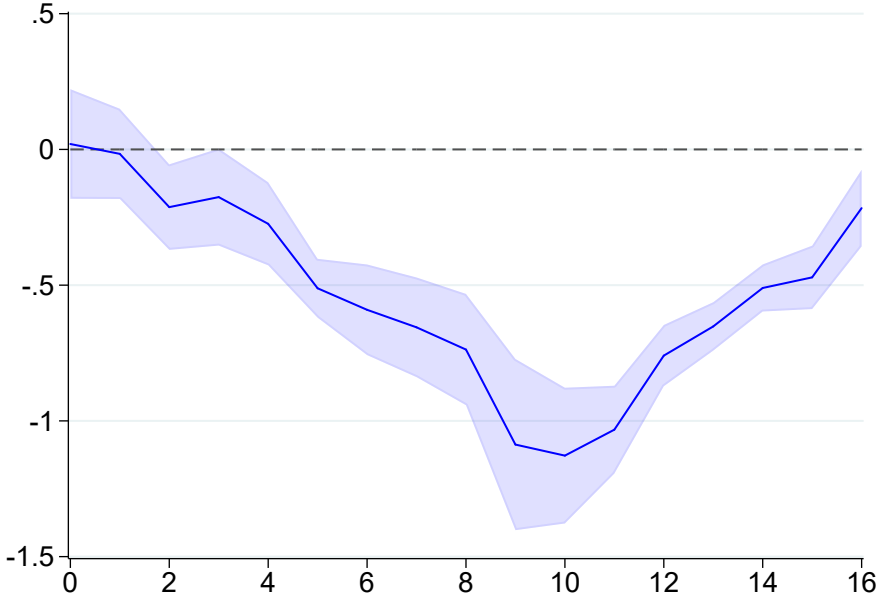
HP response to MP shocks



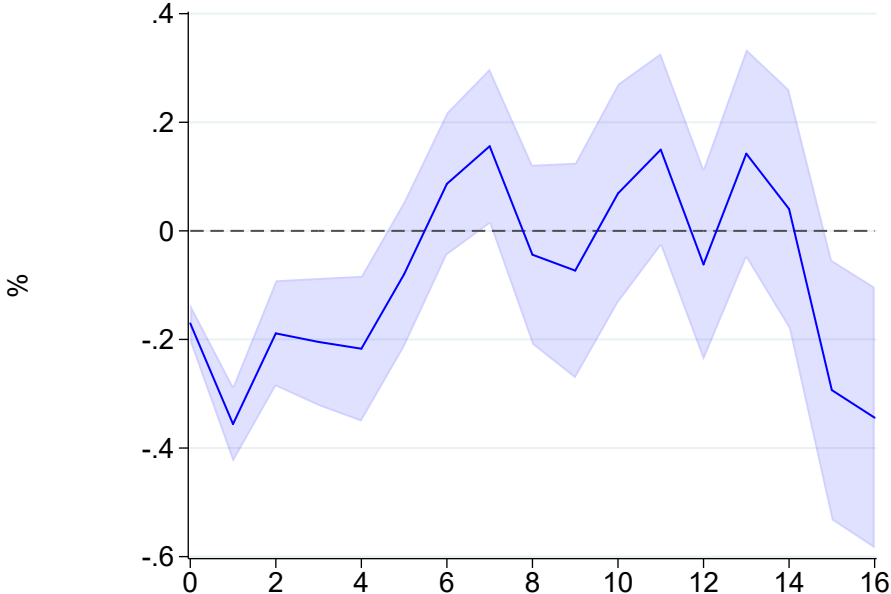
HP response to MaPP shocks



CISS response to MaPP shocks



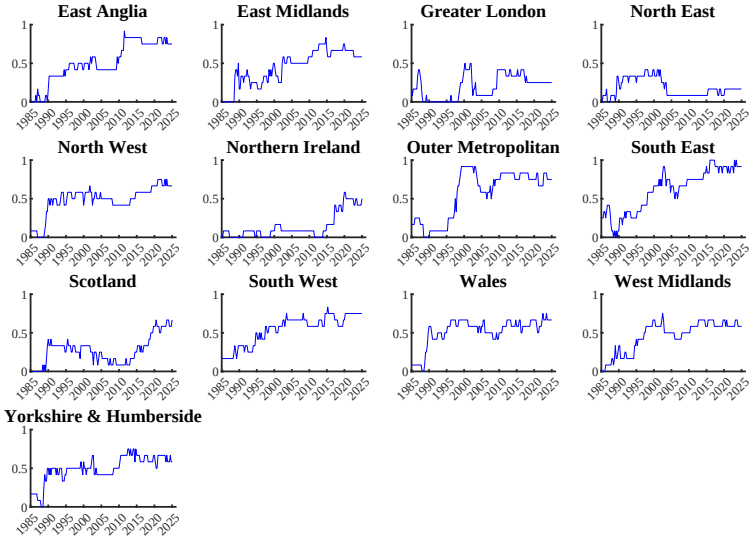
Credit response to MaPP shocks



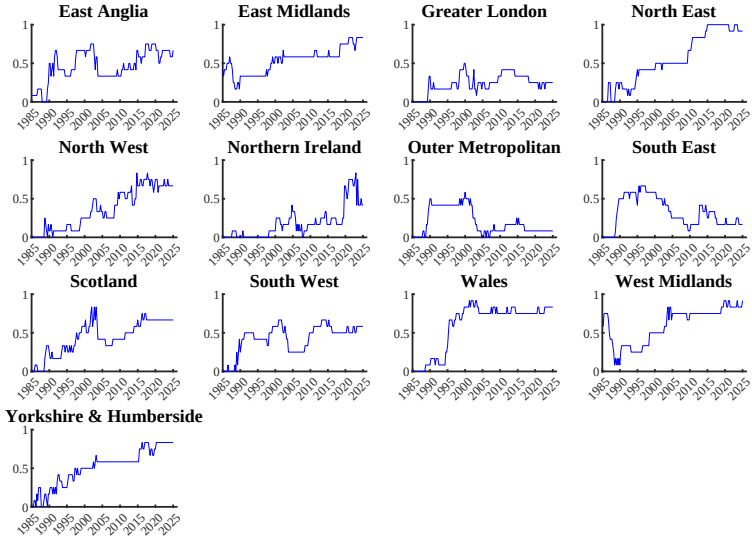
Main takeaways

- The trend in TCI suggests a growing potential for shock transmission across regional markets, which may heighten systemic risks.
- A persistent spatial asymmetry in the direction of price spillovers.
- Housing market connectivity is counter-cyclical: Markets are more closely related to each other during market downturns. In housing slumps, cross-regional interdependencies can magnify price declines.
- While house price shocks tend to propagate geographically, income dynamics remain largely regional and disconnected, leading to uneven housing affordability pressures across the UK.
- High housing market interconnectedness can enhance the effectiveness of tightening macroeconomic policies.

The role of regions: Centrality Index



The role of regions: Fragility index



GDP response to MP shocks