An Anatomy of the 2022 Gilt Market Crisis

Gabor Pintér (BoE)

EEA 2023

28 Aug 2023

The views expressed are those of the author and not necessarily those of the Bank of England or its committees.

Introduction

'It was not quite a Lehman moment. But it got close.'
(Sep 2022, Senior London-based banker)

Contribution and Data

- Contribution:
  - Detailed account of a liquidity crisis through the joint analysis government bond, repo and swap markets
  - Identify individual clients sharpens the analysis (compared to Falato, Goldstein, and Hortacsu (2021); O'Hara and Zhou (2021); Kargar, Lester, Lindsay, Liu,Weill, and Zuniga (2021); Haddad, Moreira, and Muir (2021); Ma, Xiao, and Zeng (2022) among others)

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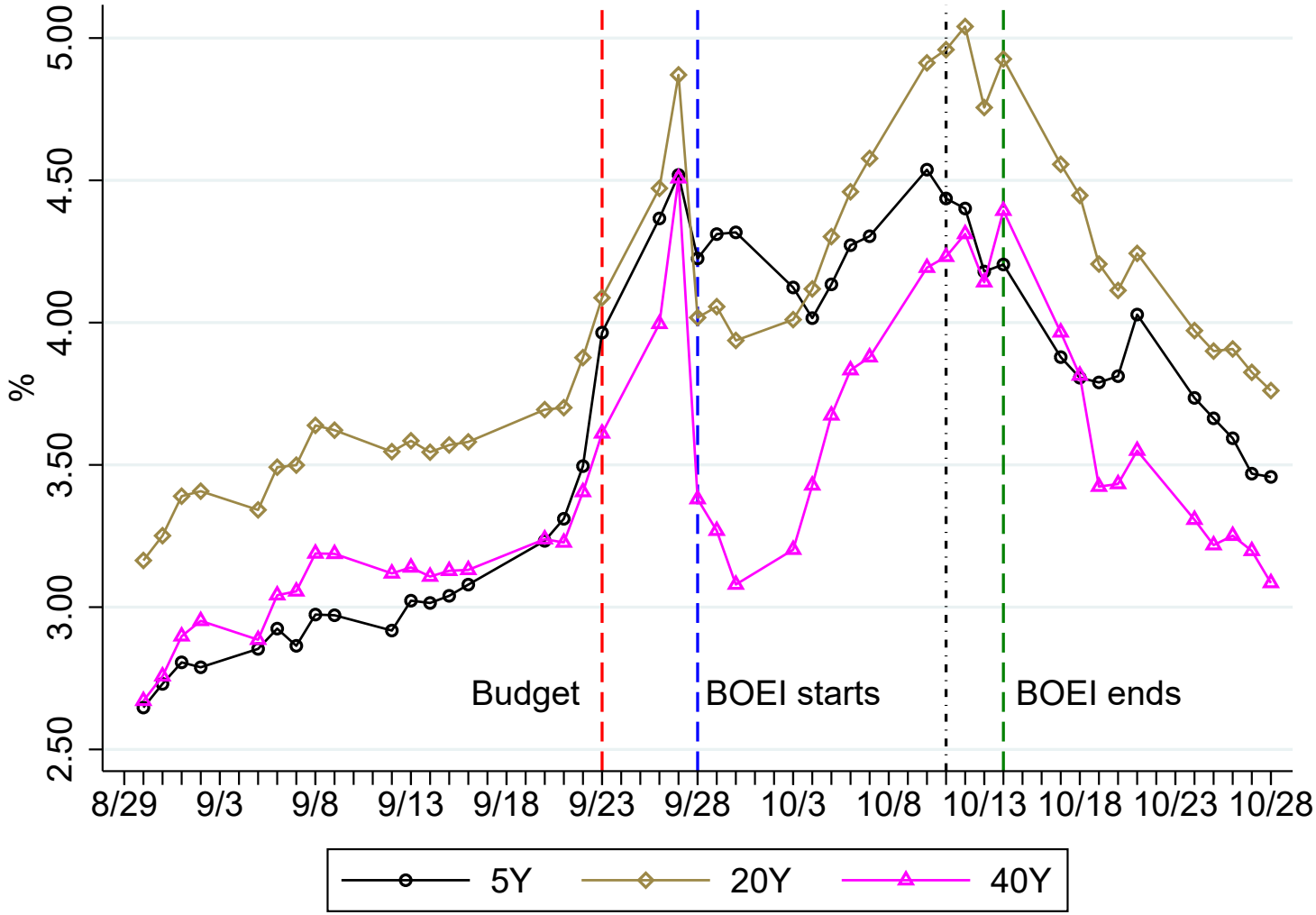
- Datasets:
  - Government Bond Market: all secondary market trades from the MIFID II dataset
  - Repo Market: Sterling Money Market Data (SMMD), a proprietary dataset of the Bank of England
  - Inflation and Interest Rate Swaps: EMIR TR data
    - Legal Entity Identifiers (LEIs) allows a consistent merge across these markets

Overview

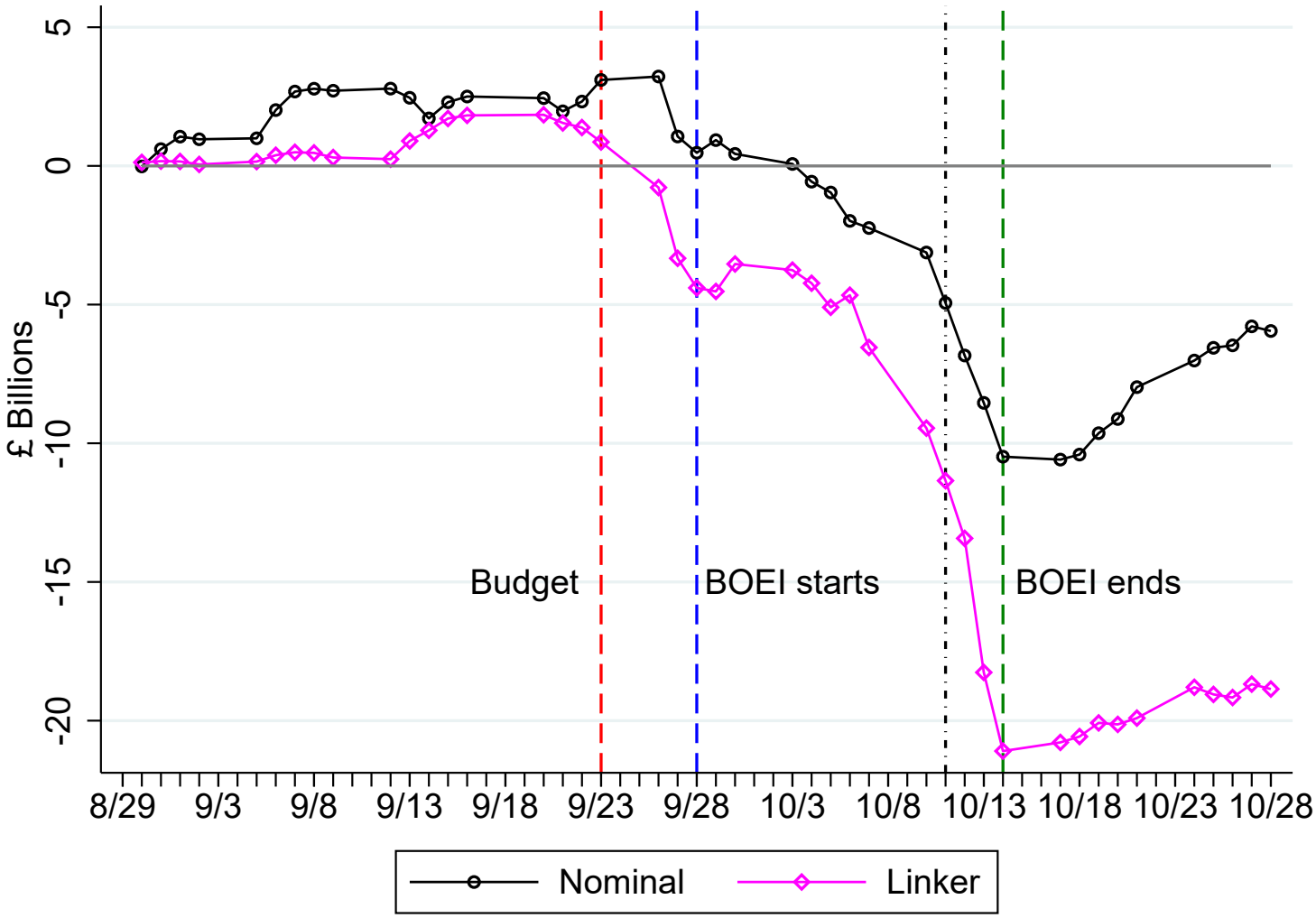
- Extreme stress in gilt markets during 23 Sep – 14 Oct 2022
- At its centre: highly leveraged, liability-driven investment (LDI) strategies of certain pension funds and asset managers
- Sudden worsening of repo and swap positions (collateral and margin calls) forced them to quickly liquidate gilts for cash.
- Selling pressures and market illiquidity $\longrightarrow$ yield spikes and extreme orderflows $\longrightarrow$ Bank of England intervention within days to restore market functioning (Breeden, 2022; Hauser, 2022).

Nominal Yields

5Y, 20Y, 40Y Maturities



Gilt Sales by the LDI Sector



Liability-Driven Investment

Liability Hedging

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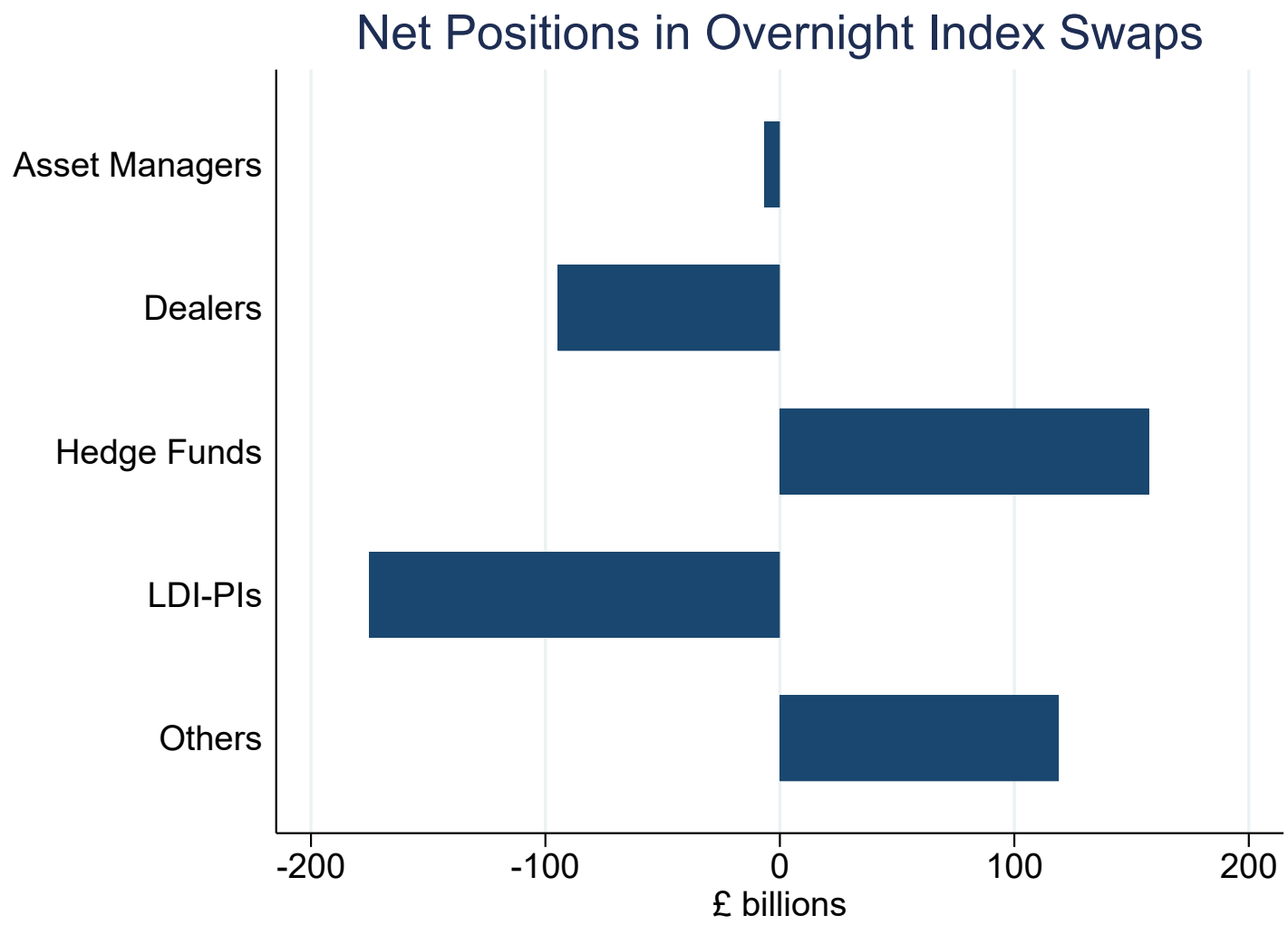
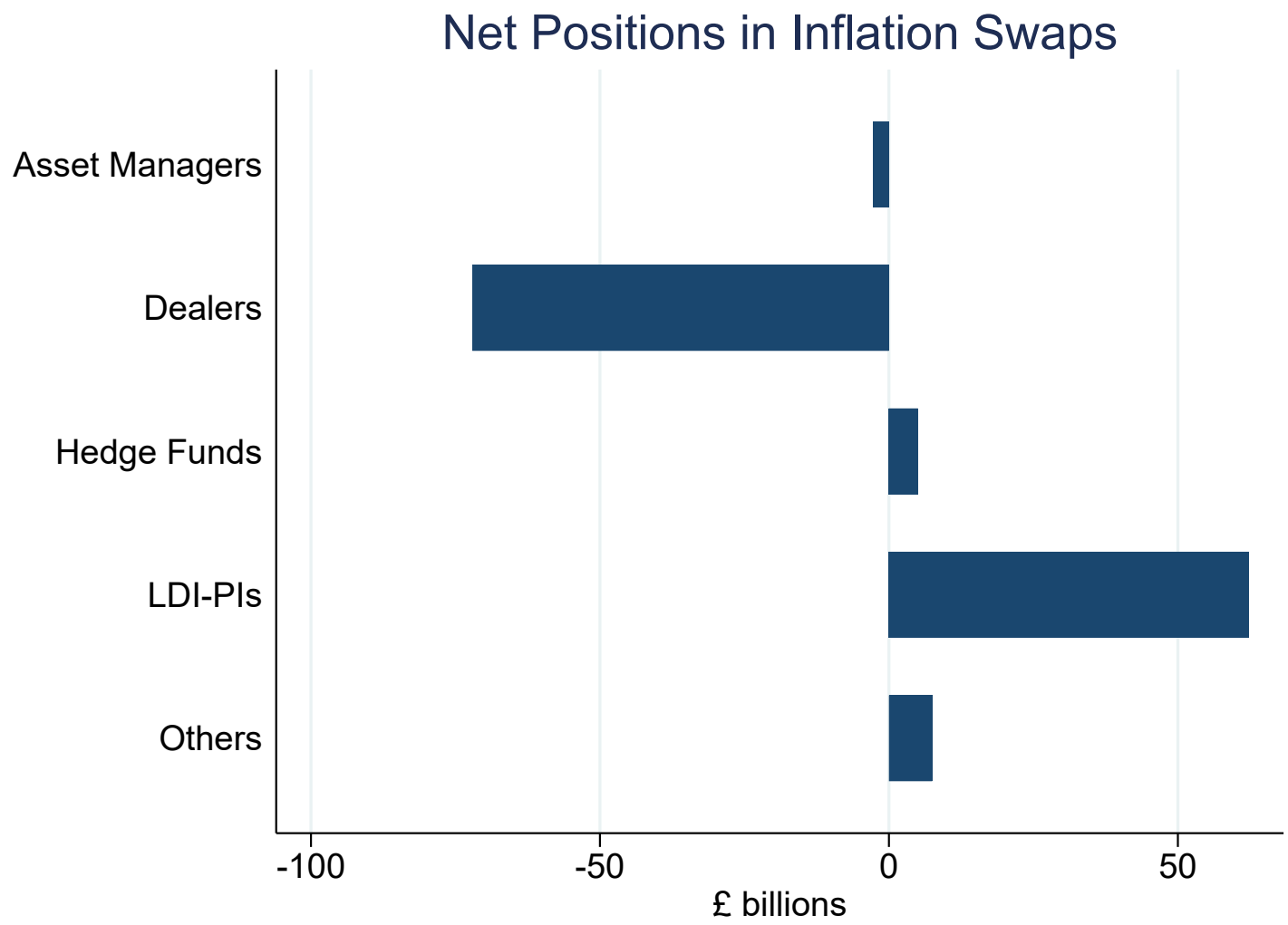
Net Positions in the OIS Market (22 Sep, 2022)

LDIs are the largest payer of floaters



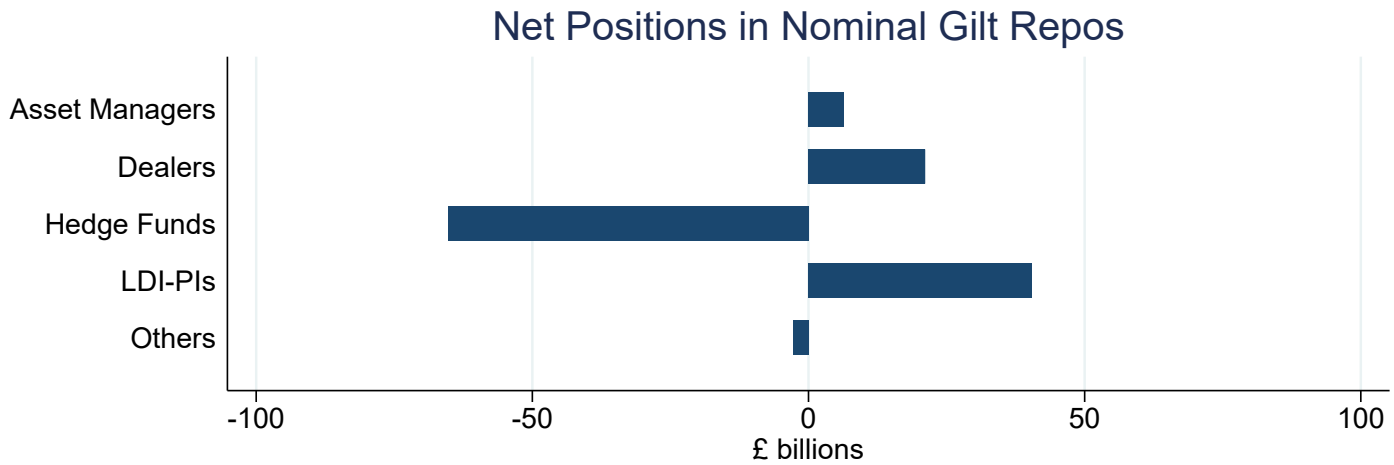
Net Positions in the Inflation-swap Market (22 Sep, 2022)

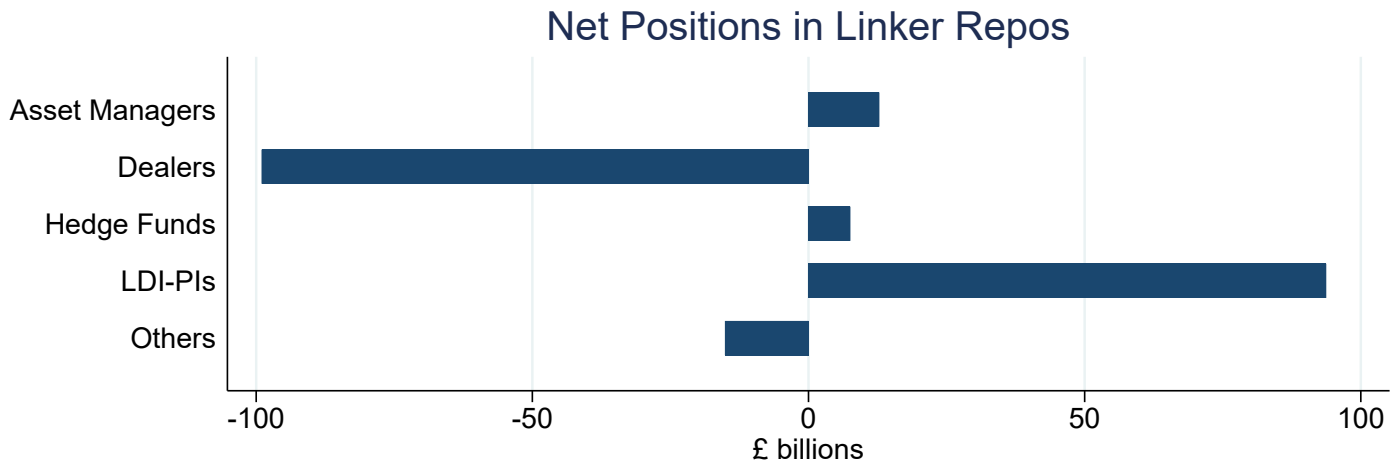
LDIs are the largest buyer of inflation



Net Positions in the Repo Market (22 Sep, 2022)

LDIs are the largest borrowers

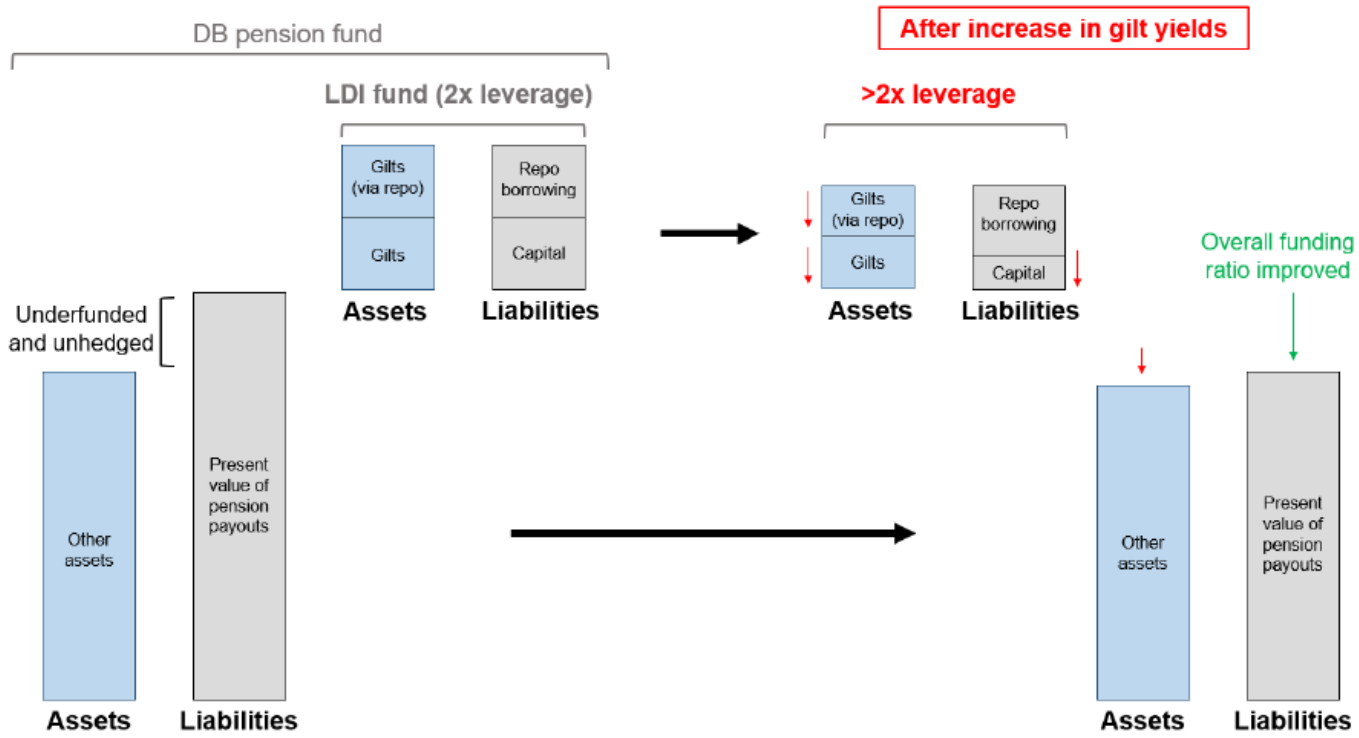




Liability-Driven Investment

Leverage (Cunliffe, 2022)

Diagram 1: Illustrative change in assets and liabilities for a DB pension fund using LDI to hedge its liabilities, with impact of an increase in long-term gilt yields

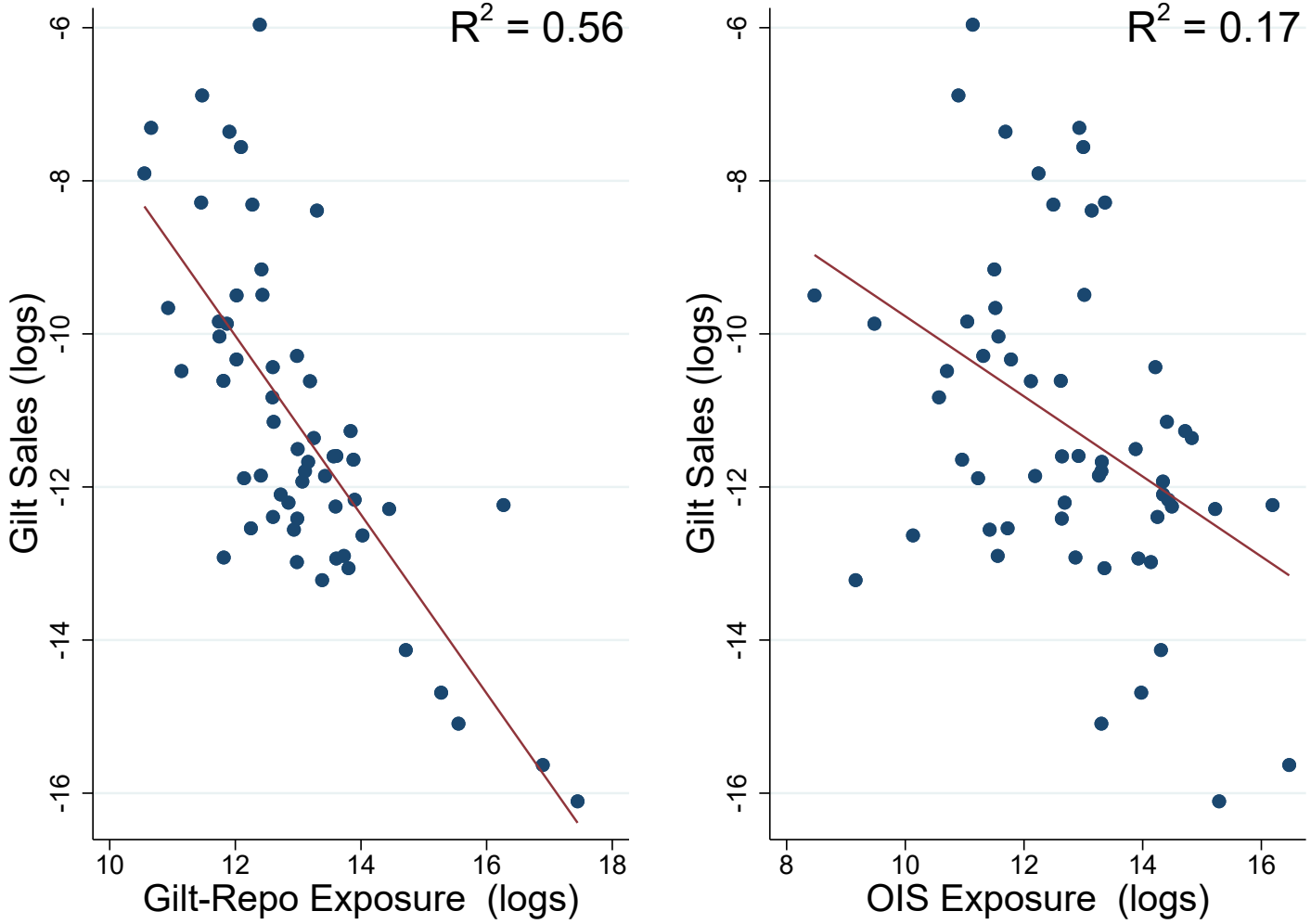


Source: Bank of England

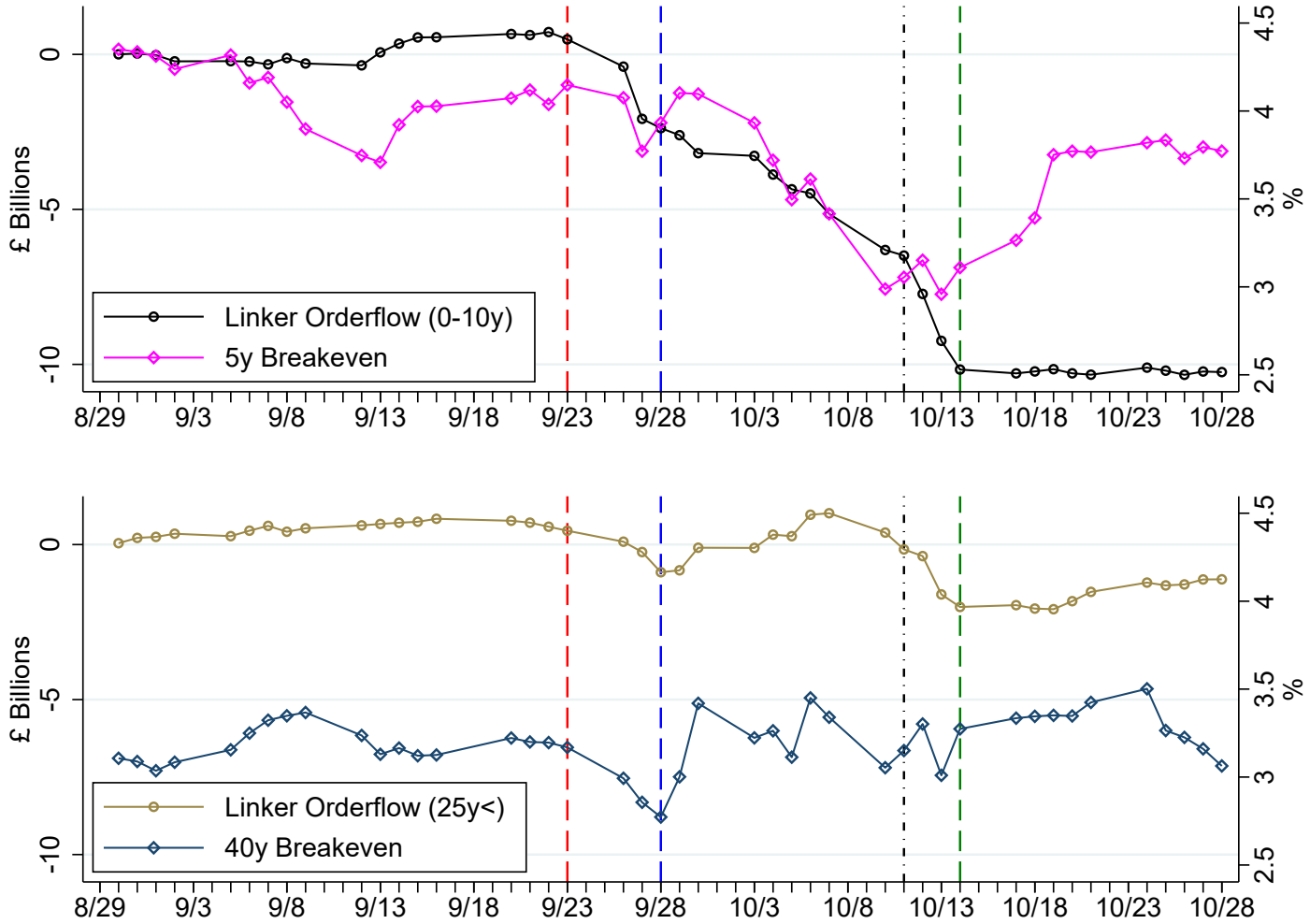
6 Main Results

1. Pre-crisis swap and repo positions of LDIs **predictive** of gilts sales
2. Selling pressure started in linkers (across **all** maturities) followed by nominals (**mid** maturities) $\longrightarrow$ consistent **price pressures**
3. **3 firms** generated over 70% of LDI gilt sales to dealers
4. Transaction **costs soared**
   - concentrated in smaller trade sizes, at smaller dealers, at clients other than LDIs ($\rightarrow$ illiquidity **spillovers**)
   - stronger **trading relationships** mitigated these cost hikes
5. Dispersion of transaction prices jumped (large price differentials **across dealers** $\leftrightarrow$ intermediation frictions)
6. Hedge funds **profited** greatly

Result 1: Role of Pre-crisis Funding Positions



Result 2: Evidence on Price Pressure



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Mispricing in UK Inflation Markets (Fleckenstein-Longstaff-Lustig, 2014)

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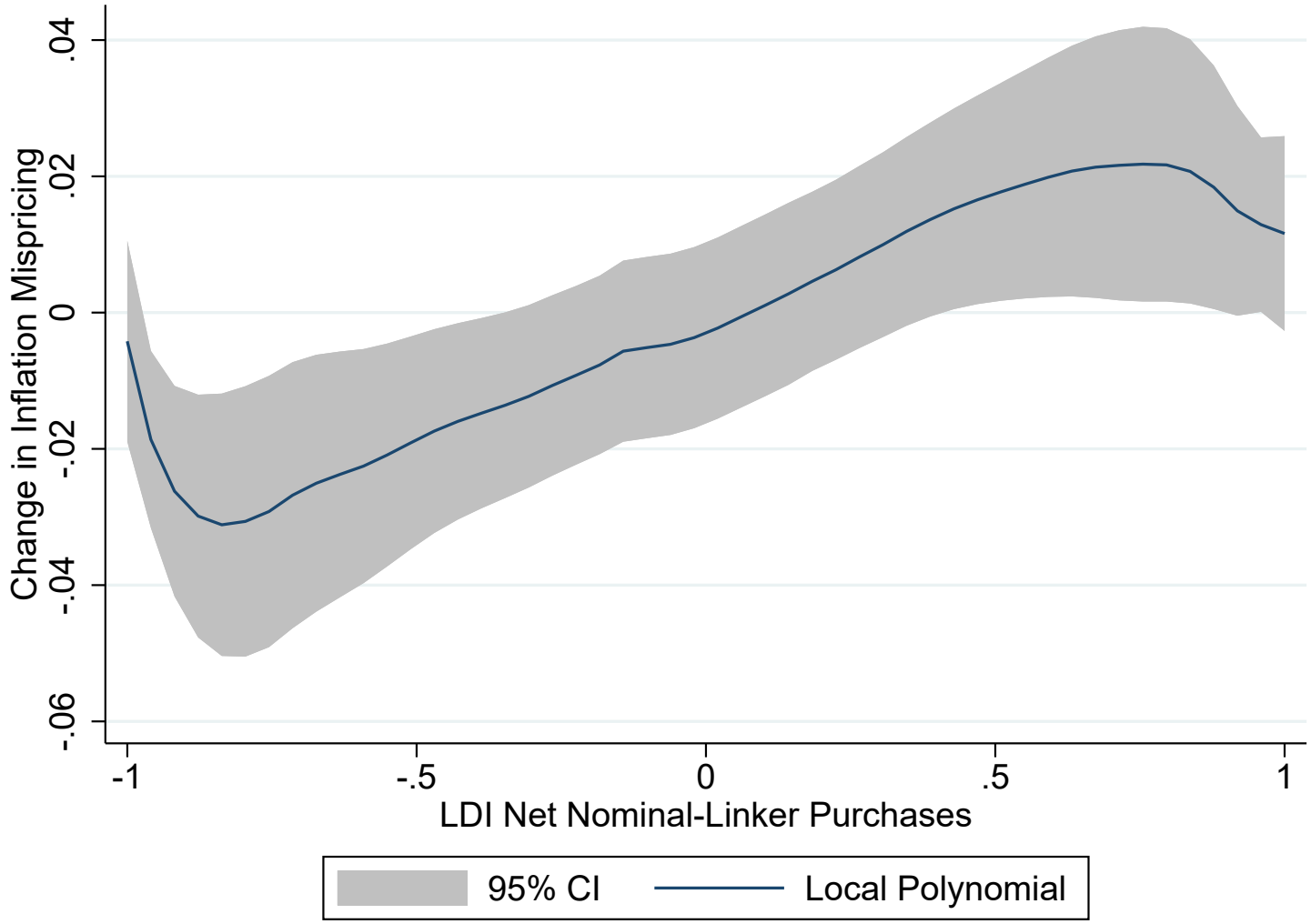
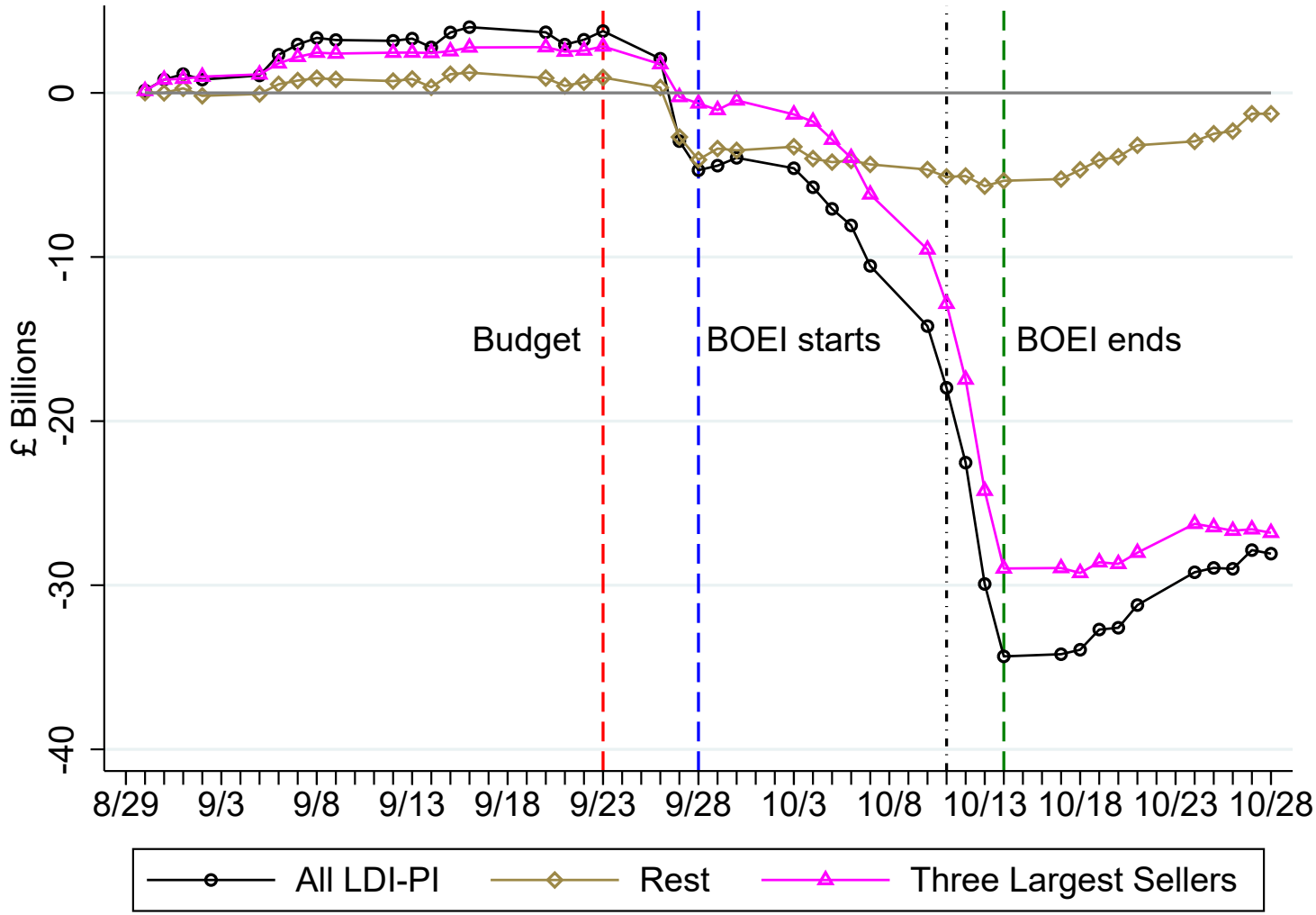
Mispricing in Inflation Markets (Barria-Pinter, 2023)



Result 3: A few large sellers

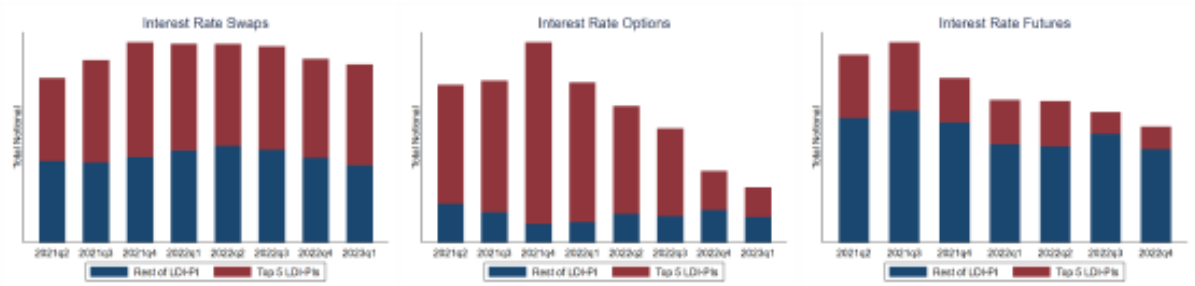


Concentration in UK Interest Rate Derivative Markets

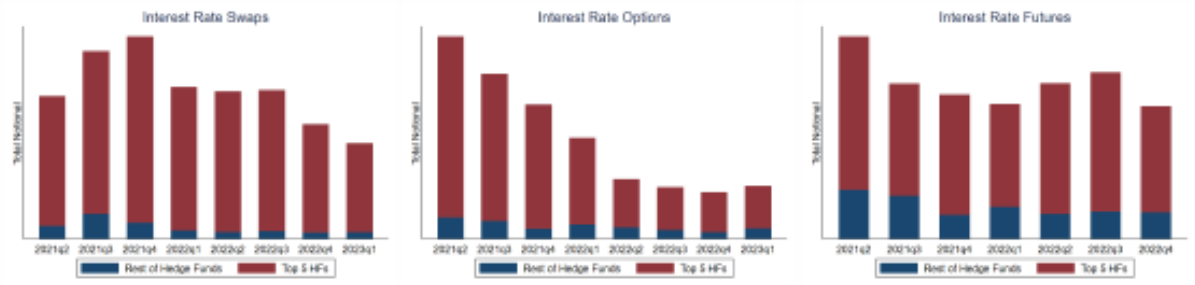
Pinter-Walker (2023)

Figure 11: Concentration in UK Interest Rate Derivatives Markets: Top 5 Notional vs Rest

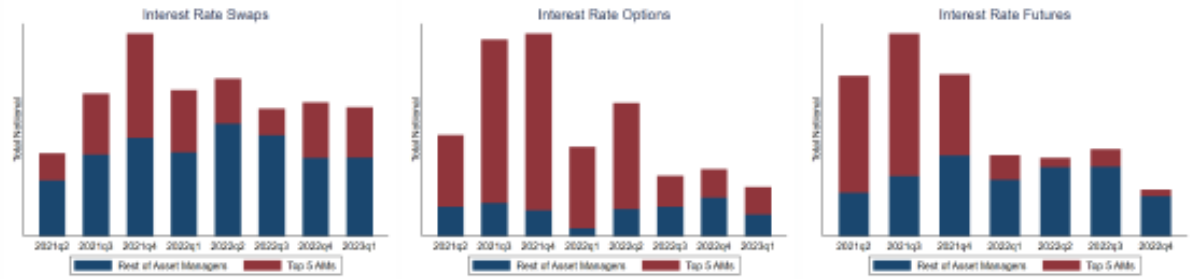
(a) LDI-PI



(b) Hedge Funds



(c) Asset Managers



Result 4: Transaction Cost Heterogeneity

Measurement

- Measuring transaction costs (O'Hara and Zhou (2021)) for each trade v:

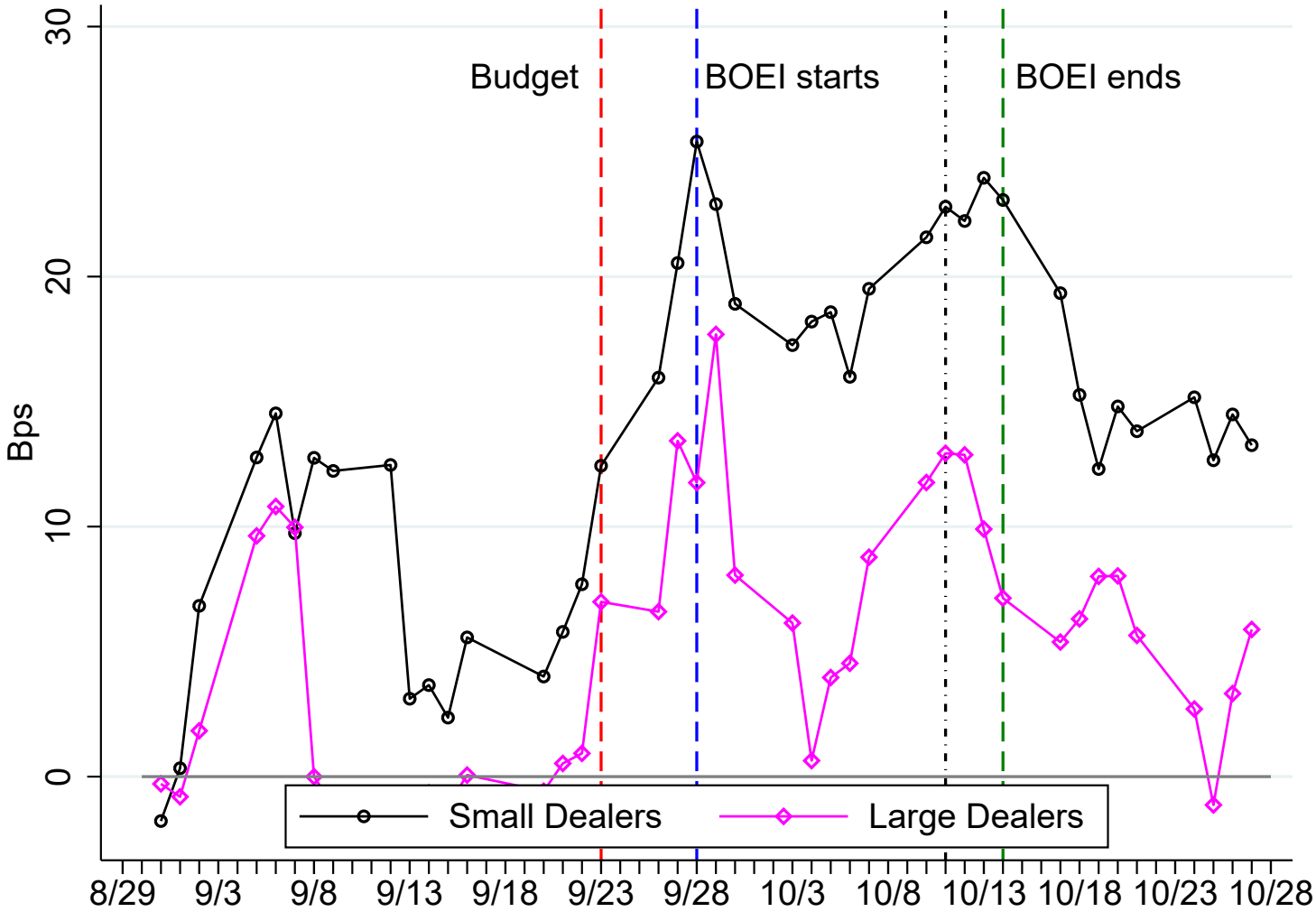
$$Cost_v = \left[\ln\left(P_v^\star\right) - \ln\left(\overline{P}\right)\right] \times \mathbf{1}_{B,S}, \tag{1.1}$$

where:

  - $P_v^\star$ is the transaction price,
  - $\mathbf{1}_{B,S}$ buy-sell indicator
  - $\overline{P}$ is a benchmark price (hourly quoted price from Datastream)

Result 4: Transaction Cost Heterogeneity

Small vs Large Dealers



Result 5: Dispersion of Transaction Prices

- Measuring total dispersion (Jankowitsch, Nashikkar, and Subrahmanyam (2011)) :

$$D_T = \sqrt{\frac{1}{N}\sum_{v}^{N}\left(\ln\left(P_v^{\star}\right) - \ln\left(\overline{P}\right)\right)^2}, \tag{1.2}$$

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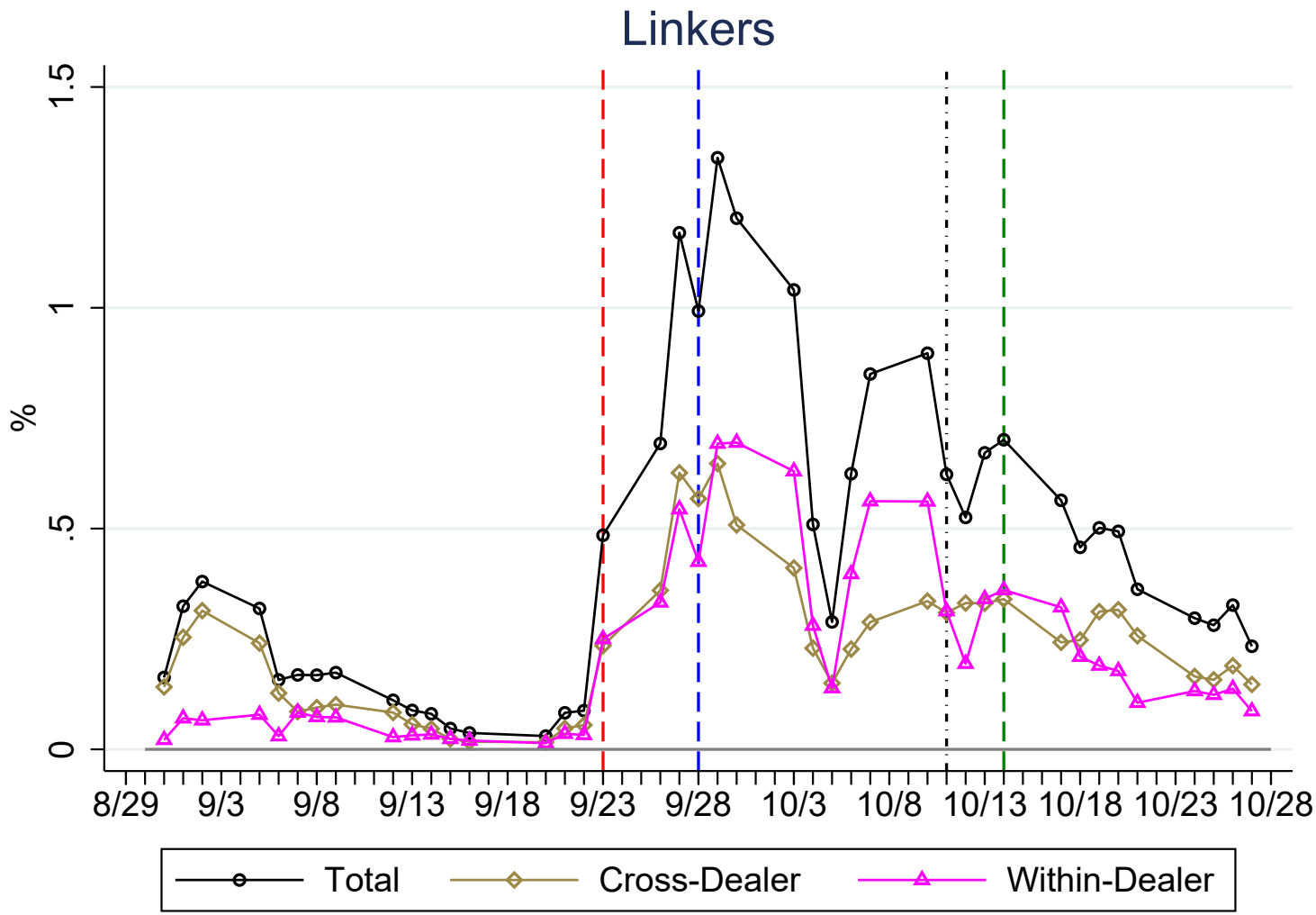
- The decomposition of total dispersion 1.2 is then written as:

$$D_T^2 = \underbrace{\frac{1}{N}\sum_{v}^{N}\left(\ln\left(P_v^{\star}\right) - \ln\left(\ddot{P}\right)\right)^2}_{within-dealer} + \underbrace{\frac{1}{N}\sum_{v}^{N}\left(\ln\left(\ddot{P}\right) - \ln\left(\overline{P}\right)\right)^2}_{cross-dealer}, \tag{1.3}$$

where $\ddot{P}$ is the average hourly transaction price at the dealer where trade v is executed.

Result 5: Heightened Dispersion of Transaction Prices



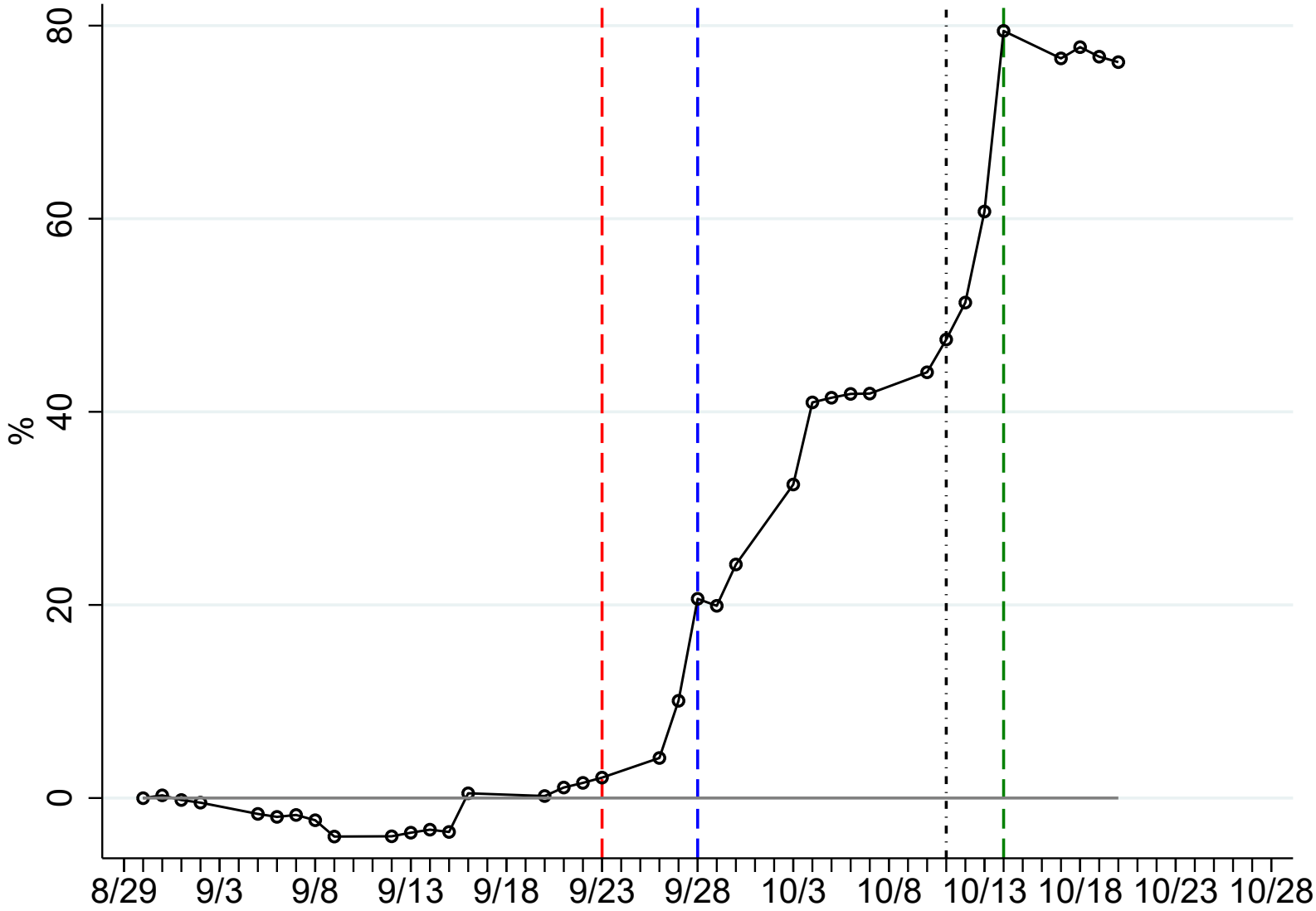
Result 6: Hedge Fund Returns - Measurement

- T-day-horizon return on each hedge fund trade on day t (Di Maggio, Franzoni, Kermani, and Sommavilla (2019)) for each trade j:

$$Performance_j^T = \left[\ln\left(P^T\right) - \ln\left(P_j^\star\right)\right] \times \mathbf{1}_{B,S}, \tag{1.4}$$

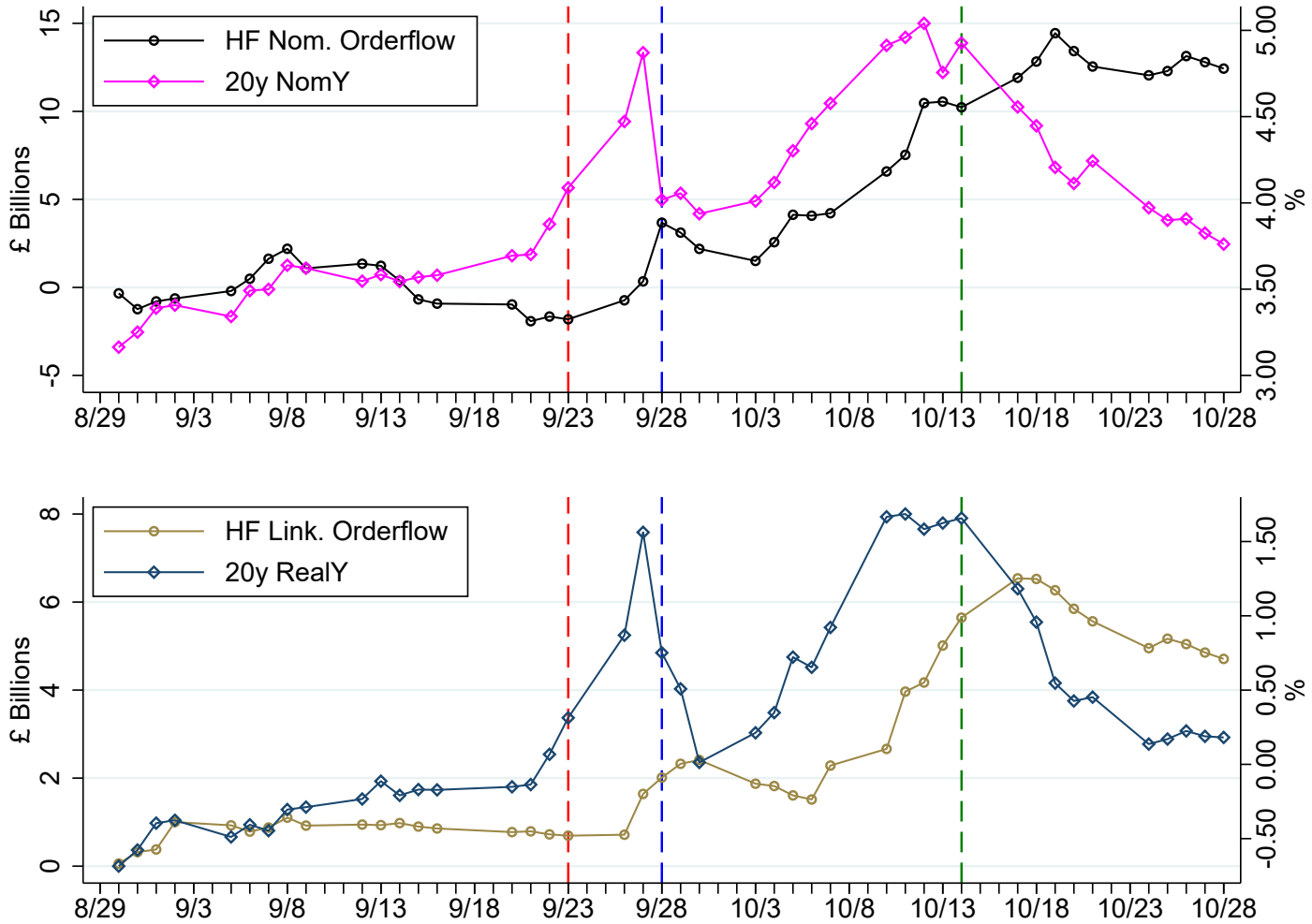
- we then aggregate at the hedge fund sector - day level (using unweighted or size weighted) averages
- we experiment with horizon $T = 1, 3, 6$ days

Result 6: Cumulative Hedge Fund Returns



Result 6: Hedge Funds' Timing of Liquidity Provision

Hedge Fund Orderflow and Yield Dynamics



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5. Will dealers manage to intermediate rapidly increasing government debt ?! (Duffie, 2020)

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5. Will dealers manage to intermediate rapidly increasing government debt ?! (Duffie, 2020)
6. Was the BoE intervention optimal ?
   - beyond reduced-form regressions $\rightarrow$ structural equilibrium model $\rightarrow$ **policy counterfactuals** (Gavazza-Pinter-Uslu (2023))

Need for New Theory?!

- A model of why liquidity providers (e.g. hedge funds) stayed away
  1. 2 shocks: fundamental shock (e.g. fiscal) and liquidity (e.g. LDI)
  2. average liquidity provider cannot tell apart the two shocks
     1. fear of fundamental shock scares them away
     2. [lack of liquidity could also feed back to further erode the fundamental!?]
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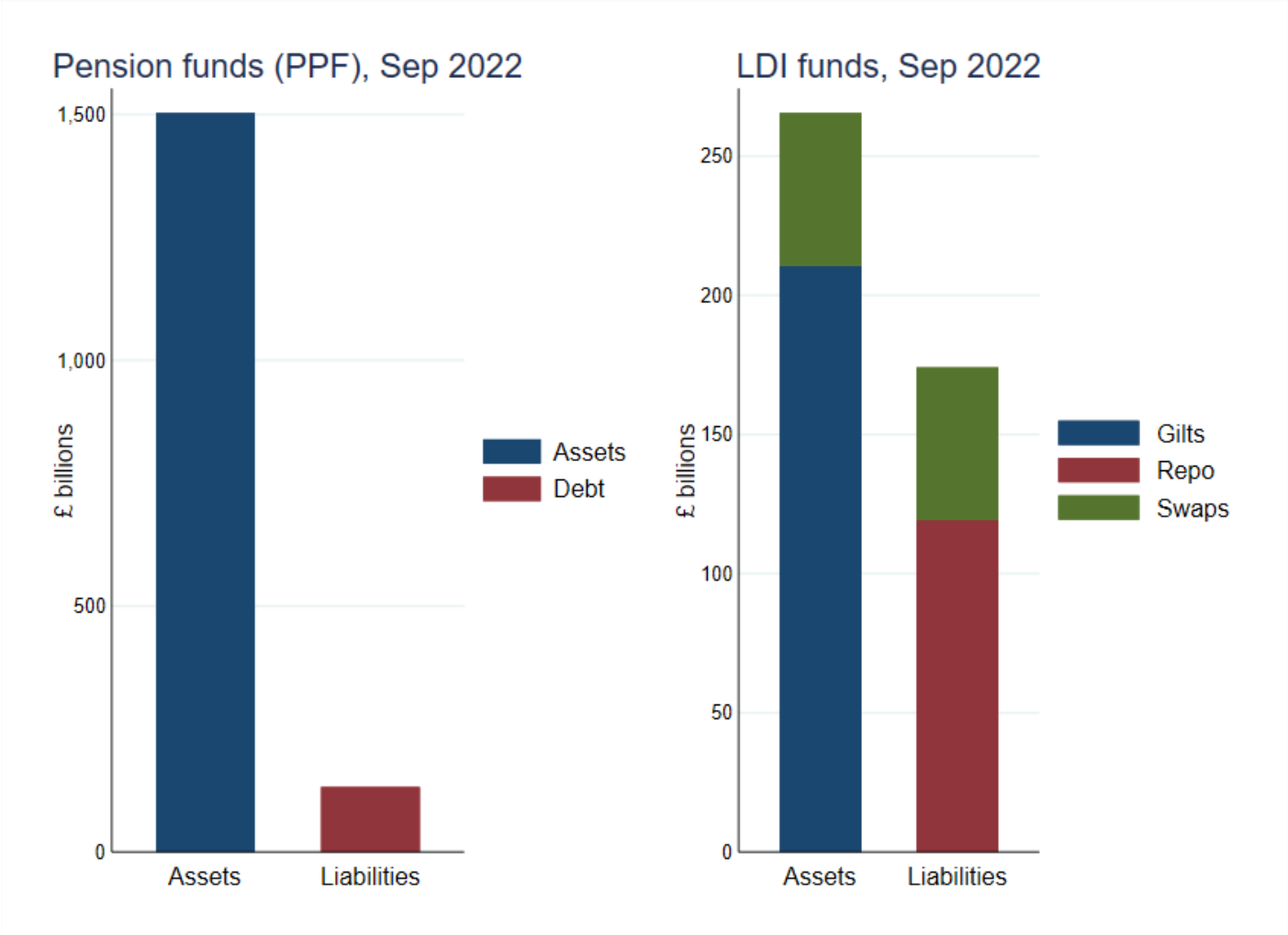
$\longrightarrow$ a model of learning – through relationships – about the nature of shocks

- A model of (derivatives) portfolio choice: repo vs swaps
  - why the large variation over time?
  - why the large variation across investors?

THANK YOU FOR YOUR ATTENTION!

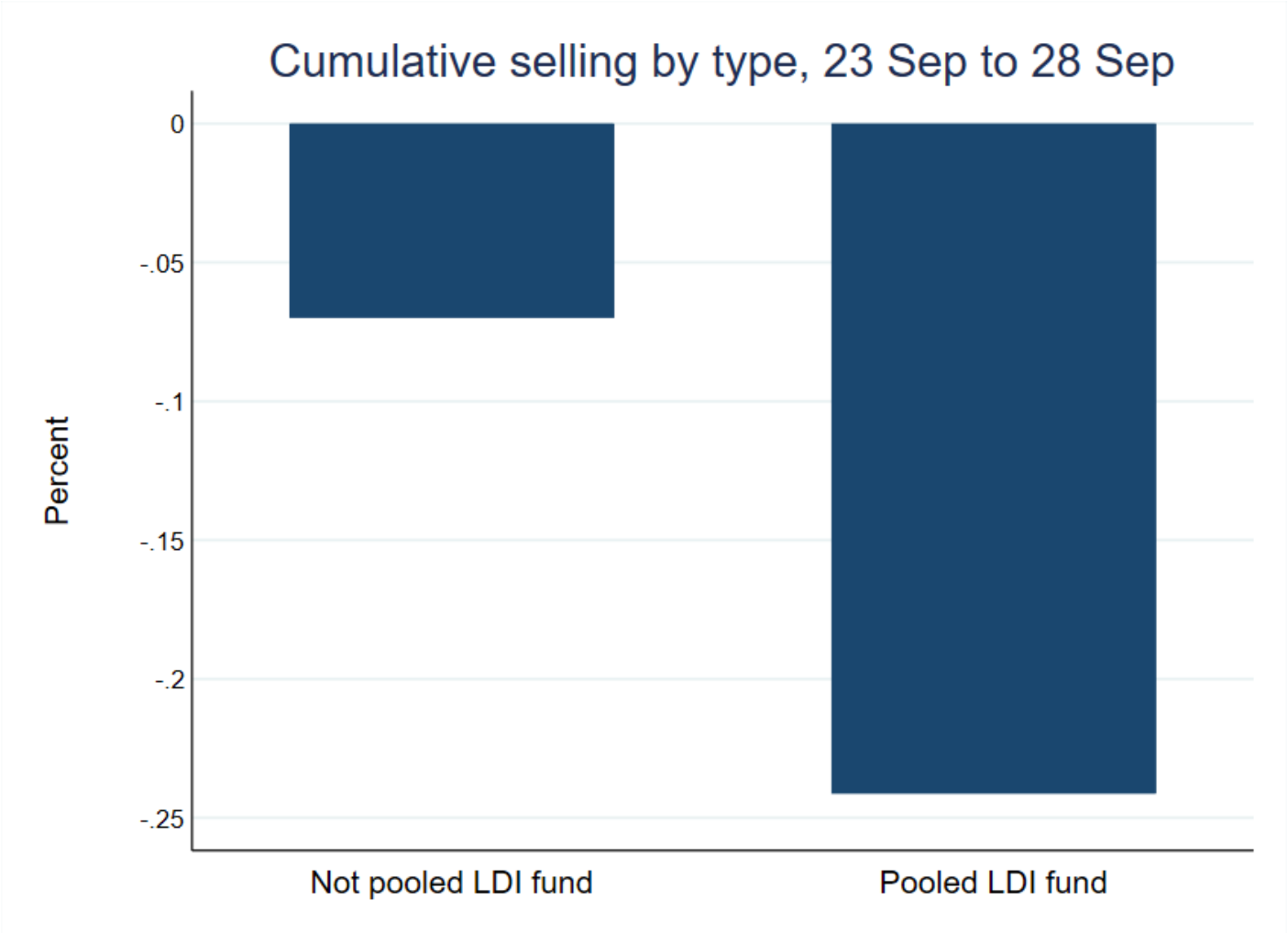
Leverage Structures

Pinter-Siriwardane-Walker (2023)



Pooled vs Other LDI Funds

Pinter-Siriwardane-Walker (2023)



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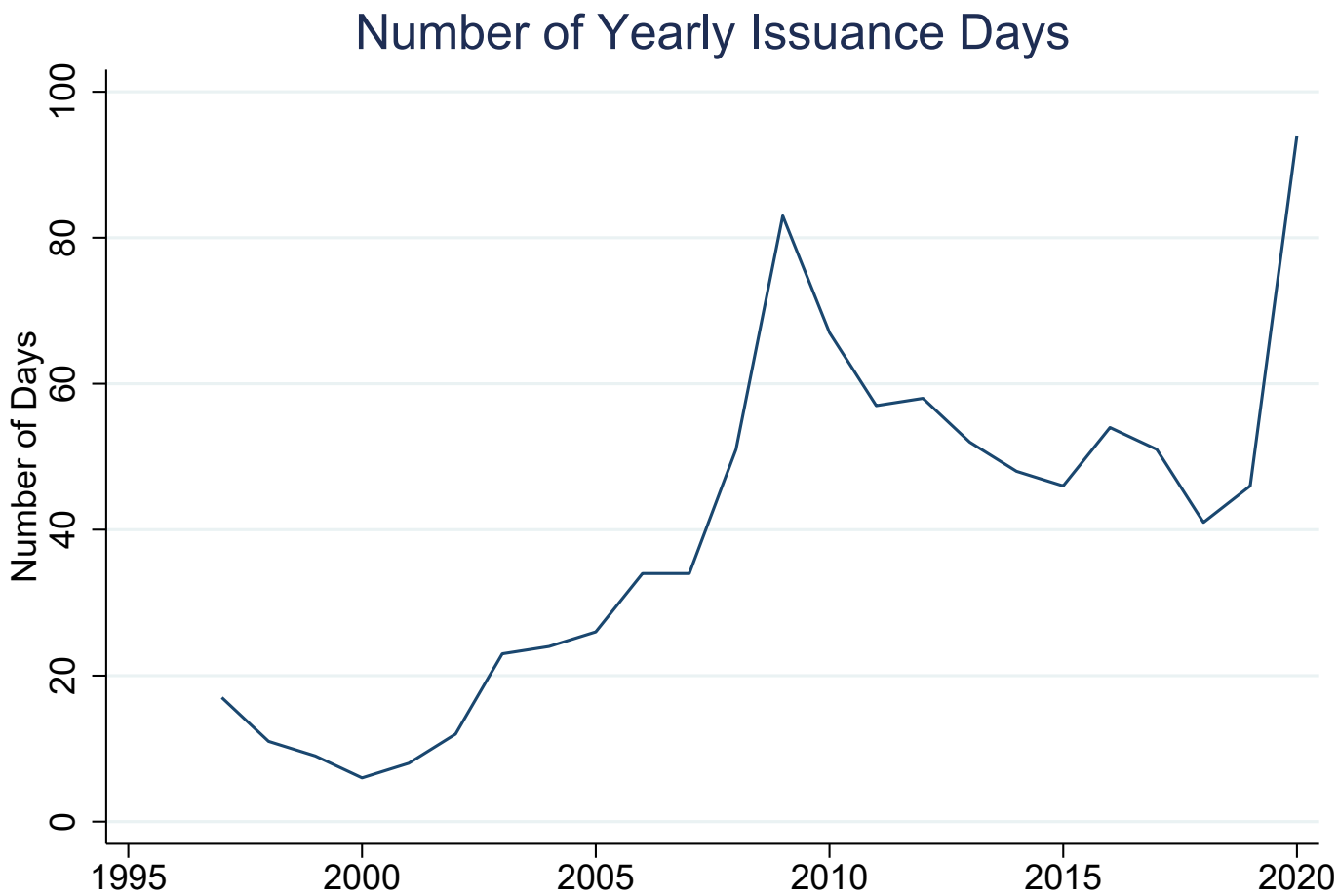
Sizeable Issuances during the Crisis

Operation Date	Gilt Name	Nom. Amount	Cash Raised
27-Sep-2022	0 1/8% Index-linked Gilt 2031	1,200	1,383
28-Sep-2022	1½% Green Gilt 2053	4,500	2,352
4-Oct-2022	0½% Treasury Gilt 2061	2,500	948
5-Oct-2022	1% Treasury Gilt 2032	3,750	2,852
11-Oct-2022	0 1/8% Index-linked Gilt 2051	1,106	871
12-Oct-2022	4 1/8% Treasury Gilt 2027	4,365	4,252
		17,422	**12,658**

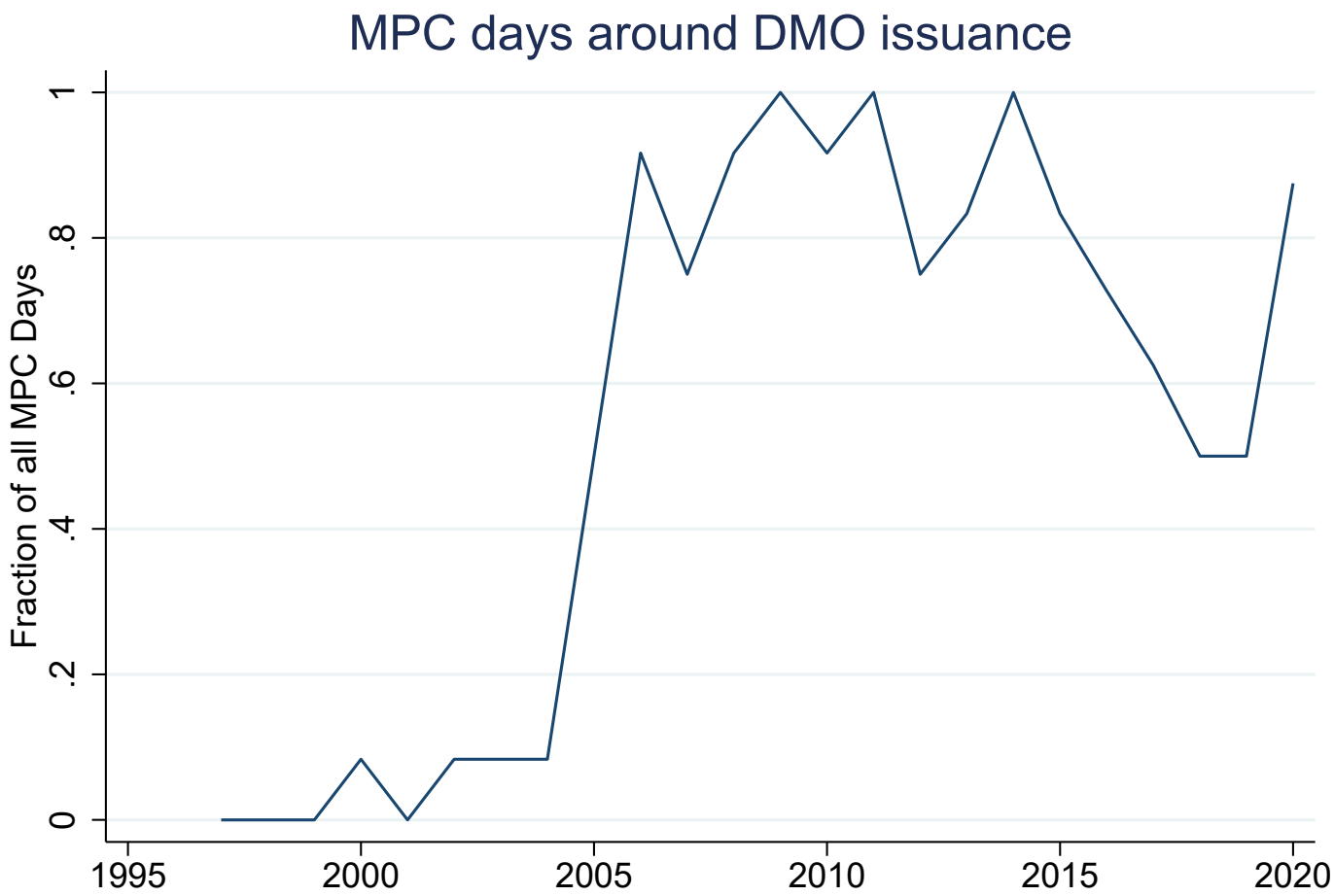
Increasing Issuance Activity of the Years

Lou-Pinter-Uslu, 2022



Fiscal-Monetary Interactions?

Lou-Pinter-Uslu, 2022



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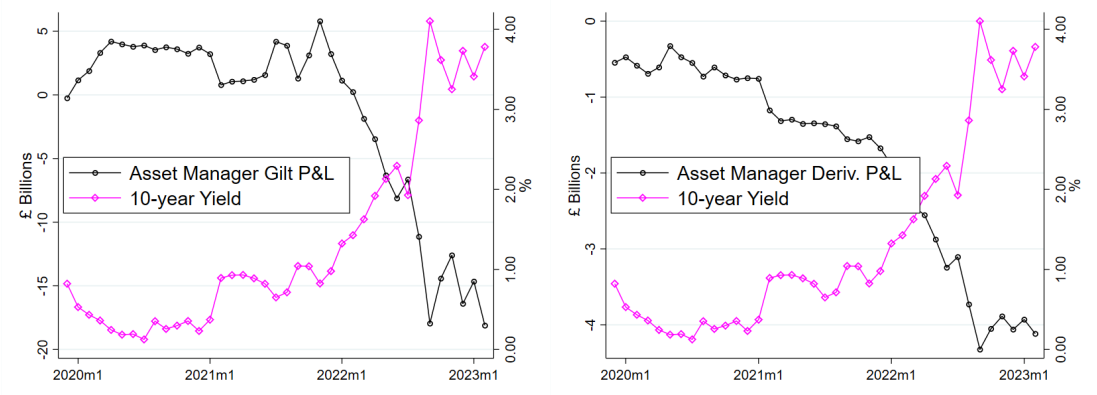
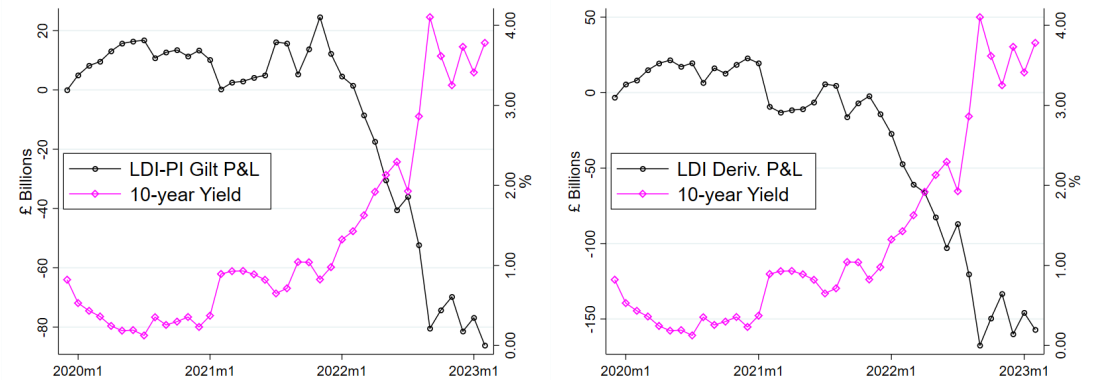
Who Hedges Interest Rate Risk in NBFI sectors?

Pinter-Walker (2023)



(a) Asset Managers



(b) LDI-PI