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\* Views expressed are those of the author and do not necessarily reflect official positions of  
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# The anatomy of transmission: pass-through of market rates to bank deposit rates in the euro area<sup>1</sup>

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## Abstract

This paper investigates the pass-through of market rates to bank deposit rates in the euro area, using bank-level data from July 2007 to March 2025. We employ local projections and an error-correction model to analyze the dynamics of pass-through over time, across interest rate regimes, and among countries, as well as explore its potential drivers. The results show that pass-through is significant but uneven. It is stronger for term and corporate deposits than for demand and household deposits. The effectiveness of pass-through diminishes in a low-interest-rate environment and varies across countries. Structural features of the banking sector and bank balance sheet characteristics also shape transmission. Specifically, banks operating in more concentrated markets exhibit lower pass-through. In addition, banks with larger liquidity buffers, stronger capitalization, and greater reliance on deposit funding adjust deposit rates less. Lastly, higher customer switching frequency and higher payment account fees are associated with stronger pass-through for household demand deposits.

**Keywords:** deposit rates; market rates; pass-through; euro area; zero lower bound; bank competition.

**JEL Codes:** G21; G10; E43; E52

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## 1. Introduction

Policymakers have a keen interest in understanding how commercial banks set their deposit rates. For central banks, sticky interest rates may hamper the transmission of monetary policy. For competition authorities, a limited pass-through of market interest rates to bank deposit rates may be a signal of unwarranted market concentration.

While deposit rate rigidity has been extensively studied, at least three important aspects remain underexplored. First, it matters against which market rate deposits are assessed to estimate pass-through. While studies often use short-term market rates as a benchmark, reflecting monetary policy stance, from a bank's perspective it makes more sense to use longer maturities to match the duration of their deposits. Second, banks' discretion to set rates may be constrained by country-specific government regulations and practical limitations such as the zero lower bound (ZLB). Third, bank deposits have important features beyond their interest rate, such as payment services and coverage by deposit guarantee. Such features may give banks some market power but also make bank deposits less comparable to market instruments.

In this paper, we analyze the pass-through of market rates to bank deposit rates in the euro area (EA), using comprehensive bank-level data from July 2007 to March 2025. We consider the aspects mentioned in the previous paragraph. We find that pass-through to deposit rates is higher for longer-maturity market rates used as benchmarks – like the two-year swap rate – than for short-term rates. This is in line with the idea that banks themselves typically consider longer-term rates as a benchmark, as these are closer to the (estimated) duration of their deposits. We also find that pass-through is asymmetric across several dimensions. First, the impact of market rates differs across deposit types and customer segments. Pass-through is almost full for term deposits and only limited – albeit significant – for demand deposits, and somewhat higher for corporate deposits than for household deposits. Second, pass-through significantly diminished during a low interest rate period, which can be attributed to the ZLB. Third, we observe substantial differences in pass-through across EA countries.

We also investigate structural features. In line with previous studies, we establish that market concentration is a dominant driver of rate stickiness, as banks in more concentrated markets exhibit slower pass-through, particularly for demand deposits. Consistent with this, we find that higher switching frequency by customers – likely reflecting limited banks' power to retain customers – is associated with stronger pass-through. Higher payment account fees are also linked to greater pass-through, possibly because they cover the fixed costs of payment

services, implying that banks do not need to rely on cross-subsidization through low and sticky deposit rates (Drechsler et al., 2017). In addition, pass-through tends to be lower for banks with larger liquidity buffers, stronger capitalization, and greater reliance on deposit funding.

Our contribution is threefold. First, we present a comprehensive approach, exploring different benchmark rates, deposit types, customer segments, interest rate environments, and countries. Second, we extend the set of structural drivers by incorporating indicators related to payment services, which have been linked to deposit rate rigidity in recent studies such as Drechsler et al. (2021). Third, we use two complementary methodologies – local projections and an error correction model – to address the research question within the empirical setting suitable for a large panel dataset and combine various dimensions of the pass-through analysis.

The remainder of our paper is organized as follows. Section 2 reviews the relevant literature. Section 3 describes the data and presents stylized facts. Section 4 discusses our main methodology based on local projections; the error-correction model is described in Annex E. Section 5 presents our results. We use local projections to estimate the baseline pass-through effects for different deposit types and by segment (households and non-financial firms), followed by extensions focusing on normal versus low-rate periods and country-specific estimations. Next, we apply an error-correction model to investigate conditioning factors: market concentration, bank balance sheet characteristics, and payment services. Section 6 concludes by summarizing our main results and linking these to policy implications.

## **2. Literature review**

The literature on pass-through of market interest rates to bank deposits is extensive and highlights several recurring themes and mechanisms. A large body of research links pass-through to the degree of competition in lending and deposit markets. The foundational Monti-Klein model (Klein, 1972; Monti, 1972) shows that imperfect competition leads to a mark-down of deposit rates relative to market rates. This model has been extended to various forms of imperfect competition (Freixas and Rochet, 1997). Drechsler et al. (2017) introduce the deposit channel of monetary policy transmission, where incomplete pass-through reflects banks' influence in deposit markets. This influence means that increases in policy rates are not fully transmitted to deposit rates, resulting in deposit outflows into bonds and a contraction in bank lending. In a related study, Drechsler et al. (2021) attribute the stickiness of deposit rates to the “deposit franchise” – banks' long-term investments in payment services grant them some degree of market power that allows them to pay relatively low and constant interest rates.

Recent empirical studies confirm that imperfect competition slows deposit rate pass-through for European banks (e.g., Messer and Niepmann, 2023; Beyer et al., 2024; Kho, 2025). Competition is often measured by concentration indices such as the Herfindahl-Hirschmann Index (HHI) or the market share of the top-5 banks. Van Leuvensteijn et al. (2013) note conceptual flaws in these measures, although alternative indicators like the Lerner index (Heckmann-Draisbach and Moertel, 2020) and the Boone indicator (Van Leuvensteijn et al., 2013) yield similar results. Other studies focus on specific aspects of imperfect competition. Polo (2021) links imperfect pass-through to market power driven by persistence in customer behavior due to switching costs, while Carbo-Valverde et al. (2011) and Hannan and Adams (2011) find that switching costs significantly affect bank deposit rates in Spain and the U.S., respectively.

The relationship between pass-through and banks' balance sheet characteristics has also been widely studied. Beyer et al. (2024) find that pass-through to deposit rates is more sluggish for European banks with higher liquidity, a result echoed by Gambacorta (2008) for Italian lending rates. Both Gambacorta (2008) and Holton and Rodriguez (2018) identify a negative relationship between pass-through of lending rates and bank solvency. Altavilla et al. (2021) show that Eurosystem's non-standard monetary policies have strengthened weaker banks, contributing to reduction in pass-through heterogeneity across the EA countries. In the U.S., Kang-Landsberg and Plosser (2022) observe that the response of bank deposit rates to monetary policy changes has weakened over recent decades, attributing this to the decreased loan-to-deposit ratio, which made deposit funding relatively abundant compared to bank lending.

A growing strand of literature examines the impact of very low or negative interest rates on pass-through.<sup>2</sup> Abadi et al. (2023) introduce the concept of the “reversal rate,” below which the impact of any further policy rate cuts on bank profitability and lending would reverse and may become contractionary. The limited scope to reduce (retail) deposit rates when the policy rate is near or below zero – the ZLB – is a key constraint. Sopp (2018) finds that pass-through from market rates to deposit rates for German banks gradually declined after 2013, as the main policy rate (the DFR) was reduced below zero.<sup>3</sup> Ulate (2021) shows that lowering interest rates

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<sup>2</sup> See e.g. Heider et al. (2021) for and earlier literature review.

<sup>3</sup> In 2024, the ECB formally adjusted its operational framework and announced that the Deposit Facility Rate (DFR), rather than the Main Refinancing Operations (MRO) rate, would serve as the primary instrument for steering the monetary policy stance. See for details: [Changes to the operational framework for implementing monetary policy](#). In practice, however, the DFR had already functioned as de facto main policy rate for some time, as the large stock of excess reserves in the Eurosystem, created through unconventional monetary policy operations, had made it the principal anchor for short-term money market rates.

below zero can be less effective than lowering them in positive territory, as deposit rates become stuck at zero, squeezing bank profits. Basten and Mariathan (2023) similarly document that negative rates interrupt pass-through for Swiss banks, eroding deposit margins and encouraging risk-taking. In addition, Freriks and Kakes (2024) demonstrate that banks' reluctance to reduce deposit rates below zero has significantly eroded their interest rate margins. Banks partly compensated for lost interest rate margins by raising fees and shifting towards non-interest income sources (e.g., Lopez et al., 2020) or by cutting operational costs (Freriks and Kakes, 2024; Avignone et al., 2025).

Recent studies focus on the recent hiking cycle (2022-2024), following low-rate policy in the EA. Messer and Niepmann (2023) document that pass-through from policy rates to deposit rates has been slower than in previous episodes, likely because banks have weak incentives to compete for deposits when liquidity is abundant and balance-sheet expansion – particularly lending – is limited. They find that rates for demand deposits and household deposits are less sensitive to changes in the DFR than time deposits and corporate deposits. Beyer et al. (2024) also find that pass-through has been sluggish in recent years with significant cross-country variation, which they attribute to differences in competition and liquidity. Mayordomo and Roibás (2023) further analyze the recent hiking cycle in the EA and Spain, confirming that pass-through to retail time deposit rates is slower than in earlier hiking cycles.

Another important element of pass-through is the choice of a benchmark rate. Studies focusing on monetary policy transmission typically use central bank policy rates or targets (e.g., Van Leuvensteijn et al., 2013; Altavilla et al., 2022; Messer and Niepmann, 2023; Beyer et al., 2024). Others, such as Altavilla et al. (2021) and Kho (2025), use a narrower benchmark by considering unanticipated monetary policy shocks identified via vector autoregression models or high-frequency interest rate movements around monetary policy announcements. An alternative approach, more aligned with banks' balance sheet management, is to use as a benchmark a replicating portfolio of market rates with a duration close to that of the bank deposit rate. For instance, Maes and Timmermans (2005) estimate the duration of Belgian bank deposits based on weighted averages of a market rates portfolio that mimics deposit rates most closely. Sopp (2018) presents a similar empirical approach, based on a theoretical model that relates deposit rates to bank loan rates which, in turn, closely follow market rates. In this case, deposit rates can be characterized as moving averages of market rates of different maturities, i.e. as a replicating portfolio. Other examples applying a replicating portfolio to deposits – as a robustness check – are Drechsler et al. (2021) and Freriks and Kakes (2024).

Building on these strands of literature, our paper aims to address several dimensions. First, we analyze pass-through of market rates to deposit rates in a dynamic setting, exploring its evolution over time. Second, we examine whether pass-through varies between low and normal interest rate periods, as well as its heterogeneity across EA countries. Third, we investigate potential drivers of pass-through identified in previous studies, including bank balance sheet characteristics, market competition, and payment and switching costs. By integrating these perspectives, our analysis seeks to provide a comprehensive understanding of the mechanisms shaping deposit rate pass-through in the EA.

### 3. Data

#### 3.1. Data description

Our panel dataset consists of monthly bank-level observations spanning the period from July 2007 up to March 2025. It includes 280 commercial banks from the ten largest EA countries – Austria (AT), Belgium (BE), Germany (DE), Spain (ES), Finland (FI), France (FR), Ireland (IE), Italy (IT), the Netherlands (NL), and Portugal (PT) – which together account for around 80% of the EA’s total banking system assets (based on average shares over the past decade). This coverage provides a representative sample for the purpose of our analysis.

The individual bank-level data are sourced from the ECB’s Individual Balance Sheet Items (IBSI) and Individual MFI Interest Rate Statistics (IMIR) databases. Deposit rates are reported for seven types of deposits (new business), differentiated by customer segment and maturity. These include demand deposits (referred to as overnight deposits in the Eurosystem statistics)<sup>4</sup>, term deposits with maturities up to one year, and term deposits with maturities over one year for both households and non-financial corporations. Additionally, household deposits redeemable at notice are included; this category is not available for firms in the IMIR database. Coverage of deposit rate data varies across deposit types and banks, ranging from 40% to 70% of total observations in our sample. To improve coverage, we interpolate missing observations linearly, which enhances completeness while preserving the underlying time-series structure.

We supplement the IMIR data with bank-specific balance sheet variables from IBSI, including total assets, liquid assets, total deposits, and capital and reserves. Liquid assets are

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<sup>4</sup> Overnight deposits are defined as deposits convertible into currency and/or transferable on demand by cheque, banker’s order, debit entry or similar means, without significant delay, restriction or penalty. This category includes balances (interest bearing or not) which are immediately convertible into currency on demand or by close of business on the day following that on which the deposit was made, plus pre-paid amounts in the context of e-money (e.g. prepaid cards). See [Manual on MFI interest rate statistics, January 2017](#), p.76.

defined as the sum of cash, debt securities, money market fund (MMF) shares or units, equity, and non-MMF investment fund shares or units. Total deposit volumes aggregate all outstanding volumes of demand, time, and redeemable-at-notice deposits for both households and firms. Following Demiralp et al. (2021), we construct the leverage ratio as the sum of capital and reserves expressed as a percentage of total bank assets.

Market interest rate data are obtained from Bloomberg, including one-, two-, and three-year overnight index swap (OIS) rates, and from the Eurosystem, including the €STR and key policy rates. Furthermore, we include monthly country-level data on the manufacturing industrial production index and the HICP inflation index, both seasonally and calendar adjusted, sourced from the Eurostat.<sup>5</sup>

In order to examine conditioning factors that may influence interest rate pass-through, we construct several country-level variables. These include banking concentration measures such as the Herfindahl-Hirschmann index, calculated for each EA country with our data on deposits outstanding, as well as concentration measures published annually by the ECB in the Banking Structural Statistical Indicators (SSI) dataset. Additionally, we use data from the European Commission on deposit holders' switching frequency between banks and the cost of retail payment services in each EA country, which reflects the total fee of a basic package.

Table 1 provides descriptive statistics of the variables in our sample. Deposit rates are, on average, higher for term deposits than for demand deposits, both for households (HHs) and non-financial corporations (NFCs). Market and policy rates display substantial variation, reflecting the full monetary policy cycle from pre-GFC through the negative rate period and into the recent tightening and subsequent easing phases. The banks in our sample are generally well-capitalized, with an average leverage ratio of 7.8%, and maintain sizable liquidity buffers (mean liquid assets ratio of 21.6%), though there is heterogeneity across banks, as shown by the wide interquartile ranges. Deposits constitute a key funding source, with a mean deposit funding ratio of 33% of total assets and a 75<sup>th</sup> percentile of around 54%. The average value of the Herfindahl-Hirschmann index is 0.09 points but varies substantially across countries, providing a sufficient source of variation to explore cross-country differences in pass-through.

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<sup>5</sup> As a sensitivity check, we added in the model the country-level index of financial stress (CLIFS) from the [ECB Statistical Data Warehouse](#). This index comprises six financial stress measures capturing equity, bond and foreign exchange markets (see Duprey and Klaus, 2015). Including this variable does not materially affect the LPs impulse responses, and the CLIFS variable itself is insignificant in most specifications.

**Table 1. Descriptive statistics**

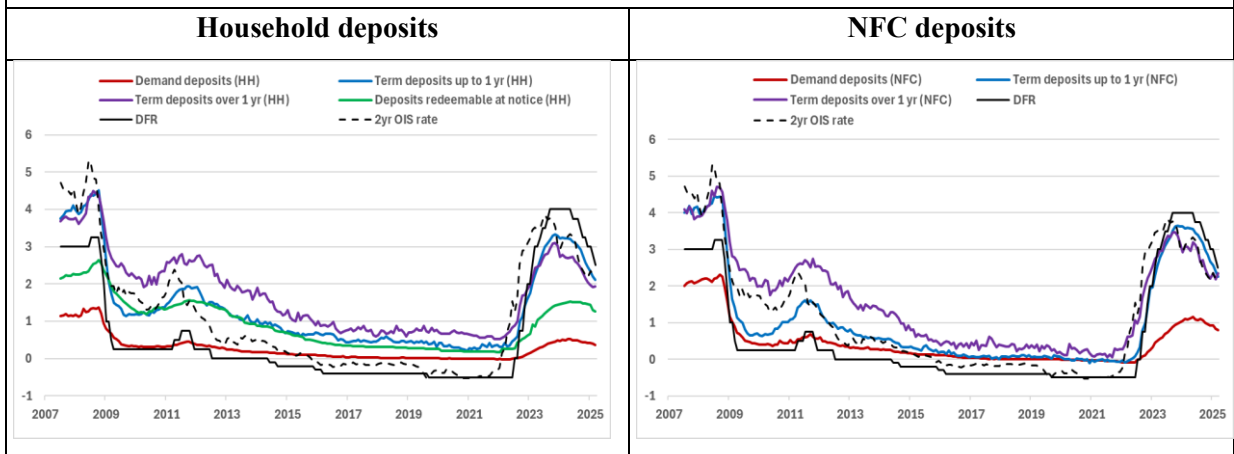
Variable	Mean	St. dev.	25th prct	75th prct
Deposit Facility Rate (DFR)	0.61	1.44	-0.40	0.75
€STR	0.68	1.56	-0.45	0.92
One-year OIS rate	1.11	1.64	-0.23	1.92
Two-year OIS rate	1.14	1.55	-0.15	-2.12
Demand deposits, HH	0.31	0.59	0.00	0.35
Time deposits ≤1 year, HH	1.40	1.42	0.23	2.29
Time deposits >1 year, HH	1.60	1.32	0.43	2.53
Deposits redeemable at notice, HH	0.85	0.86	0.14	1.33
Demand deposits, NFC	0.41	0.75	0.00	0.49
Time deposits ≤1 year, NFC	1.21	1.44	0.08	2.07
Time deposits >1 year, NFC	1.59	1.46	0.25	2.65
Total assets, in log-level	3.76	1.43	2.76	4.75
Liquid assets ratio (in percentage of total assets)	21.58	16.18	10.79	30.03
Leverage ratio (in percentage of total assets)	7.82	5.90	4.33	9.75
Total deposit ratio (in percentage of total assets)	33.23	26.62	4.99	53.89
Headline HICP inflation (y-o-y)	2.08	2.28	0.70	2.80
Growth rate of Industrial Production Index (y-o-y)	-0.37	8.21	-2.92	2.83
Market share (Herfindahl-Hirschmann index)	0.09	0.07	0.04	0.12

### 3.2. Stylized facts and data trends

The evolution of bank deposit rates in the EA reveals several notable stylized facts. Deposit rates generally co-move with the ECB's DFR and market rates such as the two-year OIS rate, but the degree of pass-through varies by deposit type and over time (see Figure 1). During the period of low and negative policy rates (roughly 2010-2022), banks were reluctant to fully pass on declining rates to depositors, particularly for demand deposits constrained by the ZLB. The highest pass-through is for term deposits (comparatively across maturities), reflecting their greater rate sensitivity and closer alignment with market benchmarks. The dynamics for household deposits redeemable-at-notice fall between demand and term deposits.

Correlation patterns reinforce these findings (see Table 2). Term deposits for both households and NFCs show strong contemporaneous correlations with market rates, while demand deposits display much weaker correlations (0.4-0.5), highlighting their limited responsiveness. Adjustments of deposit rates to market and policy rate changes are not immediate; both the narrative and the lagged correlations (not reported) suggest a lag of several months, in line with the literature on lags in monetary policy transmission.

**Figure 1: Deposit interest rates vs policy and market rates in EA (in percentage points)**



Source: ECB IBSI statistics, Bloomberg, own calculations.

Note: deposit interest rates are calculated as monthly weighted average over all banks in the sample (by total assets as proxy of bank’s size). Demand deposits are also known as overnight deposits in the Eurosystem statistics.

**Table 2. Correlations of bank deposit rates with policy and market rates**

	DFR	€STR	1-year OIS	2-year OIS
DFR	1.00			
€STR	0.99	1.00		
1-year OIS rate	0.93	0.96	1.00	
2-year OIS rate	0.89	0.93	0.99	1.00
Demand deposits, HH	0.41	0.50	0.54	0.55
Time deposits ≤1 year, HH	0.69	0.72	0.73	0.71
Time deposits >1 year, HH	0.63	0.68	0.74	0.74
Deposits redeemable at notice, HH	0.45	0.51	0.56	0.57
Demand deposits, NFC	0.56	0.64	0.66	0.65
Time deposits ≤1 year, NFC	0.86	0.89	0.88	0.86
Time deposits >1 year, NFC	0.69	0.74	0.79	0.80

Figure A1 (Annex A) further illustrates cross-sectional and temporal heterogeneity in deposit pricing. During policy tightening cycles, the dispersion of deposit rates across banks increases, especially for demand deposits and deposits redeemable at notice, indicating greater divergence in pricing as policy rates rise. During easing cycles, dispersion narrows, suggesting more uniform rate reductions across banks. The ZLB effect is pronounced for household deposits, where dispersion compresses as most banks avoid charging negative rates to retail customers. Regulatory and institutional constraints, such as legal or reputational barriers, further limit negative rates. For corporate deposits, the lower bound seems to be less binding and negative rates are more common, as seen in the lower percentiles of the distribution falling below zero. Notably, there are no consistent differences in rate dispersion by bank size, suggesting the size is may not be a primary driver of pricing heterogeneity.

These stylized facts provide a foundation for our empirical analysis, underscoring the importance of deposit characteristics, market structure, and institutional features in shaping monetary transmission to deposit rates.

#### 4. Methodological approach

Our methodology relies on two complementary approaches: local projections and an error-correction model. Using both methodologies allows us to examine different aspects of pass-through, enriching our insights.

The first approach employs panel local projections (Jordà, 2005) to analyze the dynamics of pass-through, i.e. how bank deposit rates react to a change in market (or policy) rates over time. The baseline linear specification is formalized as follows:

$$y_{i,t+h} - y_{i,t-1} = \alpha_{i,h} + \beta_h * r_{t-1} + \gamma_h \sum_{p=1}^2 X_{i,t-p} + \varepsilon_{i,t+h} \quad (1)$$

where  $i$  denotes the bank and  $t$  denotes the month. The dependent variables  $y_{i,t+h}$  include seven bank-level deposit rates for demand, term, and redeemable at notice deposits for households and firms.  $h = 0, 1, 2 \dots H$  is a projection horizon for the impulse response function (IRF), set to 12 months.  $r_{t-1}$  is the interest rate used as an impulse variable, proxied by the 2-year OIS rate in our baseline specification (which is close to the average duration across deposit types, see Annex B). It is included in the model with the first lag to derive IRFs of the dependent variable to a one percentage point (p.p.) increase in the benchmark rate. In a robustness check, we use other market and policy rates to estimate impulse responses (see Section 5.1).

$X_{i,t-p}$  is a vector of controls, which include a lagged dependent variable, lags of the impulse variable, bank-specific controls, country-specific macroeconomic controls, and a linear time trend. Bank-specific variables – total assets, liquid assets ratio, leverage ratio, and deposits ratio – capture relevant bank-level characteristics that may impact banks' funding strategy, and specifically, their deposit pricing. Total assets (in log of EUR bn) control for the bank size: smaller banks may rely more on deposit funding as it is likely more difficult for them to switch to market funding (while large banks are typically more active in various financial markets) and thus may be more inclined to adjust deposit rates in response to policy (market) rate changes than large banks. The liquid assets ratio (measured as the sum of liquid assets divided by total bank assets, in percentage) is a proxy for a bank's liquidity position: banks with a larger liquidity buffer may be less sensitive to deposit outflows in stress scenarios

and as such would exhibit lower sensitivity to adjusting their deposit rates. The leverage ratio (measured as the sum of capital and reserves divided by total assets, in percentage) captures bank’s capitalization level – well-capitalized banks are likely less rate-sensitive and thus more reluctant to adjust deposit rates upward after an observed increase in market and policy interest rates. The deposit ratio (total bank deposits of households and NFCs divided by total assets, in percentage) captures bank’s deposit dependence – banks relying more on customer deposits in their primary activity may be inclined to adjust deposit rates more actively than banks less dependent on deposit funding.

Following previous studies, we also include two macroeconomic factors – the 12-month log change in manufacturing industrial production index and HICP inflation – to control for changes in deposit demand and general economic conditions (see e.g., Messer and Niepmann, 2023; Beyer et al., 2024; Kho, 2025).

$p$  denotes the number of lags included in the set of control variables and is set to two.<sup>6</sup>  $\alpha_{i,h}$  are bank-specific fixed-effects<sup>7</sup>, and  $\varepsilon_{i,t+h}$  is an idiosyncratic error term with mean 0. The local projections model is estimated by fixed-effects regression with Driscoll and Kraay (1998) standard errors, which are robust to general forms of cross-sectional (spatial) and temporal dependence in panels with large time dimensions.<sup>8</sup>

As an extension, we estimate pass-through separately in a normal and a low interest rate regime. We do so by adding in our baseline specification an interaction term of the 2-year OIS rate with a binary variable which takes the value 1 in a low rate regime, and 0 in a normal rate regime (see Section 5.2 for details). We subsequently calculate impulse responses of deposit rates, conditional on being in each of these regimes.

The local projections (LPs) approach offers several advantages over vector autoregression models (VARs). Unlike VARs, LPs do not require strong identification assumptions or the imposition of specific dynamic structures, making them more flexible for analyzing dynamic relationships (Jordà, 2005). This flexibility is particularly valuable in panel settings with complex fixed effects, where the computational burden and parameter proliferation in VAR models can be prohibitive. LPs simplify estimation by focusing directly on the impulse

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<sup>6</sup> The results are robust to using different numbers of lags.

<sup>7</sup> The cross-sectional dimensions  $b$  (bank) and  $j$  (country) in our panel dataset are nested, i.e., multiple banks reside in one country. Therefore, bank-specific effects automatically control for country-specific effects.

<sup>8</sup> We conducted Pesaran’s CD test to assess cross-sectional dependence across panel units. The test strongly rejects the null hypothesis of cross-section independence for all key variables. These findings justify the use of Driscoll-Kraay standard errors, implemented via the `xtscc` estimator in STATA.

response of the variable of interest, reducing the number of parameters and facilitating a more parsimonious specification. Moreover, LPs inference is robust to persistent time series and non-stationary data (Montiel Olea and Plagborg-Møller, 2021). LPs also offer greater adaptability to nonlinear specifications and heterogeneous effects.

Our second approach is an error-correction model (ECM), which has been applied by several related studies (e.g., van Leuvensteijn et al., 2013; Gambacorta, 2018; Holdon and Rodriguez, 2018; Sopp, 2018; Mayordomo and Roibás, 2023). If deposit rates and their benchmark rates are cointegrated, the overall pass-through is reflected by the long-run equilibrium relationship. We use the ECM as a robustness check, but also as a straightforward tool to analyze possible drivers of pass-through, which are added as interaction terms with the market rate. A more detailed discussion and results of the ECM are provided in Annex E.

## **5. Main results**

### **5.1. Baseline analysis – linear model**

The baseline linear LPs model estimates the impulse responses of bank deposit rates to changes in the two-year OIS rate, which serves as a benchmark market rate. The results, presented in Figure 2, show that deposit rates respond significantly to changes in the OIS rate over the projection horizon, with the magnitude of adjustment varying across deposit maturities, types, and customer segments.

Pass-through to term deposit rates with maturities up to one year is close to one-for-one, and slightly stronger for firms than for households. This is consistent with the use of the two-year OIS rate as a pricing benchmark for term deposits, particularly for corporate clients who are more likely to negotiate rates and whose deposits are more sensitive to market conditions. For term deposits with maturities over one year, pass-through is somewhat lower – around 0.8 p.p. rise for a 1 p.p. increase in the two-year OIS rate. This attenuation may reflect the longer duration and lower repricing frequency of these instruments, as well as the influence of expectations about future rate paths embedded in longer-term deposit pricing.

In contrast, demand deposit rates exhibit low interest rate sensitivity, with peak responses of around 0.5 p.p. for firms and 0.25 p.p. for households. This result aligns with the literature confirming the inherent stickiness of demand deposits (Drechsler et al., 2021), which highlights that banks adjust rates on demand deposits infrequently due to their role as a stable and low-

cost funding source. Household demand deposits, in particular, are less rate-sensitive due to their transactional nature and lower opportunity cost for depositors.

Household deposits redeemable at notice show intermediate interest rate sensitivity, with pass-through of about 0.4 p.p. per 1 p.p. increase in the two-year OIS rate. These instruments combine some flexibility with a modest yield premium, making their pricing more responsive than demand deposits but less than term deposits.

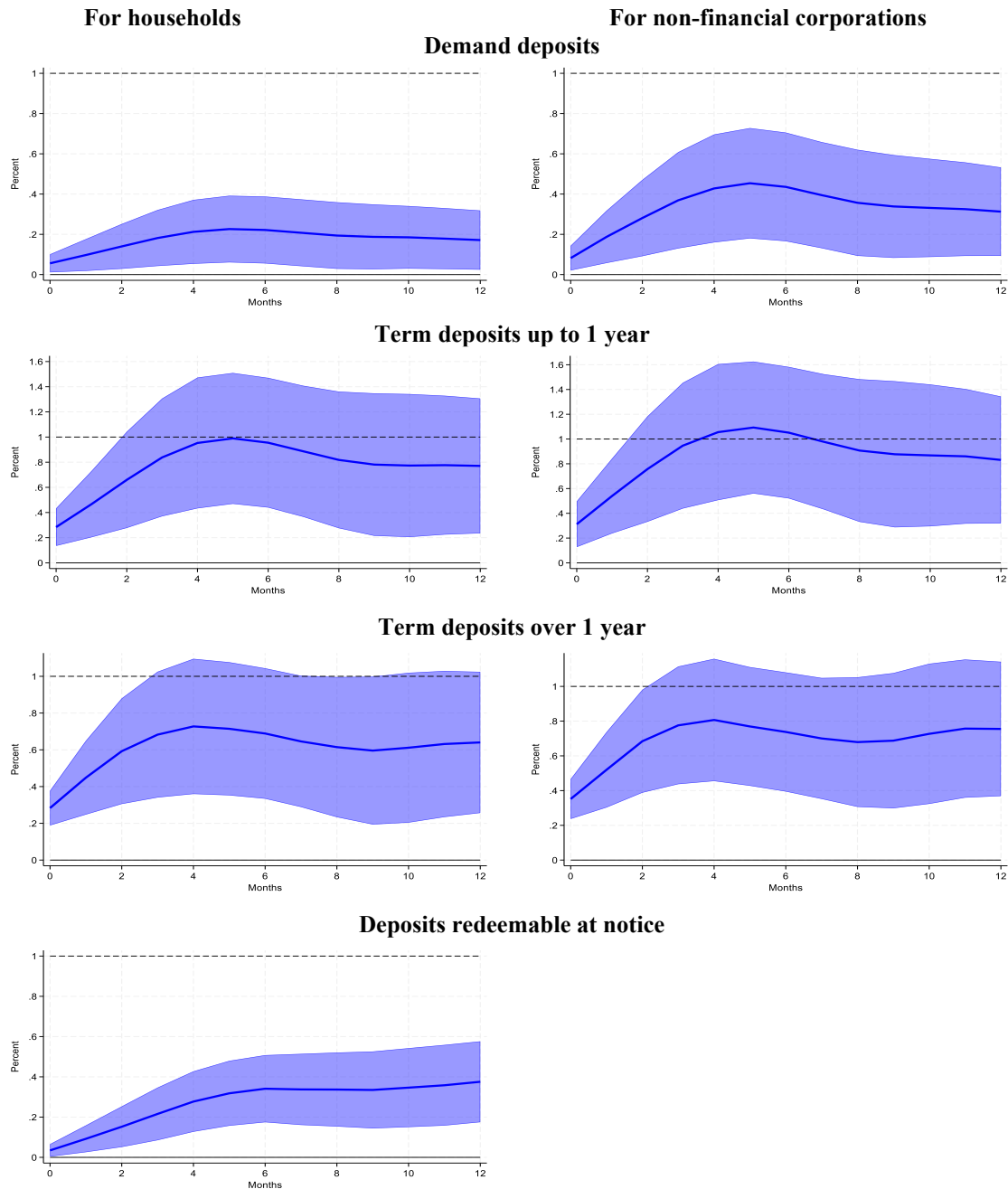
Overall, the results confirm that deposit rate pass-through may depend on liquidity characteristics, duration, and negotiability of deposit products, as well as on the client type, with corporate deposits generally more sensitive to market rates than household deposits.

As a robustness check, we estimate the impulse responses of bank deposit rates to different market rates, including the €STR, the one-year OIS rate, and the ECB's DFR. Overall, the findings are consistent with the baseline analysis in terms of relative sensitivity of deposit types: term deposits and deposits of firms exhibit stronger responses than demand deposits and household deposits (see Figure C1 in Annex C). This pattern reflects a greater interest rate elasticity of more mobile and negotiable deposit instruments, as well as a more active rate-setting behavior for corporate clients.

Notably, the magnitude of responses differs across benchmark rates and is generally larger than for the two-year OIS rate. Pass-through from changes in the DFR is closest to the baseline, albeit slightly stronger for term deposits. This is consistent with the DFR directly affecting the opportunity cost of holding excess reserves and thereby influencing banks' deposit pricing. The one-year OIS rate yields intermediate responses, in line with its shorter duration relative to the two-year benchmark.

In contrast, pass-through from the €STR is stronger, especially for term deposits with maturities up to one year. This may reflect a mismatch between the ultra short-term nature of the €STR and the longer effective duration of bank deposits (see Annex B). As an overnight money market unsecured rate, the €STR captures high-frequency fluctuations in funding conditions, which may overstate the relevant pricing signal for deposits. In a LPs framework, this can result in larger estimated short-run responses, reflecting temporary adjustments in marginal funding costs rather than structural pricing behaviour. By contrast, longer-term market rates such as the two-year OIS better align with deposit duration and therefore provide more stable and economically meaningful estimates of pass-through.

**Figure 2. Effects of 1 p.p. increase in the 2-year OIS rate on bank deposit rates**



*Notes: The figure plots the smoothed impulse responses of bank deposit rates for households and non-financial corporations to a 1 percentage point increase in the 2-year OIS rate. X-axis denotes months in the projection horizon. Shaded areas represent 90% confidence intervals around the responses (solid lines).*

As a further robustness check, we examine whether bank size affects deposit pricing behavior and its sensitivity to market rates by splitting the sample into large banks and all remaining banks. Bank size is proxied by total assets, and a dummy variable is constructed that equals one for banks in the top 20th percentile of the size distribution in each month and zero otherwise. Estimated impulse responses of all deposit rates for large banks are slightly higher than for remaining banks (results available on request), suggesting somewhat stronger pass-

through by larger banks to term deposits. However, the differences are not statistically significant, as responses largely overlap. Thus, our baseline results are robust to the bank size.

In another sensitivity check, we assess whether pass-through differs between domestic banks and foreign-owned institutions (including branches and subsidiaries), as their deposit pricing may reflect differences in funding structures, competitive strategies, and integration with parent balance sheets. To explore this, we extend our baseline LPs by interacting the market rate with a dummy variable equal one for foreign banks and zero otherwise. The results (available on request) indicate that the overall patterns of pass-through across deposit rates remain unchanged. While there are some differences in magnitude of responses between domestic and foreign banks, these are generally small and not significant. This suggests that distinguishing between domestic and foreign banks does not materially alter our conclusions.

We applied an alternative methodological approach based on the ECM (see Annex E). The ECM delivers long-run pass-through estimates that are significant and closely match the outcomes from the LP model: high pass-through for term deposits ( $\sim 0.75\text{--}0.90$ ), intermediate for redeemable at notice ( $\sim 0.5$ ), and low for demand deposits ( $\sim 0.2\text{--}0.4$ ), with deposit rates for corporates consistently above those for households (Table E1 in Annex E). We also repeated the robustness checks with the ECM: alternative benchmark rates, large versus small banks and domestic versus foreign-owned banks. As reported in Annex E (Table E.4), the alternative benchmark rates – the €STR, the one-year OIS rate, and the DFR – yield similar results as the benchmark two-year OIS rate. The ECM also confirms that differences between large and small banks as well as between domestic and foreign-owned banks are not statistically significant.

## **5.2. Extension: pass-through varies in normal versus low interest rate regimes**

We extend our baseline analysis by investigating whether pass-through differs between normal and low interest rate environments. As highlighted in recent literature, banks have been reluctant to transmit negative or very low positive market and policy rates to depositors, largely due to customer unwillingness to accept negative or near-zero returns on deposits. These frictions imply that the pass-through mechanism may weaken in low-rate regimes, reflecting constraints such as the ZLB on deposit rates, reduced incentives and, in some cases, legal

restrictions for banks to adjust deposit rates downward,<sup>9</sup> as well as behavioral factors limiting depositor acceptance of negative remuneration.

To identify interest rate regimes, we adopt two approaches: splitting the sample into subperiods based on changes in ECB's monetary policy stance or using state variables to define threshold values that indicate such a split. Both approaches have their advantages and drawbacks. The first approach ensures that the regime identification is independent of potentially endogenous state variables, while the second may better capture prevailing market conditions and is more closely anchored in economic intuition. In the main text we adopt the first approach and use the second as a robustness check.

Under the policy-based definition, we identify two key ECB Governing Council decisions: reduction of the DFR to 0% in July 2012 and its increase from -0.5% back to 0% in July 2022. This period is commonly referred to as the ZLB period. Accordingly, we define the low-rate regime as the ZLB period (July 2012–July 2022), while the normal-rate regime includes the pre-ZLB period (before July 2012) and the post-ZLB period (after July 2022, when the ECB began its hiking cycle). We construct a dummy variable equal one during the low-rate regime and zero otherwise (normal-rate regime) and interact it with the two-year OIS rate in LPs to estimate regime-specific impulse responses (see Figure 3).<sup>10</sup>

The results reveal a clear asymmetry in pass-through across regimes. Pass-through weakens in a low-rate environment, particularly for demand deposits. While responses in a normal rate regime broadly align with the baseline analysis (see Figure 2), a low-rate regime displays distinct dynamics in terms of magnitude and persistence. Specifically, an increase in the two-year OIS rate during the low-rate regime produced no immediate adjustment in demand deposit rates for both households and firms. Corporate rates eventually responded positively and significantly after about eight months, while household deposit rates remained largely subdued throughout the projection horizon. This pattern contrasts with normal rate regime, when demand deposit rates, although still sticky, exhibit a measurable and earlier response. This asymmetry confirms that pass-through becomes less effective when rates are very low. One explanation lies in compression of banks' net interest margins, as deposit rates approach

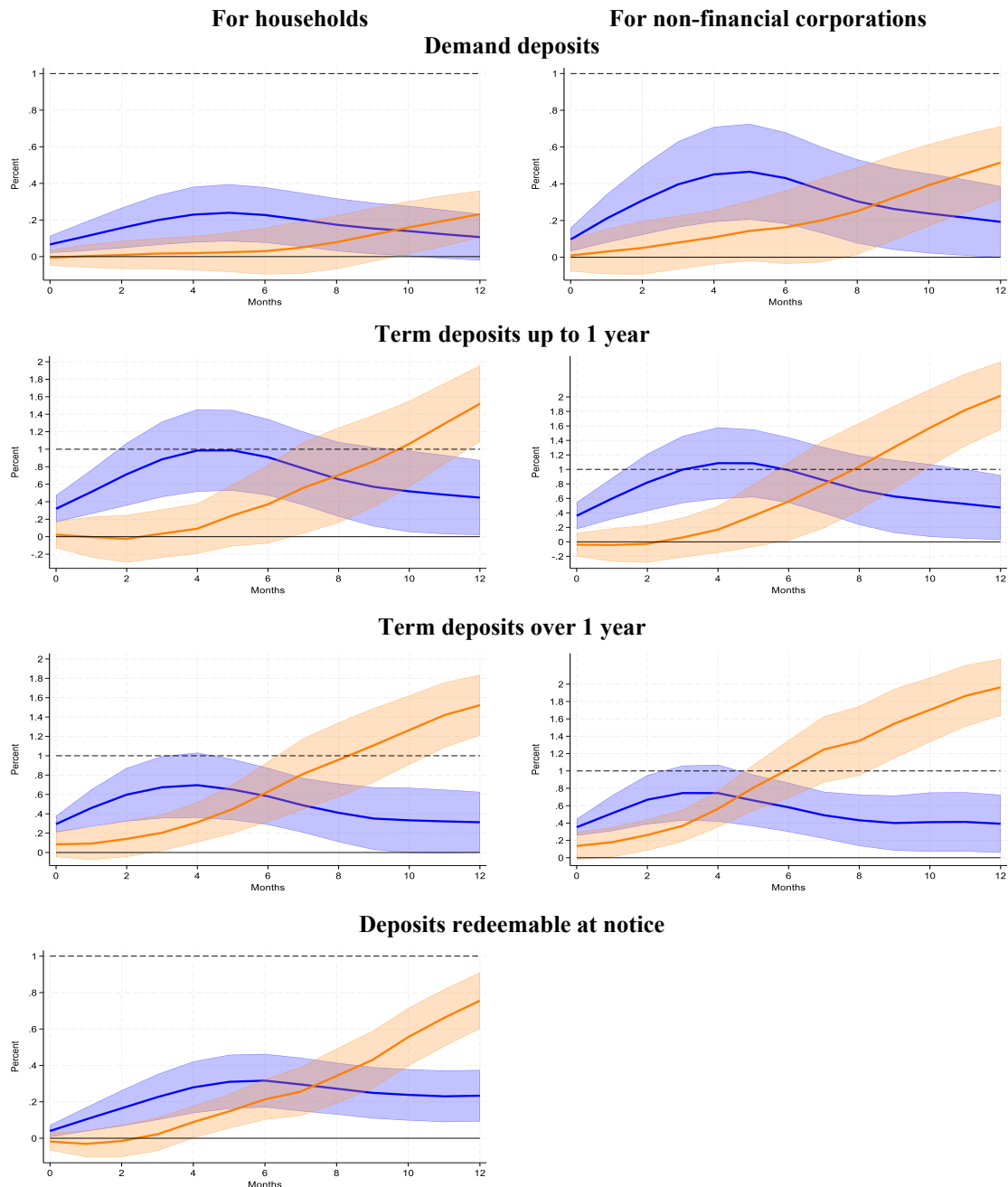
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<sup>9</sup> To our knowledge, only Austria, Belgium, and France explicitly legally prohibit banks to charge negative deposit rates for households. All other EA countries rely on strong soft constraints, including contractual limitations, supervisory guidance, litigation risks, and reputational factors, effectively preventing negative household deposit rates. In contrast, negative deposit rates have been widely applied to corporate deposits across the EA.

<sup>10</sup> The results hold when we use an alternative definition of the ZLB-period starting in June 2014 (when the DFR was cut by 10 basis points from 0% to -0.1%) and ending in July 2022. See Annex D for results.

zero and banks become reluctant or unable to pass on further rate cuts to depositors. This dynamic is consistent with the "reversal rate" hypothesis (Abadi et al., 2023), which posits that overly low policy rates can impair bank profitability and reduce incentives to transmit monetary policy easing, possibly leading to lower deposit rates even when benchmark rates rise.

**Figure 3. Effects of 1 p.p. increase in the 2-year OIS rate on bank deposit rates in normal (blue) and low interest rate (orange) regimes**



*Notes: the figure plots the smoothed impulse responses of bank deposit rates for households and non-financial corporations to a 1 p.p. increase in the two-year OIS rate. Blue (orange) lines show the responses in normal (low) interest rate regime. A low-rate regime dummy takes value 1 during the ZLB period (July 2012 - July 2022) and 0 otherwise. Shaded areas represent 90% confidence bands. X-axis denotes months in the projection horizon.*

Term deposits display a different pattern. Pass-through remains positive and significant even in the low-rate regime, but the adjustment is slower and initially more muted than in normal times. Interestingly, at longer horizons the cumulative response in the low-rate regime can exceed that in normal times. This may suggest that when market and policy rates decline further in an already-low interest rate environment, banks initially delay adjustments but eventually pass on the changes more fully, particularly for corporate term deposits. This behavior is consistent with observed practices during the ZLB period, when banks were more willing to apply negative rates to term deposits – especially for corporates – while maintaining zero floors on rates of demand deposits. NFC term deposits with maturity over one year exhibit the most persistent pass-through across both regimes, reflecting greater rate sensitivity. One possible interpretation is that banks, while initially cautious in adjusting long-term deposit rates during periods of very low policy rates, eventually transmit changes more fully as expectations about future rate paths become embedded in pricing strategies. Noteworthy, that interest rate movements were relatively small in the low-rate period, so a significant overshooting in the impulse response was probably somewhat minor in reality. Interest rates on household deposits redeemable at notice show an intermediate pattern and similar asymmetry, with stronger and faster pass-through in normal rate regime than in low-rate periods, albeit at smaller magnitudes.

As a robustness check, we follow the approach of van den End et al. (2025), identifying periods in our sample when the benchmark rate falls within the lowest range of its historical distribution. Since using the same interest rate as both the impulse variable and the state variable to define regimes may introduce econometric endogeneity, we rely on exogenous state variables that are suitable in our context. Specifically, we define a low-rate regime as periods when the €STR falls within the 20th lowest percentile of its historical distribution, which corresponds to -0.45% in our sample. To test sensitivity to the chosen threshold, we alternatively use the 50th lowest percentile of the €STR distribution, equal to -0.01%.<sup>11</sup> The results remain consistent with the main findings (see Annex D). When defining low-rate regimes based on the €STR distribution, the results remain qualitatively unchanged: demand deposits exhibit near-zero sensitivity in low-rate environments, while term deposits continue to adjust, albeit more slowly. This alternative specification mitigates concerns about endogeneity in regime classification and reinforces the conclusion that the observed asymmetry is structural rather than sample specific. We also repeat the analysis using the natural real

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<sup>11</sup> We follow Van den End et al. (2025) who define a low interest rate regime as the lowest 20 percent (in terms of the interest rate level) of observations in our sample. The results remain largely robust for alternative thresholds of the 30th or 40th lowest percentiles.

interest rate for the EA, constructed by Brand et al. (2026), which captures structural economic and financial trends determined outside our model. The results of this estimation show similar differences between normal and low-rate regimes (results available on request).

As an additional robustness check, we estimate the ECM with interaction terms between the two-year OIS rate and low-rate regime dummies (see Table E2 in Annex E). The results broadly confirm the LP findings: long-run pass-through for corporate demand deposits weakens in low-rate periods, while household demand deposits show a similar but statistically insignificant decline in pass-through. For term deposits over one year, pass-through tends to increase in low-rate regimes, particularly for corporates, whereas effects for term deposits up to one year and redeemable deposits are generally insignificant. These patterns are robust across alternative regime definitions (ZLB and €STR-based thresholds).

Overall, the evidence demonstrates that bank deposit rates were much stickier in the low interest rate environment. Demand deposits, particularly for households, show almost no sensitivity to changes in market rates, while term deposits retain some responsiveness, though with delayed dynamics. In contrast, responses in normal-rate regimes are broadly consistent with our baseline results, with near-complete pass-through for term deposits. These findings underscore the nonlinearity of monetary transmission at very low interest rates and highlight the constraints faced by banks in adjusting retail deposit pricing under such conditions.

### **5.3. Extension: pass-through across countries**

As another extension of our analysis, we examine whether pass-through differs across EA countries in our sample. To this purpose, we estimate country-specific LP models and compare the peak pass-through, defined as the highest point in the estimated impulse response over the projection horizon, for each deposit category. The results are presented in Table 3 as a heatmap, where the numerical values indicate the peak pass-through in percentage points and the color intensity reflects its magnitude: darker (lighter) red shades correspond to stronger (weaker) pass-through. This visual representation allows for an intuitive comparison between deposit types within a country and between countries for the same deposit category.

The overall pattern across countries is broadly consistent with the findings from the panel model. Term deposit rates exhibit substantially higher pass-through than demand deposit rates, and corporate deposits adjust more strongly than household deposits. *Within* each country, this ranking is remarkably stable: term deposits with maturities up to one year often approach full

pass-through, while household demand deposits remain the least responsive, with peak effects rarely exceeding a fraction of the market rate change. Deposits redeemable at notice occupy an intermediate position, reflecting their partial liquidity and hybrid characteristics.

*Between* countries, however, differences are substantial. Finland and Austria stand out with the highest pass-through across most deposit categories, particularly for term deposits, where responses are close to or above unity. Belgium and France also display relatively strong transmission for term deposits, though demand deposits remain sticky. At the other end of the spectrum, Portugal exhibits the lowest pass-through across nearly all deposit types, with especially muted responses for household deposits. Ireland also shows weak transmission, particularly for household demand deposits and short-term corporate deposits. Germany, Italy, the Netherlands, and Spain occupy intermediate positions, with patterns that generally mirror the EA panel average but with notable variation across deposit types.<sup>12</sup>

**Table 3. Cross-country heterogeneity: pass-through of 1 p.p. increase in 2-year OIS rate on bank deposit rates in individual EA countries**

Deposit type	Panel	AT	BE	DE	ES	FI	FR	IE	IT	NL	PT
HH demand deposits	0.23	0.30	0.08	0.32	0.13	0.42	0.07	0.14	0.30	0.20	0.06
HH term deposits, up to 1 year	0.99	1.08	1.34	1.08	0.95	1.18	0.80	0.81	0.75	0.82	0.82
HH term deposits, over 1 year	0.73	0.94	0.84	0.79	0.85	0.80	0.76	1.06	0.56	0.53	0.59
HH deposits redeemable at notice	0.39	0.24	0.38	0.27	N/A	0.43	0.62	0.61	0.28	0.41	0.06
NFC demand deposits	0.45	0.33	0.19	0.43	0.51	0.78	0.38	0.13	0.70	0.56	0.23
NFC term deposits, up to 1 year	1.09	1.05	1.24	1.20	1.04	1.34	1.16	0.93	0.96	1.06	1.04
NFC term deposits, over 1 year	0.81	1.12	0.94	0.79	0.83	1.10	1.23	1.27	0.57	0.65	0.80

*Note: the table displays the peak-pass-through (in percentage points), based on country-specific LP models with projection horizon of 18 months. Panel results are estimated for a full panel sample, as presented in Figure 2.*

This heterogeneity in transmission mechanism likely reflects a combination of structural, legal, fiscal, and institutional factors. Market concentration, funding structures, and bank-level characteristics can influence bank pricing behavior, which we examine in the next section. In addition, regulatory and contractual constraints play a role. For example, Belgium imposes a 0.11 percent floor for most retail deposits, while in France the interest rate on regulated savings products such as the Livret A is set administratively. Such institutional features may dampen or amplify the responsiveness of deposit rates to market conditions, contributing to observed heterogeneity. Mayordomo and Roibás (2023) similarly find heterogeneity in pass-through

<sup>12</sup> Country-level ECM estimates of long-run pass-through broadly confirm the heterogeneity observed in LPs, but the country ranking differs in some cases (results available on request). For example, Finland and Austria show strong pass-through in both approaches, while Portugal and Ireland consistently rank at the bottom. However, the ECM results suggest relatively higher pass-through for Belgium and France compared to the LP-based responses. These differences likely reflect that LPs capture peak short- to medium-term dynamics, while ECM focuses on the long-run steady-state relationship.

across EA countries, especially for retail time deposits, which they explain by bank and country characteristics. Specifically, they relate almost half of the difference between the remuneration of retail time deposits in Spain and the EA to differences across banking sectors in the need to raise deposit funding to supply credit.

#### **5.4. Possible drivers of pass-through: conditioning factors**

To explore whether and how pass-through varies across banks, countries, and deposit types, this section examines the role of structural and balance sheet characteristics using an error-correction framework with interaction terms. This methodological approach, following Gambacorta (2008) and Holton and Rodriguez (2018), allows assessing the impact of conditioning factors on the long-run relationship between bank deposit and market rates. Our focus is on the long-term pass-through, capturing the overall impact on deposit rates, while the short-term pass-through and the adjustment speed provide complementary insights (Annex E describes the ECM methodology). We measure the impact of each conditioning factor by calculating pass-through based on its average values above and below the interquartile range, i.e. the top and bottom 25 percent of observations in our sample. Then we take the difference between outcomes based on the top and bottom values, which indicates to what extent the pass-through changes as the value of the conditioning factor increases. Table 4 summarizes the main results. Full presentation of ECM estimates is reported in Table E3 in Annex E.

Market concentration emerges as the most significant determinant. Higher concentration in the deposit market reduces the long-term pass-through across all deposit types (with one exception). This finding is consistent with the notion that banks in more concentrated banking sectors face less competitive pressure and thus are more reluctant to adjust deposit rates. The impact is most pronounced for demand deposits, where banks are already likely to have some degree of market power because of associated payment services where switching costs are high. The supplementary indicators (see Table E3) suggest that limited pass-through in concentrated banking sectors is not only reflected by a lower long-term impact, but also by a slower adjustment speed towards the steady state. Recent evidence for the EA confirms that concentrated markets exhibit weaker monetary transmission (Messer and Niepmann, 2023; Beyer et al., 2024; Kho, 2025), and similar patterns have been documented for Germany (Heckmann-Draisbach and Moertel, 2020) and the U.S. (Drechsler et al., 2021; Gödl-Hanisch and Pandolfo, 2025).

**Table 4. Impact of conditioning variables on long-term pass-through, ECM results**

	Market concentration	Leverage ratio	Total assets	Liquid assets ratio	Deposit funding ratio
HH demand deposits	-0.107 ***	-0.084 ***	-0.020	-0.089	-0.089 *
HH term deposits, up to 1 year	-0.033 **	-0.042	0.061	-0.021 ***	-0.338
HH term deposits, over 1 year	0.001 *	0.137	-0.124	0.194	0.139 **
HH, redeemable at notice	-0.346	-0.263 **	0.084	-0.034	-0.053 **
NFC, demand deposits	-0.070 ***	-0.112 *	0.029	-0.154	-0.096 **
NFC term deposits, up to 1 year	-0.026 ***	-0.054	0.025	-0.118 ***	-0.139
NFC term deposits, over 1 year	-0.026 **	0.006	0.052 *	0.068	-0.104

*Notes: the table shows the difference between the long-term pass-through calculated for observations where values of a conditioning variable are above the third quartile, and those where the values of this variable are below the first quartile; \*, \*\* and \*\*\* indicate that the difference between the upper and lower pass-through measure is statistically significant at the 10%, 5% and 1% level, respectively. Market concentration is proxied by the Herfindahl-Hirschmann Index, calculated for each month and deposit type, using outstanding volumes.*

Next, the results show that pass-through tends to be lower for relatively solid banks, as reflected by higher capitalization and liquidity. The finding that better-capitalized banks exhibit lower pass-through for demand and notice deposits is consistent with these banks facing weaker marginal funding pressure and enjoying a stronger deposit franchise. Higher capitalization reduces reliance on rate-sensitive funding and enhances perceived safety, allowing such banks to adjust deposit rates less aggressively in response to market rate changes. This effect is particularly pronounced for transactional deposits, which are less interest-elastic. Rather than reflecting balance-sheet constraints, weaker pass-through for better-capitalized banks appears to capture greater ability to extract franchise rents from depositors who value convenience over return. For term deposits, the effect is insignificant. Bank's liquidity position matters, too. A higher share of liquid assets is associated with lower pass-through for deposits up to one year both for households and corporates and has no significant impact on other categories. This may suggest that banks with ample liquidity buffers face less pressure to compete for funds. It aligns with Demiralp et al. (2021) and Beyer et al. (2024), who show that excess liquidity in the EA dampened deposit rate sensitivity during periods of unconventional monetary policy.

By contrast, bank size – measured by total assets (log) – does not significantly affect pass-through once other factors are controlled for. This suggests that size per se may be relatively less important than funding structure or market concentration, although size may correlate with these characteristics indirectly.

Finally, a share of deposit funding in bank's total assets significantly reduces the long-term pass-through for demand and redeemable deposits. Banks heavily reliant on deposits may prioritize stability over price competition, particularly for transactional accounts, reinforcing the stickiness of these products. This is particularly understandable in periods of negative

interest rates, when deposit-intensive banks may have been more cautious to cut rates below zero, aiming to protect their core funding base. For instance, Altavilla et al. (2022) provide evidence that banks with higher deposit funding have been less likely to charge negative rates in recent years. Böhnke et al. (2024) show that deposit funding dampens pass-through from market rates to household deposit rates, but not to NFC deposit rates.

Taken together, these results underscore that structural features of the banking sector and individual bank balance sheet characteristics to some extent shape monetary transmission. Market concentration appears to be a dominant driver, while bank's liquidity position, capitalization, and funding structure exert additional influence.

To further investigate the role of banking competition and market concentration in shaping pass-through, we complement our analysis with two additional indicators: frequency of customers switching to another bank and annual fees for keeping a bank account. Questions on switching frequency were included in the European Commission's (EC) Eurobarometer Surveys, while the data on annual payment fees come from two separate studies by the European Commission based on a stock-take among banks per country. These variables capture dimensions of customer mobility and pricing strategies that may influence banks' incentives to adjust deposit rates. The results are reported in Table 5.

Our findings indicate that switching frequency has a significant positive impact on pass-through for household payment accounts (demand deposits), while the effect for savings accounts (term deposits) is insignificant. It suggests that greater customer mobility strengthens competitive pressure, incentivizing banks to adjust deposit rates more promptly when market rates change. This interpretation is consistent with evidence that high switching costs and customer inertia are key drivers of deposit rate stickiness (ECB, 2023). Evidence from Eurobarometer surveys and UK competition studies shows that annual switching rates for retail bank accounts are typically below 10% (CMA, 2016; European Commission, 2022). Thus, only a small fraction of customers switches banks annually, which allows banks to exploit the "deposit franchise" and maintain low deposit betas (Drechsler et al., 2021; Polo, 2021). In this context, policies aimed at reducing switching barriers, such as account portability initiatives, could enhance monetary transmission by increasing competitive pressure.

Higher payment fees are also associated with stronger pass-through of market rates to demand deposits. At first glance, this may seem counterintuitive, as higher fees could signal greater market power, which would normally dampen rate sensitivity. A more plausible

explanation is that higher payment fees directly compensate banks for fixed costs of providing payment services, reducing their reliance on cross-subsidization through low deposit rates. This interpretation is consistent with Drechsler et al. (2021), who emphasize that banks exploit the deposit franchise to hedge interest rate risk and cover non-interest costs. When these costs are offset by explicit fees, banks may have less incentive to keep deposit rates artificially low.<sup>13</sup> Similar mechanisms have been documented in two-sided payment markets, where pricing adjustments on one side of the market (fees) affect competitive dynamics on the other (deposit rates). Manuszak and Wozniak (2017) provide evidence from the U.S. debit card regulation showing that when interchange fee revenues were capped, banks responded by increasing account fees and adjusting deposit account terms, illustrating how payment-related revenues and deposit pricing are jointly determined.

**Table 5. Impact of switching frequency and costs of payment accounts on pass-through**

	Switching frequency	Payment account fees
HH demand deposits	0.051 **	0.043 ***
HH term deposits, up to 1 year	0.002	
HH term deposits, over 1 year	0.085	

*Notes: switching frequency is taken from the EC Eurobarometer survey in 2016 and 2022, which included the question “In the last 5 years have you changed provider of these products and services?” for several financial products including payment accounts and savings accounts. We included country results from the 2022 survey for the years 2017-2025 and results from the 2016 survey for pre-2017 years. For payment accounts, a similar question was asked in 2011; we include the results for the 2007-2011 years. For savings accounts we include the 2016 outcomes for the entire 2007-2016 period. Payment fees are taken from two studies by the EC (2007, 2019), with country-specific data based on individual banks. We include median fees for each country and rescale them with GDP per capita levels to facilitate direct comparison. We use the 2007 results for the 2007-2015 period and the 2019 results for the 2016-2025 period. Interpretation of the coefficients: see Table 4.*

We carried out robustness checks for our ECM estimates with different lag structures and alternative benchmark rates (see Annex E). In general, this does not materially change the outcomes and has no implications for conclusions.

## 6. Conclusions

This paper examines the pass-through of market interest rates to bank deposit rates in the EA, drawing on comprehensive bank-level data from July 2007 up to March 2025. We employ two methodological approaches – local projections and an error-correction model – to analyze the

<sup>13</sup> Deposit pricing may also be influenced by banks’ strategic focus on building a deposit franchise, particularly for institutions that emphasize payment services and digital banking (e.g. digital-only banks such as Bunq or Revolut). These banks may exhibit different deposit pricing incentives that are not fully captured by our analysis. A more explicit treatment of digitalization and payment-focused business models is left for future research.

dynamics of pass-through over time, across interest rate regimes, and among EA countries. Our study also explores potential drivers of pass-through including bank balance sheet characteristics, market concentration, and payment and switching costs.

The results show that pass-through of market rates to bank deposit rates is significant. This suggests that market rates strongly influence banks' deposit pricing, highlighting the importance of longer-term interest rates in shaping monetary transmission. However, pass-through is uneven. First, it varies between deposit types and customer segments, with a strong response of term and corporate deposits while demand and household deposits remain sticky. Second, the effectiveness of pass-through diminishes in low-interest-rate periods, particularly for demand deposits, which show minimal responsiveness. Such stickiness can dampen or even counteract the intended monetary policy stance in the low rate environment. Third, substantial differences in pass-through across countries further contribute to heterogeneous transmission.

Structural features of the banking sector and individual balance sheet characteristics play a role, too. Market concentration is a dominant driver: banks operating in more concentrated markets exhibit lower pass-through, especially for demand deposits. In addition, banks with larger liquidity buffers, stronger capitalization, and greater reliance on deposit funding adjust deposit rates less in response to market rate changes. Higher customer switching frequency is associated with stronger pass-through for household demand deposits, while higher payment account fees are also linked to greater rate sensitivity.

The findings carry important policy implications. Policymakers need to take into account the asymmetries in monetary transmission or consider measures to mitigate them. Weakened pass-through in low-rate regimes constrains effectiveness of conventional interest rate policies, suggesting that central banks may need to rely more on complementary instruments such as targeted longer-term refinancing operations, asset purchases, and forward guidance to achieve desired policy stance and support effective transmission. Observed cross-country differences in pass-through can lead to uneven monetary conditions across the EA, complicating the implementation of a single monetary policy. This underscores the need for ongoing monitoring and, where appropriate, targeted interventions to address divergences.

Structural policies can play a role in mitigating pass-through asymmetries, even though such measures typically fall outside the central bank's remit. For instance, increasing competition in retail banking - through reforms that enhance competition and reduce switching costs, such as account portability initiatives or greater transparency around bank account fees

- can strengthen pass-through, particularly for demand deposits. The European Union has already taken steps over the past 15 years to improve transparency and make it easier for customers to switch between banks.<sup>14</sup> These efforts could be further reinforced in the context of the Savings and Investment Union launched in 2025.<sup>15</sup> However, while such measures may improve monetary transmission, they should be balanced against potential impacts on bank profitability, as increased competition may prompt banks to recover costs through higher fees for payment services or other channels. Moreover, the rise of digital banking and fintech is likely to further lower switching costs and increase competitive pressure, potentially strengthening pass-through in the future. An analysis of the implications of digitalization and payment-oriented business models for deposit pricing and monetary transmission therefore remains an important avenue for future research.

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<sup>14</sup> [https://finance.ec.europa.eu/consumer-finance-and-payments/retail-financial-services/access-bank-accounts\\_en](https://finance.ec.europa.eu/consumer-finance-and-payments/retail-financial-services/access-bank-accounts_en).

<sup>15</sup> [Savings and investments union - Finance - European Commission](#).

## References

- Abadi, J., M. Brunnermeier, and Y. Koby (2023). The reversal interest rate. *American Economic Review*, 113 (8), 2084-2120.
- Altavilla, C., G. Carboni, and R. Motto (2021). Asset purchase programs and financial markets: Lessons from the euro area. *International Journal of Central Banking*, 17(70), 1-48.
- Altavilla, C., L. Burlon, M. Giannetti, and S. Holton (2022). Is there a zero lower bound? The effects of negative policy rates on banks and firms. *Journal of Financial Economics*, 144(3), 885-907.
- Avignone, G., C. Girardone, C. Pancaro, L. Pancotto and A. Reghezza (2025). Making a virtue out of necessity: The effect of negative interest rates on bank cost efficiency. *Journal of International Money and Finance*, 155, 103306.
- Basten, C., and M. Mariathan (2023). Interest rate pass-through and bank risk-taking under negative-rate policies with tiered remuneration of central bank reserves. *Journal of Financial Stability*, vol. 68(C), 101160.
- Beyer, R.C.M., R. Chen, F. Misch, C. Li, E.O. Ozturk, and L. Ratnovski (2024). Monetary policy pass-through to interest rates: stylized facts from 30 European countries. IMF Working Papers 2024/009, International Monetary Fund.
- Böhnke, V., L. Heckmann-Draisbach, and H. Littke (2024). Banks' interest rate pass-through: Frictions and heterogeneity. ECB ChaMP Research Network Paper. European Central Bank.
- Brand, C., G. Goy, and W. Lemke (2026). Estimating the natural rate of interest in a macro-finance yield curve model. *Journal of Business & Economic Statistics*, 1-44, <https://doi.org/10.1080/07350015.2025.2561409>.
- Carbo-Valverde, S., T. Hannan, and F. Rodriguez-Fernandez (2011). Exploiting old customers and attracting new ones: The case of bank deposit pricing. *European Economic Review*, 55(7), 903-915.
- Competition and Markets Authority (CMA) (2016). Retail banking market investigation: Final report. London: CMA, August 2016.
- Demiralp, S., J. Eisenschmidt, and T. Vlassopoulos (2021). Negative interest rates, excess liquidity and retail deposits: banks' reaction to unconventional monetary policy in the euro area. *European Economic Review*, 136(C), 103745.

- Drechsler, I., A. Savov, and P. Schnabl (2017). The deposits channel of monetary policy. *The Quarterly Journal of Economics*, 132 (4), 1819-1876.
- Drechsler, I., A. Savov, and P. Schnabl (2021). Banking on deposits: maturity transformation without interest rate risk. *The Journal of Finance*, 76, 1091-1143.
- Driscoll, J. C., and A. C. Kraay (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics*, 80 (4), 549-560.
- Duprey, T. and Klaus, B. (2015). Dating systemic financial stress episodes in the EU countries. Working Paper Series No 1873, European Central Bank.
- European Central Bank (2023). Study on the payment attitudes of consumers in the euro area (SPACE). ECB Report.
- European Commission (2022). Eurobarometer survey on retail financial services and products. Brussels: European Commission, October 2022.
- Freixas, X., and J.C. Rochet (1997). *Microeconomics of banking*. The MIT Press.
- Freriks, J., and J. Kakes (2024). Lessons from low interest rate policy: How did euro area banks respond? *Journal of International Money and Finance*, 146(C), 103122.
- Gambacorta, L. (2008). How do banks set interest rates? *European Economic Review*, 52(5), 792-819.
- Gödl-Hanisch, I., and J. Pandolfo (2025). Monetary policy transmission, bank market power, and income source. Research Working Paper No. 25-02. Federal Reserve Bank of Kansas City.
- Hannan, T.H., and R.M. Adams (2011). Consumer switching costs and firm pricing: evidence from bank pricing of deposit accounts. *Journal of Industrial Economics*, 59(2), 296-320.
- Heckmann-Draisbach, L., and J. Moertel (2020). Hampered interest rate pass-through – a supply-side story? Working Paper no. 59/2020, Deutsche Bundesbank.
- Heider, F., F. Saidi, and G. Schepens (2021). Banks and negative interest rates. *Annual Review of Financial Economics*, 13(1), 201-218.
- Hoffmann, P., S. Langfield, F. Pierobon, and G. Vuillemeys (2019). Who bears interest rate risk? *The Review of Financial Studies*, 32(8), 2921-2954.
- Holton, S. and C. Rodriguez d’Acri (2018). Interest rate pass-through since the Euro Area crisis. *Journal of Banking & Finance*, 96, 277-291.

- Jordà, Ò. (2005). Estimation and inference of impulse responses by local projections. *American Economic Review*, 95(1), 161-182.
- Kang-Landsberg, A., and M. Plosser (2022). How do deposit rates respond to monetary policy? Liberty Street Economics, November 1, Federal Reserve Bank of New York.
- Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of Econometrics*, 90(1), 1-44
- Kho, S. (2025). Deposit market concentration and monetary transmission: Evidence from the euro area. *European Economic Review*, 173(C), 104933.
- Klein, M. (1971). A theory of the banking firm. *Journal of Money, Credit and Banking*, 3, 205-218.
- Lerner, A. P. (1934). The Concept of monopoly and the measurement of monopoly power. *The Review of Economic Studies*, 1(3), 157-175.
- Lopez, J.A., A.K. Rose, and M.M. Spiegel (2020). Why have negative nominal interest rates had such a small effect on bank performance? Cross country evidence. *European Economic Review*, 124, 103402.
- Maes, K. and T. Timmermans (2005). Measuring the interest rate risk of Belgian regulated savings deposits, *Financial Stability Review*, National Bank of Belgium, vol. 3(1), 137-151.
- Manuszak, M. D., and K. Wozniak (2017). The impact of price controls in two-sided markets: Evidence from US debit card interchange fee regulation. Finance and Economics Discussion Series 2017-074, Board of Governors of the Federal Reserve System.
- Mayordomo, S., and I. Roibás (2023). The pass-through of market interest rates to bank interest rates. Occasional Papers 2312, Banco de España.
- Messer, T. and F. Niepmann (2023). What determines passthrough of policy rates to deposit rates in the Euro Area? FEDS Notes No. 2023-07-28-2, Washington: Board of Governors of the Federal Reserve System.
- Monti, M. (1972). Deposit, credit and interest rate determination under alternative bank objectives. In: *Mathematical methods in investment and finance*, edited by G.P. Szego and K. Shell, Amsterdam, North-Holland.
- Montiel Olea, J. L., and M. Plagborg-Møller (2021). Local projection inference is simpler and more robust than you think. *Econometrica*, 89 (4), 1789-1823.
- Polo, A. (2021). Imperfect pass-through to deposit rates and monetary policy transmission. Bank of England Working Papers 933, Bank of England.

Sopp, H. (2018). Interest rate pass-through to the rates of core deposits – a new perspective.

Discussion Paper No 25, Deutsche Bundesbank.

Ulate, M. (2021). Going negative at the Zero Lower Bound: the effects of negative nominal interest rates. *American Economic Review*, 111 (1), 1-40.

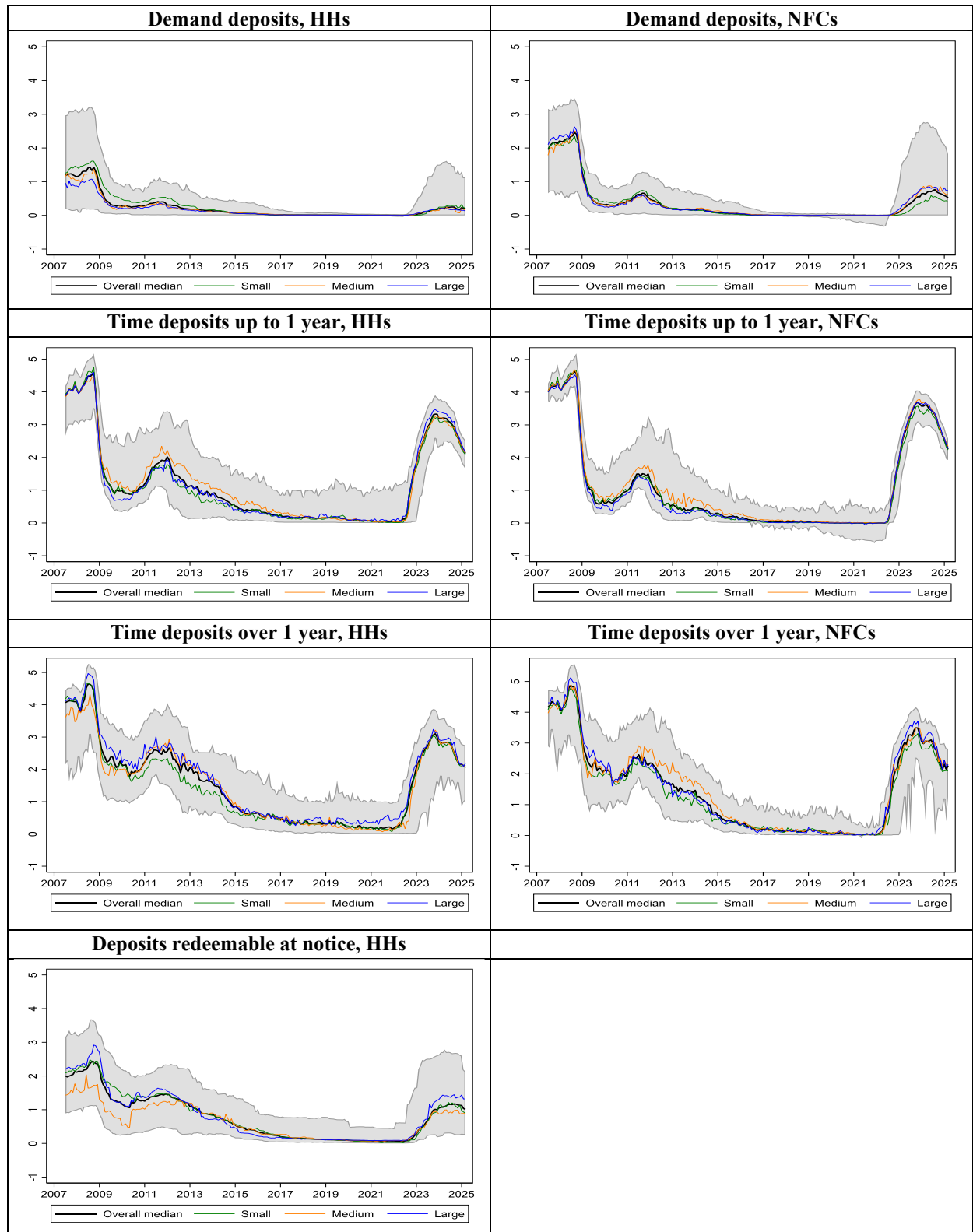
Van den End, J. W., P. Konietschke, A. Samarina, and I. Stanga (2025). Macroeconomic reversal rate in a low interest rate environment. *International Journal of Central Banking*, 21(3), 1-68.

Van Leuvensteijn, M., C. Kok Sørensen, J.A. Bikker, and A.A.R.J.M. van Rixtel (2013). Impact of bank competition on the interest rate pass-through in the euro area. *Applied Economics*, 45(11), 1359-1380.

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics*, 69(6), 709-748.

**Annex A**

**Figure A1. Dispersion of deposit rates over time and across banks**



*Notes: the figure displays the evolution and dispersion of deposit rate across banks for analyzed deposit categories. The thick black line shows the overall median across the sample, with the 10th–90th percentile range (grey area). In addition, median rates are shown for small (green line), medium (orange line), and large banks (blue line), classified by monthly tertiles of bank size distribution, measured by bank’s total assets: small banks – bottom tercile, medium banks – above first and below third tercile, large banks – top tercile).*

## Annex B. What is the duration of bank deposits?

The duration (i.e. interest rate sensitivity) of deposits is important for banks' overall interest rate risk management. Particularly for demand deposits, assessing duration is not straightforward as they do not have a fixed maturity; these deposits can be withdrawn immediately but overall tend to be sticky and unresponsive to interest rate changes. The latter also reflects convenience, which means that the attractiveness of holding demand deposits largely depends on the associated payments services rather than just on interest rates. Drechsler et al. (2021) denote this as the “deposit franchise”, allowing banks to pay relatively low and constant interest rates.

Term deposits typically have a fixed maturity and coupon payments, which makes the calculation of duration more straightforward. As interest income is likely to be a key motivation to hold term deposits, these are more likely to respond to market rates with a similar maturity than demand deposits.

Based on observed client behavior, banks typically estimate the duration of demand deposits at 2-3 years for households and somewhat lower for corporates. The interest rate sensitivity of term deposits is more likely to be determined by contractual maturity. Table B1 presents duration estimates based on supervisory data and our own calculations. The table shows that duration tends to be higher for demand deposits than for term deposits, and higher for households than for corporates.

**Table B1. Deposit duration (in years): estimates**

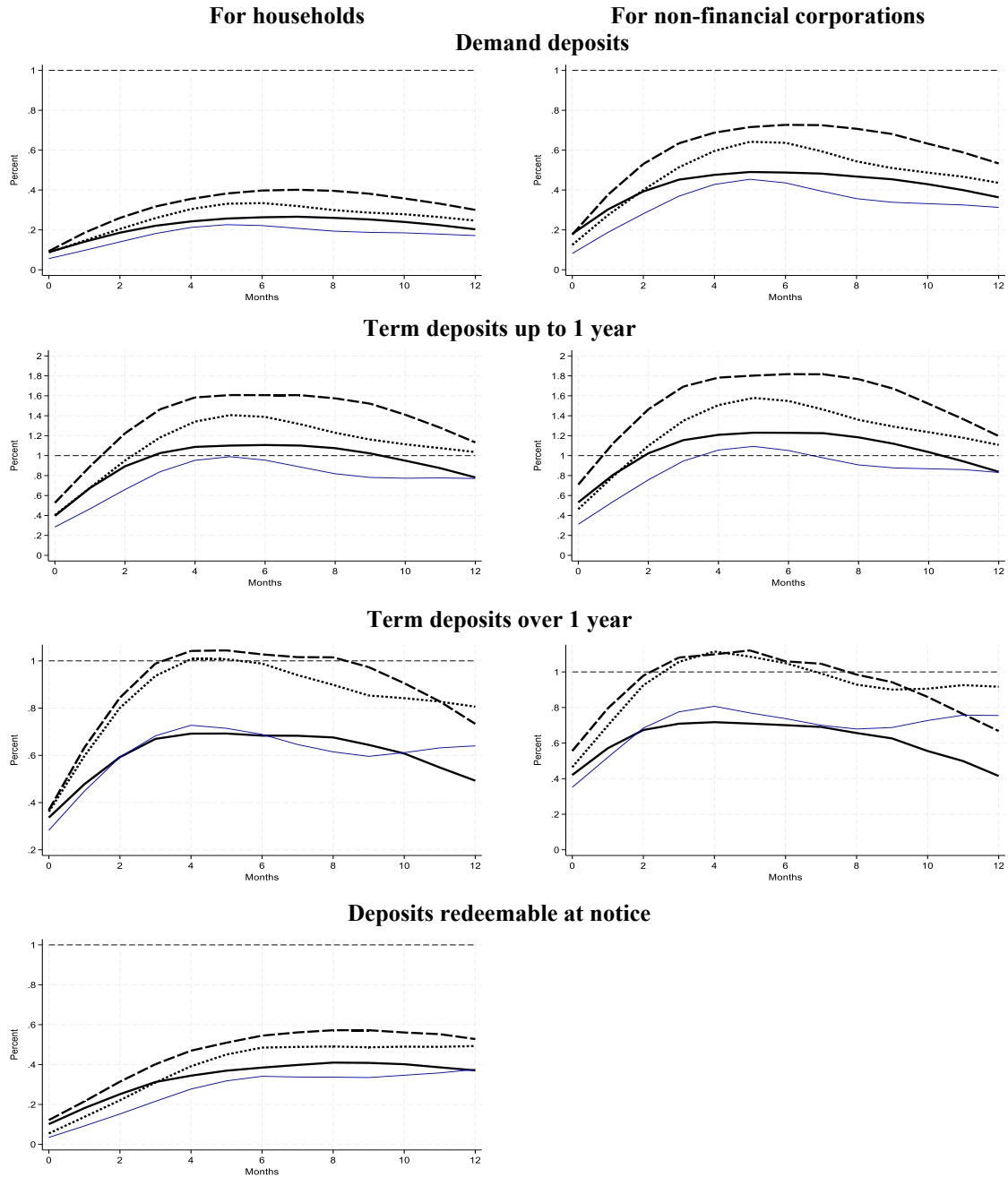
	Supervisory data <sup>a</sup>	Proxy: replicating market portfolio <sup>b</sup>		
		EA level	Country level	Bank-specific
Demand deposits				
Households	2.00	2.19	2.16	1.83
NFCs	1.02	1.92	1.91	1.65
Term deposits				
Households <1 year		1.98	1.43	1.37
Households > 1 year		2.61	2.37	2.09
NFCs < 1 year		0.69	0.72	1.01
NFCs > 1 year		2.46	2.49	2.12
Household deposits redeemable at notice		2.40	1.81	1.84

<sup>a</sup> Mean duration of SSM banks, based on supervisory reports, end-2015. Source: Hoffmann et al. (2019).

<sup>b</sup> Based on grid search for different baskets of three market rates (€STR, one-year, three-year swap rates) to select the portfolio which is most similar to each of the deposit rates, using the data over 2007-2025. The selection is based on minimizing the standard deviation of the difference between the market portfolio and the deposit rate. Calculations have been made for, respectively, EA aggregate deposit rates, country-level deposit rates and bank-specific deposit rates. See Maes and Timmermans (2005) for a discussion about methodology.

**Annex C**

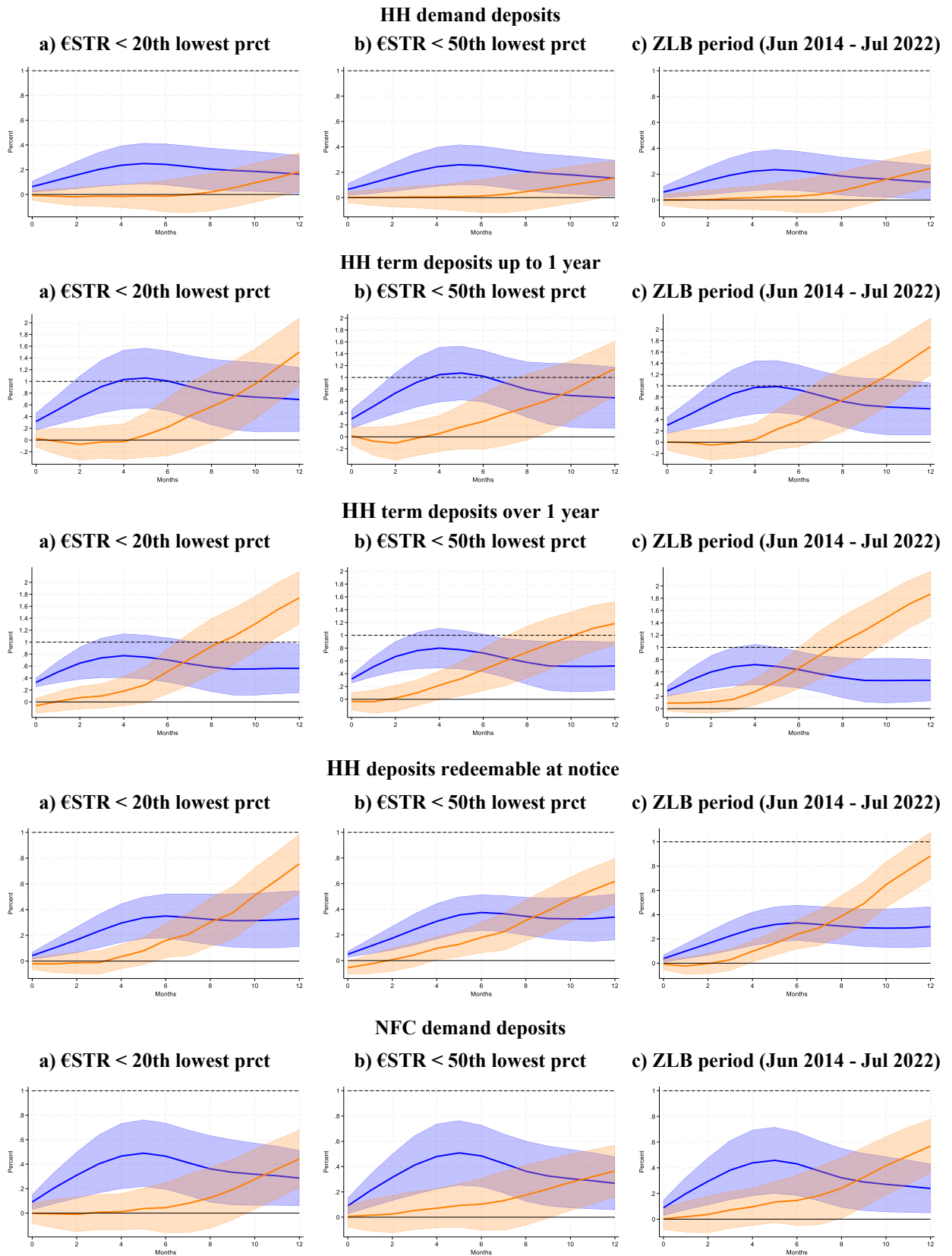
**Figure C1. Robustness check - effects of 1 p.p. increase in the DFR (black solid line), €STR (long-dashed line) and one-year OIS rate (short-dashed line) on bank deposit rates**



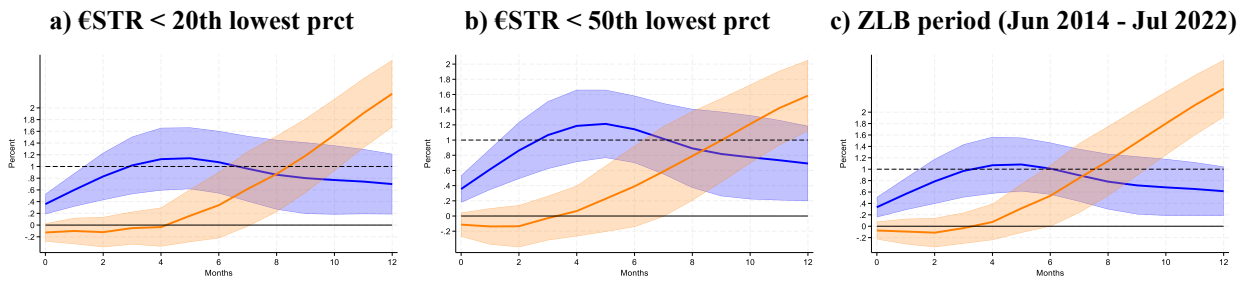
*Notes: the figure plots the smoothed impulse responses of bank deposit rates for households and non-financial corporations to a 1 p.p. increase in the DFR, the €STR, and the one-year OIS rate, denoted by the black solid, long-dashed, and short-dashed lines, respectively. Solid blue line denotes the baseline specification – responses to the two-year OIS rate, as in Figure 2; x-axis denotes months in the projection horizon. All responses are statistically significant at the 5% significance level. Confidence bands are not included, for better chart visibility.*

## Annex D. Pass-through in normal versus low rate regime – robustness checks

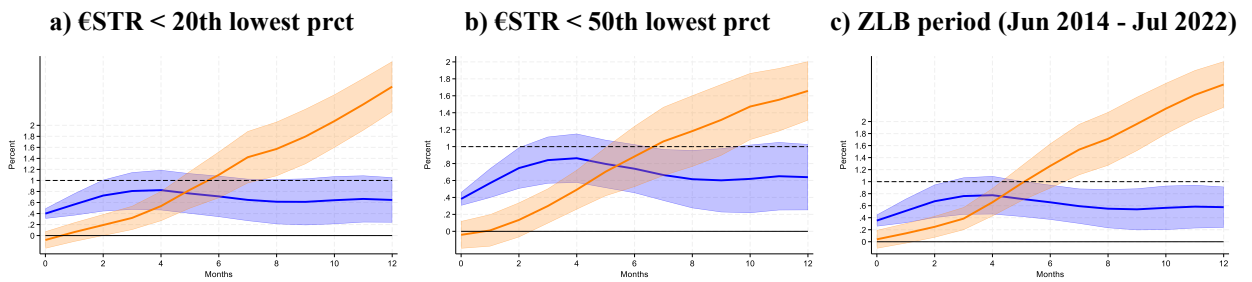
**Figure D1. Effects of 1 p.p. increase in the 2-year OIS rate on bank deposit rates in normal (blue) and low interest rate (orange) regimes, with low rate regime defined by periods ...**



**NFC term deposits up to 1 year**



**NFC term deposits over 1 year**



Notes: the figure plots the smoothed impulse responses of bank deposit rates for households and non-financial corporations to a 1 p.p. increase in the two-year OIS rate. Blue (orange) lines show the responses in normal (low) interest rate regime. A low-rate regime dummy takes the value 1: a) for periods when the €STR falls within the 20th lowest percentile of its time series, equal -0.45% in our sample; b) for periods when the €STR falls within the 50th lowest percentile of its time series, equal -0.01% in our sample; c) for alternative definition of ZLB period from June 2014 (DFR cut by 10 bps from 0% to -0.1%) until July 2022 (DFR hike by 50 bps from -0.5% to 0%); and 0 otherwise. Shaded areas represent 90% confidence bands around responses. X-axis denotes months in the projection horizon.

### Annex E. Error-correction model and conditioning factors

This annex outlines the error-correction model (ECM) employed to examine the deposit rate pass-through and the role of conditioning factors. We follow the methodology of Gambacorta (2008) and Holton and Rodriguez (2018), adapted to our setting in the following specification:

$$\Delta y_{i,t} = \gamma_0 + \sum_{j=1}^n \gamma_j \Delta y_{i,t-j} + \sum_{j=0}^n (\theta_j + \theta_j^* Z_{i,t-j}) \Delta r_{t-j} + \sum_{j=0}^n \phi_j X_{i,t-j} + \rho Z_{i,t-1} + (\alpha + \alpha^* Z_{t-1}) y_{i,t-1} + (\lambda + \lambda^* Z_{i,t-1}) r_{t-1} + \varepsilon_{i,t}, \quad (E1)$$

where the dependent variable is the monthly change in bank  $i$ 's deposit rate  $y_{i,t}$ , which is explained by its own lags and lagged changes in the market benchmark rate  $r_t$ . The specification also includes a similar set of control variables  $X_{i,t}$  as in the local projections model, comprising bank-specific variables (log-level of total assets, share of liquid assets, leverage ratio, and share of deposit funding) and country-level macroeconomic indicators (monthly year-on-year growth rates in HICP and industrial production index). Bank-specific fixed effects capture unobserved heterogeneity, and standard errors are clustered at the bank level. We investigate the impact of potential conditioning factors by adding them as interaction terms. Conditioning factors are incorporated through interaction terms  $Z_{i,t}$  of the market rate with a variable of interest, allowing us to assess how structural characteristics influence the pass-through mechanism. The remaining terms represent the long-term relationship between  $y_{i,t}$  and  $r_t$ , as well as the interaction of  $r_t$  with  $Z_{i,t}$ . The latter are evaluated at the average levels of the conditioning factor below each quartile, i.e.  $\bar{Z}_{t-1}^p$  for  $p = 1, 2, 3$ , and 4.

From the equation (E1), the following three indicators can be derived:

- (1) Long-term pass-through:  $-(\lambda + \lambda^* \bar{Z}_{t-1}^p) / (\alpha + \alpha^* \bar{Z}_{t-1}^p)$
- (2) Short-term pass-through:  $\theta_0 + \theta_0^* \bar{Z}_{t-1}^p$
- (3) Adjustment speed:  $\alpha + \alpha^* \bar{Z}_{t-1}^p$

In the absence of interaction terms with conditioning factors  $Z_{i,t}$ , these indicators are the familiar characteristics of an error-correction framework: the short-term pass-through ( $\theta_0$ ) is the contemporaneous regression coefficient of the benchmark interest rate; the long-term pass-through ( $-\lambda/\alpha$ ) follows from the equilibrium relationship between both interest rates.<sup>16</sup>

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<sup>16</sup> In error-correction specifications, the long-term equilibrium is often presented as  $\alpha * (y_{i,t} - \beta r_t)$ . The term in parentheses reflects the cointegrating relationship between both rates ( $\beta$  can be interpreted as the equilibrium pass-through). The term  $\alpha$  is the speed of adjustment towards long-term equilibrium, which should be negative to ensure error correction. In our regressions, however, we include the levels of  $y_{i,t}$  and  $r_t$  as separate terms to facilitate the inclusion of  $Z_t$ . But it can easily be seen that the long-term adjustment coefficient is equivalent to  $\beta = -\lambda/\alpha$  if  $Z_t$  is ignored and  $-(\lambda + \lambda^* Z_{t-1}) / (\alpha + \alpha^* Z_{t-1})$  if  $Z_t$  is added.

Among these, the long-term pass-through is the most informative measure for assessing the overall transmission of the benchmark rate to bank deposit rates, while the other two measures provide supplementary insights into dynamics of adjustment. Complete and immediate transmission would imply both pass-through measures close to unity and an adjustment speed near -1. Westerlund (2007) and Kao (1999) panel cointegration tests reject the null hypothesis of no cointegration in all our specifications.

Table E1 reports the estimates of the three pass-through measures, derived from regressions for each deposit rate without conditioning factors  $Z_{i,t}$ . All coefficients are statistically significant and broadly consistent with the patterns observed in our LPs results. The long-term pass-through is highest for term deposits, particularly those with maturities up to one year, and lowest for demand deposits, with redeemable-at-notice deposits occupying an intermediate position. Corporate deposits exhibit higher pass-through than household deposits across all maturities. The short-term pass-through and the adjustment speed follow a similar pattern across deposit types, indicating that deposit products with higher long-run sensitivity also adjust more rapidly. These findings align with the LP responses, where long-term pass-through averages 0.8 for term deposits, while demand deposits display lower responsiveness. The ECM thus corroborates the LPs evidence, reinforcing the robustness of our conclusions.

**Table E1. Pass-through measures, ECM without interaction variables**

	Long-term pass-through	Short-term pass-through	Adjustment speed
HH demand deposits	0.225 ***	0.023 ***	-0.042 ***
HH term deposits, up to 1 year	0.784 ***	0.127 ***	-0.129 ***
HH term deposits, over 1 year	0.755 ***	0.158 ***	-0.106 ***
HH, redeemable at notice	0.517 ***	0.038 ***	-0.038 ***
NFC, demand deposits	0.367 ***	0.023 **	-0.061 ***
NFC, term deposits, up to 1 year	0.903 ***	0.252 ***	-0.132 ***
NFC, term deposits, over 1 year	0.814 ***	0.263 ***	-0.185 ***

*Notes: the table shows the estimates of three pass-through measures, derived from regressions for each bank deposit rate without conditioning factors. \*, \*\* and \*\*\* indicates that the estimated measure is statistically significant at the 10%, 5% and 1% significance level, respectively.*

To complement the LPs analysis in Section 5.2, we re-estimate the ECM by introducing interaction terms between the two-year OIS rate and dummy variables identifying low-rate regimes. This specification allows assessing whether the long- and short-run dynamics of deposit rate adjustment differ between normal and low interest rate environments. Table E2 presents the estimates of the interaction terms for three pass-through indicators under several

definitions of the low-rate regime: the policy-based ZLB period (July 2012 - July 2022), an alternative ZLB dating (June 2014 - July 2022), and thresholds based on the €STR distribution.

The results reveal asymmetry in the transmission across regimes. For corporate demand deposits, the long-run pass-through declines significantly in a low rate regime, indicating that banks substantially reduced the price sensitivity of these products to market rates in a low-rate environment. For household demand deposits, pass-through in a low rate regime is statistically insignificant, which is consistent with the LPs evidence showing that these deposit rates remain largely unresponsive when rates are very low. For term deposits over one year, the ECM results point to stronger long-run pass-through in low-rate regimes, particularly for corporate deposits. This finding aligns with the LPs evidence that cumulative responses at longer horizons can exceed those observed in normal-rate periods, even though initial adjustments tend to be slower. By contrast, for term deposits up to one year and for deposits redeemable at notice, the low-rate-regime effects are small and insignificant, suggesting that pass-through for these deposits remains sizable even in low-rate conditions, albeit with slower initial adjustment. These findings are robust to alternative regime definitions based on the distribution of the €STR and alternative ZLB timing.

**Table E2. Pass-through measures, ECM, interaction terms of market interest rate with low-rate regime dummies**

	Long-term pass-through	Short-term pass-through	Adjustment speed	Long-term pass-through	Short-term pass-through	Adjustment speed
	ZLB period (Jul 2012 - Jul 2022)			ZLB period, alternative (Jun 2014 - Jul 2022)		
HH demand deposits	-0.240	-0.038 ***	-0.039 **	-0.224	-0.043 ***	-0.030
HH term deposits, up to 1 year	-0.259	-0.188 ***	-0.036	-0.509	-0.284 ***	-0.102 **
HH term deposits, over 1 year	0.284 **	-0.117 **	-0.033	-0.267	-0.219 ***	-0.062
HH, redeemable at notice	-0.170	-0.031 ***	-0.019 ***	-0.411	-0.010	-0.026 **
NFC, demand deposits	-0.420 ***	-0.055 ***	-0.009	-0.443 ***	-0.081 ***	-0.021
NFC, term deposits, up to 1 year	-0.570	-0.351 ***	-0.072 ***	-0.776	-0.508 ***	-0.171 **
NFC, term deposits, over 1 year	0.607 ***	-0.203 ***	-0.042 **	0.134 **	-0.285 ***	-0.111 **
	Low rate regime defined by €STR < 20th lowest pret			Low rate regime defined by €STR < 50th lowest pret		
HH demand deposits	-0.116	-0.034 ***	-0.035 **	-0.133	-0.039 ***	-0.024
HH term deposits, up to 1 year	-0.505 **	-0.124 ***	-0.040 **	-0.230	-0.164 ***	-0.055
HH term deposits, over 1 year	-0.098	-0.057	0.009	0.138	-0.050	-0.029
HH, redeemable at notice	-0.189	-0.008	-0.008	-0.053	-0.028 **	-0.018 ***
NFC, demand deposits	-0.062	-0.063 ***	-0.024	-0.240	-0.076 ***	-0.027 *
NFC, term deposits, up to 1 year	-0.542	-0.308 ***	-0.043	-0.485	-0.325 ***	-0.098 ***
NFC, term deposits, over 1 year	-0.068	-0.161 **	-0.061 **	0.478 ***	-0.101	-0.031

*Notes: the table shows the estimates of three pass-through measures from regressions for each bank deposit rate, including interaction terms between 2-year OIS rate and dummy variables identifying low-rate regimes. \*, \*\* and \*\*\* indicates that the coefficient is statistically significant at the 10%, 5% and 1% significance level, respectively.*

As a final step, we include conditioning factors  $Z_{i,t}$  individually into ECM specification to assess their influence on pass-through. For each factor, we compute the average long-term pass-through across quartiles of its distribution and report the difference between average values above and below the interquartile range, i.e.  $\bar{Z}_{t-1}^4$  and  $\bar{Z}_{t-1}^1$ , respectively. This difference measures how strongly the factor affects transmission. Summary results for the long-term pass-

through are presented in Table 4 (Section 5.4), while Table E3 provides the full set of estimates for three indicators: long-term pass-through, short-term pass-through, and adjustment speed.

**Table E3. Full presentation of pass-through measures with conditioning factors**

	Long-term pass-through	Short-term pass-through	Adjustment speed	Long-term pass-through	Short-term pass-through	Adjustment speed
	Market concentration (HHI)			Leverage ratio		
HH demand deposits	-0.107 ***	-0.015	0.019 **	-0.084 ***	-0.053 ***	0.013 **
HH term deposits, up to 1 year	-0.033 **	-0.068 *	-0.061 **	-0.042	-0.206 ***	-0.016
HH term deposits, over 1 year	0.001 *	-0.022	0.051 *	0.137	-0.133 *	0.068 *
HH, redeemable at notice	-0.346	-0.005	0.036	-0.263 **	0.017	0.000
NFC demand deposits	-0.070 ***	0.037	0.037 ***	-0.112 *	-0.057 *	0.005
NFC term deposits, up to 1 year	-0.026 **	-0.017	0.041 **	-0.054	-0.130 *	0.006
NFC term deposits, over 1 year	-0.026 **	-0.045	0.064 **	0.006	-0.163	0.043
	Total assets (log)			Liquid assets ratio		
HH demand deposits	-0.020	-0.003	-0.007	-0.089	-0.011	-0.007
HH term deposits, up to 1 year	0.061	0.089 *	0.031	-0.021 ***	-0.019	0.083 ***
HH term deposits, over 1 year	-0.125	0.034	-0.045	0.191	-0.035	0.039 **
HH, redeemable at notice	0.084	0.026	0.000	-0.036	-0.032	0.004
NFC demand deposits	0.029	0.027	-0.030	-0.153	-0.019	-0.024
NFC term deposits, up to 1 year	0.025	0.016	-0.041	-0.119 ***	-0.047	0.048 ***
NFC term deposits, over 1 year	0.052 *	0.102	-0.065 *	0.068	-0.187 *	0.050 *
	Deposit funding ratio					
HH demand deposits	-0.089 **	-0.051 ***	0.011			
HH term deposits, up to 1 year	-0.338	-0.216 ***	-0.145 ***			
HH term deposits, over 1 year	0.139 **	-0.111 *	0.142 ***			
HH, redeemable at notice	-0.053 **	-0.010	0.041 *			
NFC demand deposits	-0.096 **	-0.052 *	0.030			
NFC term deposits, up to 1 year	-0.139	-0.142 ***	-0.067 **			
NFC term deposits, over 1 year	-0.104	-0.300 ***	0.024			

*Notes: the table presents the estimated difference for three pass-through measures for observations where values of the conditioning variable are above the third quartile, and those where the values of the conditioning variables are below the first quartile; \*, \*\* and \*\*\* indicate that the difference between the upper and lower pass-through measure is statistically significant at the 10%, 5% and 1% significance level, respectively.*

Finally, we probe the robustness of ECM results by using alternative benchmark rates. Overall, this does not change our main findings. Table E4 shows the long-term pass-through estimates without interaction variables (upper panel), and the impact of market concentration on long-term pass-through (lower panel), using alternative benchmark rates. These alternative rates are the one-year OIS rate, the €STR, the ECB's DFR, and a rate based on a replicating portfolio of market rates. The replicating portfolio is the composition of overnight, one-year and three-year market rates that is most aligned with deposit rates in each category (Annex B presents corresponding durations). The first column in both panels repeats the first columns of Tables E1 and E3, respectively. The patterns are very similar across different benchmark rates: long-term pass-through is higher for term deposits than for demand deposits and, within these categories, higher for NFCs than households, while deposits redeemable at notice take an intermediate position. The impact of market concentration also tends to be negative and in most cases significant. The baseline results (using the two-year OIS) are most aligned with those of the one-year OIS and the replicating portfolio.

**Table E4. Robustness check: ECM with alternative benchmark rates**

<b>Long-term impact</b>								
	<b>2Y</b>	<b>OIS</b>	<b>1Y</b>	<b>€STR</b>	<b>DFR</b>	<b>Repl.</b>		
	<b>(baseline)</b>		<b>OIS</b>			<b>portfol</b>		
HH demand deposits	0.225	***	0.218	***	0.217	***	0.229	***
HH term deposits, up to 1 year	0.784	***	0.746	***	0.717	***	0.734	***
HH term deposits, over 1 year	0.755	***	0.700	***	0.622	***	0.609	***
HH, redeemable at notice	0.517	***	0.511	***	0.531	***	0.550	***
NFC, demand deposits	0.367	***	0.355	***	0.366	***	0.374	***
NFC, term deposits, up to 1 year	0.903	***	0.862	***	0.826	***	0.851	***
NFC, term deposits, over 1 year	0.814	***	0.753	***	0.661	***	0.645	***
<b>Impact of market concentration on long-term impact</b>								
	<b>2Y</b>	<b>OIS</b>	<b>1Y</b>	<b>€STR</b>	<b>DFR</b>	<b>Repl.</b>		
	<b>(baseline)</b>		<b>OIS</b>			<b>portfol</b>		
HH demand deposits	-0.107	***	-0.117	***	-0.149	***	-0.188	***
HH term deposits, up to 1 year	-0.033	**	-0.048		-0.084		-0.120	**
HH term deposits, over 1 year	0.001	*	-0.009	*	-0.078		-0.153	*
HH, redeemable at notice	-0.346		-0.296		-0.351		-0.380	
NFC, demand deposits	-0.070	***	-0.059	***	-0.057	***	-0.065	***
NFC, term deposits, up to 1 year	-0.026	***	-0.056	***	-0.101	**	-0.110	**
NFC, term deposits, over 1 year	-0.026	**	-0.035	**	0.017		0.065	*

Notes: \*, \*\* and \*\*\* indicate that the coefficient estimate is statistically significant at the 10%, 5% and 1% significance level, respectively.

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