



EUROPEAN CENTRAL BANK

EUROSYSTEM

## Working Paper Series

Katarzyna Budnik Digital banking and the evolving  
monetary policy transmission

No 3206

**Disclaimer:** This paper should not be reported as representing the views of the European Central Bank (ECB). The views expressed are those of the authors and do not necessarily reflect those of the ECB.

## Abstract

This paper maps the euro-area digital-banking segment and assesses how digital banks transmit monetary policy relative to brick-and-mortar peers. I compile a hand-checked universe of over 170 digital banks (2016–2025) from supervisory data, classifying institutions by business model (e-retail, e-service, e-wholesale). Digital banks are small on average yet growing fast, rely more on household deposits—predominantly overnight—and hold larger cash buffers and intangibles than traditional banks. Using a difference-in-differences design around the ECB tightening cycle that began in July 2022 and the initial 2024 easing. Three results stand out. (i) The funding channel is stronger and faster at digital banks in tightening: household deposit rates rise more and retail-funding spreads compress less, especially at overnight maturities and for stand-alone digital banks. Corporate-funding results are directionally similar but weaker and less robust. (ii) Loan-rate pass-through is not stronger, implying margin compression and a later slowdown in lending growth at digital banks despite continued retail inflows. Household deposits are markedly more rate-sensitive than corporate or unsecured funding. (iii) In early easing, digital banks cut new funding rates relatively quickly —particularly at longer maturities — yet effective deposit premia persist and retail inflows soften while margins begin to normalise. Policy implications concern the interaction of market digital adoption and banks’ capacity to adjust balance-sheet duration through the monetary cycle, along with financial stability.

**Keywords:** digital banks, neobanks, deposit rate pass-through, monetary policy transmission, deposit competition, retail funding, overnight deposits, household deposits, ECB tightening cycle

**JEL Classification:** E52, G21, E51, E43, E58, O33

**Disclaimer:** The views expressed are those of the authors and do not necessarily reflect those of the European Central Bank (ECB).

## Non-technical summary

Digitalisation has changed how banks in the euro area do banking. This paper maps the euro-area digital-banking segment and asks whether digital banks — institutions that deliver services almost entirely online, with minimal physical presence — transmit monetary policy differently from traditional, branch-based banks. I compile a hand-checked sample of over 170 digital banks observed in supervisory data between 2016 and 2025, classify them by business model (retail, service, wholesale), and link this universe to microdata on balance sheets and interest rates. Identification relies on a difference-in-differences design around the ECB’s tightening that began in July 2022 and the first cut in June 2024.

Three findings stand out. First, the deposit channel is stronger and faster at digital banks during tightening. Compared with traditional banks, digital banks raised household deposit rates by roughly 15 bp more per 100 bp increase in the policy rate, and saw much smaller compression in retail-funding spreads, with the largest effects at overnight maturities and among stand-alone institutions. These differentials remain sizable even after accounting for how widely internet banking is used in the countries where banks raise funds, whereas market digital adoption itself makes pricing also more sensitive to policy. Corporate-funding results point in the same direction but are less robust. Second, loan-rate pass-through is not stronger at digital banks: lending rates moved broadly in line with peers, implying margin compression and a weaker mapping from higher funding costs into loan prices. Third, on quantities, resilience is price-driven: digital banks sustained pre-existing inflows of household deposits and retail funding through the tightening phase, with household deposits proving much more rate-sensitive than at incumbents. By contrast, there is little evidence of comparable positive sensitivity for corporate deposits or unsecured funding. Fourth, balance-sheet growth and non-financial private sector lending decelerate more for digital banks late in the tightening, consistent with compressed margins.

An economic interpretation is consistent with competition on both sides of the balance sheet: arm’s-length, search-intensive deposit markets push digital banks to reprice more to retain retail funding, while competitive lending conditions limit their ability to pass higher funding costs through to borrowers, compressing margins and franchise value.

As the policy cycle turned, these asymmetries may gradually reverse. In the first quarters of easing, digital banks cut deposit prices more decisively, although the premium on outstanding

deposits over traditional banks persisted. Unsecured-funding interest rate gaps narrowed as well. At the same time, digital banks' earlier advantage in retail-deposit inflows faded. These easing-phase results are preliminary, given transmission lags and a short window, but they point to weaker downward stickiness in digital banks' funding prices — mirroring the asymmetry observed on the way up.

Several implications follow. For monetary policy, digitalisation appears to intensify the funding cost channel. It accelerates deposit competition and deposit repricing following monetary policy tightening, with the impact on banks' lending. Moreover, the competitive deposit market may respond stronger to policy also on the way down, although such adjustment appears more staggered. As digital banking continues to grow, the ECB's rate policy may ask for readjustment.

For supervisory and macroprudential policy, the relative flightiness of digital banks' retail deposits, and their greater sensitivity to monetary policy changes, show the potential for digitalisation becoming the facilitating factor for a new type of bank run. Monetary policy tightening, especially when sudden or sharp, can also lead to greater compression of banks' franchise value in more digital markets. Monitoring should focus on the composition and stability of retail funding (insured vs. uninsured), the speed of maturity rebalancing at the short end, and the group structures that can obscure brand-level digital activity in entity-level data. Scenario and stress-testing frameworks may wish to incorporate greater rate-sensitivity of retail funding and the observed asymmetry between upward and downward cycles.

For banks' strategy, the results highlight the trade-off facing digital banks: rapid price adjustment can preserve retail inflows but compress margins when loan-rate pass-through is not proportionate; extending funding duration helps, but at a cost that depends on market digital adoption and competition.

# 1 Introduction

Digitalisation has reshaped how banks obtain funding, set deposit prices, and interact with customers. Over the last decade, rapid advances in mobile technology, changing consumer preferences, and ubiquitous internet access have lowered frictions in retail finance. Branch networks have contracted, and a growing cohort of digital banks — institutions that deliver services primarily via web and apps with little or no physical footprint — now compete head-to-head with traditional, branch-based banks in the euro area. Digital banks reduce both procedural and personal costs of switching. Customers can compare offers and move funds in real time, weakening relationship capital and interpersonal trust mechanisms that historically anchored deposits. Lower search and switching costs increase deposit elasticity and rate sensitivity, potentially altering the strength and timing of monetary transmission.

This paper asks whether, and how, digitalisation changes the transmission of monetary policy through banks' prices and quantities. I first document the structure and expansion of the euro-area digital segment and then compare how digital and traditional banks adjust deposit and lending rates when policy tightens — and, more tentatively, when it eases — and how these price responses map into funding and lending volumes. I compare digital with brick-and-mortar banks applying difference-in-differences (DiD) designs to supervisory data and exploiting a rapid increase in the ECB Deposit Facility (DFR) rate from below zero in July 2022 to 4% by September 2023, followed by its subsequent cuts from June 2024.

Adoption of digital banking on the demand side has been swift. In 2023, about 66% of working-age adults in the euro area used internet banking — over 22 percentage points more than a decade earlier (Figure 1). Country heterogeneity is large but the trend is broad-based: usage exceeds 90% in the Netherlands and Finland and 80% in the Baltics and Ireland. Similar shifts are documented for the U.S., where 68% of adults in 2023 indicated online or mobile banking as their preferred choice, compared with 39% a decade earlier.<sup>1</sup> Usage is highest among younger cohorts and rises with digital literacy.<sup>2</sup> The pandemic accelerated these shifts, as more

---

<sup>1</sup>The Federal Deposit Insurance Corporation (FDIC National Survey of Unbanked and Underbanked Households) reports the use of different banking channels on a bi-annual frequency since 2013, although with a gap for 2019-2021. It also reports preferred banking choices of adults, distinguishing between banking via the web and use of mobile, which are added when quoting the statistics for 2013 and 2023. Similar statistics are compiled by American Banking Association (ABA). ABA reports that 77% of U.S. adults preferred to bank online in 2024, up from 41% in 2014.

<sup>2</sup>After Eurostat, in 2023, the share of the EU's adult population making use of the internet for banking rises quickly with age and peaked at 78.0% among people aged 25–29. By contrast, 41.1% of people aged 65–74 used internet banking. Similarly, in FDIC 2023, the preference for mobile or online banking is highest for people aged

consumers sought contactless solutions for managing their finances.

I define digital banks as licensed credit institutions that provide all services online or via mobile applications and have no — or very limited — physical presence. The focus on digital banks is justified on two grounds. First, they exemplify the profound impact of the technology on how banking is done, with the impact on bank services, customer convenience, and bank profitability. Second, they are also a canonical example of arm’s-length banking — relying minimally on direct personal interaction.

I construct a hand-checked universe of over 170 digital banks present in supervisory data between 2016 and 2025, and classify banks into three activity profiles: e-retail, e-service, and e-wholesale. The segment is small but expanding: the asset share of digital banks rose from about 1.6% in 2016 to 3.3% by end-2024. Many entered during the low-rate period, and about one third transitioned from brick-and-mortar models. Relative to incumbents, digital banks are relatively small, rely more on overnight retail funding, operate with lighter physical footprints, and combine interest income with fee-based revenues (payments, brokerage, platform services). Before the 2022 tightening, they paid higher deposit rates and faced higher new-funding spreads than peers, consistent with tougher price competition and lower search frictions. They also charged higher lending rates than more traditional competitors.

The empirical analysis combines three data sources. The backbone is quarterly supervisory reporting (FINREP/COREP), from which I derive effective (stock-based) deposit and lending rates, detailed funding structures, and balance-sheet/income measures for all resident institutions. To extend frequency and horizon into the early easing phase, I add monthly, institution-level MFI Balance Sheet Items (BSI) data and weekly web-scraped offered deposit rates for major markets. Digital banks are identified at the entity level and, where needed, mapped across perimeters. Identification uses DiD designs comparing digital and brick-and-mortar banks around ECB policy turning points. The baseline contrasts pre- and post-lift-off, while an extended specification adds the initial easing window from mid-2024.

Four main findings emerge as regards monetary policy transmission for the tightening phase. First, effective household deposit rates rise by more for digital banks than for peers, by about 38 basis points, and retail funding spreads compress less (over 1 percentage point) — implying higher marginal funding costs at digital institutions. The largest differentials occur at overnight

---

15-44 and peaked at 84.6% for those aged 25-34. It stood at 46.2% for those aged above 65. See also Lieber and Syverson (2012) and Anenberg et al. (2018).

maturities and among stand-alone LSIs. Controlling for country-level internet banking penetration leaves the digital effect intact, and market penetration itself amplifies sensitivity. Corporate deposit rates and unsecured funding costs at digital banks also moved more with policy, although those corporate effects attenuate when conditioning on market digital adoption and in detailed robustness checks. Second, loan rate pass-through is not correspondingly stronger. Lending rates at digital banks increase by a broadly similar magnitude to peers despite sharper funding-cost pressure, generating margin compression and a relative decline in profitability during and after the hikes. Third, on quantities, adjustment operates mainly via prices rather than volumes. Digital banks sustain pre-existing inflows of household deposit and retail funding inflows through the tightening (no relative slowdown in growth rates, higher inflows in levels), with uninsured retail funding more fragile at the margin. Household deposits at digital banks are substantially more rate-sensitive than at incumbents. By contrast, corporate and unsecured volumes do not respond positively to higher offered rates. Fourth, balance-sheet growth and non-financial private sector lending decelerate more for digital banks late in the tightening, consistent with compressed margins. Substantively, the results highlight that digitalisation strengthens the funding leg of monetary transmission.

The early easing phase shows a different mix. Stock-based deposit rates at digital banks remain elevated for a time — mechanically reflecting outstanding contracts — but new-business pricing (funding spreads and web-scraped offers) indicates that digital banks cut rates somewhat more decisively than peers, with sharper reductions at longer retail maturities. As deposit-rate gaps narrow, their advantage in attracting household deposits fades: relative retail-funding inflows soften for digital banks while incumbents catch up. Loan rates at digital banks prove stickier downward, so margin repair begins via funding costs, and loan-growth recovery is gradual and converges toward, rather than outpaces, peers. These easing-phase results are preliminary, given few quarters and transmission lags, but they point to weaker price stickiness on flows — mirroring the asymmetries observed on the way up.

The paper contributes to research on relationship versus arm's-length banking, digital banking and deposit competition, and monetary transmission. The relationship-banking literature shows that interpersonal contact builds trust and loyalty, reduces switching, and increases long-run customer profitability (Johnson and Grayson, 2005; Larivière and Van den Poel, 2005; Bolton et al., 2000; Colgate and Lang, 2001; Burnham et al., 2003; Verhoef, 2003; Hanssens et al., 2009). Instant payments further intensify competition (Sarkisyan, 2025; Liang et al., 2025), whereas

clientele differences and payments technology shape alertness and responsiveness (Xu Lu, 2024; Xiao, 2020). By contrast, digital banks follow an archetypic arm’s-length model with low customer attachment coupled with ease of fund withdrawal and transfer, which lowers their market power (Lieber and Syverson, 2012; Choi and Rocheteau, 2023).

Recent work links digital banking to deposit fragility and weakening franchise value (Drechsler et al., 2017, 2021; Wang et al., 2022). Empirical literature, focusing mostly on the U.S. experience, shows that banks with low branch density or higher digital usage experienced larger uninsured outflows in stress (Benmelech et al., 2023) and faster outflows in tightening (Koont et al., 2024). More digital banks raise deposit rates more after hikes (Erel et al., 2023; Koont, 2023; Koont et al., 2024; Zhang et al., 2024). I complement this literature by by compiling the corresponding evidence on monetary policy transmission during the tightening for the euro area, and presenting the first insights into digital banks’ reaction to policy easing.

Work on the industrial organisation of digital banking documents that digital channels lower operating costs and scale more readily than branch-intensive models, with implications for pricing (Koont, 2023; Xue et al., 2011; Jiang et al., 2022; Haendler, 2022) and market competition (Gropp and Kok, 2017). I add to these by being the first to document the stylised facts for the euro area digital segment.

The remainder of the paper proceeds as follows. Section 2 details data sources and the identification of digital banks. Section 3 describes the euro-area digital segment. Section 4 documents pre- and post-tightening trends in pricing and quantities. Section 5 outlines the methodology. Section 6 presents the core estimates. Section 7 discusses the early easing phase. Section 8 reports robustness, and Section 9 concludes.

## 2 Data

This section introduces the definition of digital banks and the datasets supporting the analysis. The data backbone is euro-area supervisory reporting — Financial Reporting Framework, FIN-REP (financial statements) and Common Reporting Framework, COREP (prudential/risk). The supervisory reports, due to their breadth, and combination of solo and consolidated reporting, offer the most complete coverage of digital banks. Owing to the short calendar span of the easing phase, I complement these quarterly sources with higher-frequency data: individual-institution MFI Balance Sheet Items (BSI) and a weekly panel of web-scraped deposit offer rates.

## 2.1 Defining and identifying digital banks

Digital banks are defined as licensed credit institutions that provide services exclusively online or via mobile apps and maintain no, or only minimal, physical presence. This follows Erel et al. (2023) and is stricter than Koont (2023), which would include hybrids with an online channel. In practice, “limited physical presence” means at most one physical location in a national market (headquarters or a country-level branch) and no network of in-person consultants.<sup>3</sup> To ensure a verifiable balance sheet, all digital banks are required to have a distinct RIAD code.<sup>4</sup>

The initial universe combines two ECB Banking Supervision sources: (i) Less Significant Institutions (LSIs) flagged as digital-only and (ii) new credit institutions (since SSM inception) labelled “fintech”. I expand coverage by reviewing academic sources (including the compilation by Citterio et al. (2024)) and comparison portals for online deposits and loans (available in English, German, French or Italian), and employing ChatGPT to select digital banks from the full list of credit institutions in the SSM area for 2020–2024.

Each candidate is hand-verified using official websites, annual reports and documented histories to confirm the absence of branch or office networks and the reliance on digital portals or apps. I time-stamp the authorisation as a credit institution and the point at which the bank becomes functionally digital; when not explicit, timing is inferred from the adoption of broad digital solutions, branch closures, or a published strategy to become fully digital.

Three limitations affect measurement and sample representativeness, especially for digital entities being a part of Significant Institutions (SIs). First, many prominent offerings are brands within larger groups (e.g. Erste’s George, livebank.at at Volksbank Wien, Consors/Hello bank! at BNP Paribas) whose balance sheets are inseparable at entity level. In a few cases activity is visible under specific subsidiaries (e.g. BNP Paribas Personal Finance S.A. Niederlassung Österreich), but most brands cannot be isolated. Second, SIs often reintegrate digital subsidiaries (e.g. comdirect absorbed by Commerzbank in 2020), leaving the brand but removing the stand-alone legal unit. Third, Banking-as-a-Service (BaaS) enables non-licensed neobanks to operate via partner banks (e.g. Vivid Money, Finom via Solaris SE, Qonto, before obtaining a banking licence, via Raisin Bank), placing them outside supervisory reporting.

I classify digital banks by primary activity:

---

<sup>3</sup>Direct banks that do not have a branch network but rely on face-to-face consultants (e.g. MLP SE in Germany) are excluded from the digital category. By contrast, pre-internet direct banks without face-to-face channels (e.g. telephone banking at Banco ActivoBank, opened in 1994) enter the category.

<sup>4</sup>RIAD is the ECB Register of Institutions and Affiliates Database.

- **Retail** banks serving households (e.g. N26, Revolut) and/or SMEs (e.g. VR Smart Finanz Bank), including near-universal digital banks and vehicle finance or leasing niches.
- **Service** banks specialising in payments (e.g. PayPal Europe), retail brokerage (e.g. Binck-Bank), or infrastructure provision (BaaS) (e.g. Varengold Bank).
- **Wholesale** banks focused on large corporates and private clients (investment/private/custodian banking), providing tailored products such as investment advice, estate planning, portfolio management and tax structuring.

## 2.2 Digital bank supervisory sample

200 names from the initial list could be found in the supervisory statistics. After consolidating mergers and acquisitions, the count falls to 197.<sup>5</sup>

To avoid double counting, I retain the highest consolidation level that still meets the digital definition. If both a digital bank and a bank holding appear, I keep the holding only when it owns a single digital bank and has a longer reporting history; otherwise, the holding is dropped. I use solo/sub-consolidated reporting when the parent consolidation ceases to qualify as digital. For institutions that transitioned from traditional to digital, pre-transition observations are removed.

The working supervisory sample comprises 174 digital banks, of which 151 were still active in 2025. Roughly one third transitioned from brick-and-mortar models.<sup>6</sup> Among banks no longer active by 2025, five lost their licence or were forcibly sold, nine were closed as part of group restructurings (including former branches now serving euro area markets via cross-border provision), two were sold, and seven were absorbed but continue as brands. Among those active in 2025, one was winding down and one was being absorbed. Most digital banks are LSIs (76%) and report on a solo basis (74%). 19 digital banks are foreign branches of non-euro-area banking groups, of which 13 are Swedish and the remainder represents banks from Norway or Denmark. A few digital banks were designated as SIs by national authorities (Barclays Bank Ireland, FincoBank, Revolut Lithuania). Finally, by activity, 111 banks are classified as retail, 39 as service, and 24 as wholesale.

---

<sup>5</sup>Merged entities are treated as a single unit; e.g. biw Bank für Investments und Wertpapiere and XCOM Finanz, which ultimately formed flatexDEGIRO, are combined and their balance sheets and profit and loss items are summed.

<sup>6</sup>Transitions include licence acquisition by neobanks, e.g. Qonto's purchase of Société des Banques Africaines Europe in early 2022.

Figure 2 shows entries and exits over time. The steady growth in the number of active digital banks since the 1990s accelerated after 2010 and peaked in 2014–2020, with entrants and switchers contributing roughly equally. The late-sample slowdown coincides with several exits linked to low profitability, structural headwinds and restructurings.

### **2.3 Benchmark (non-digital) supervisory sample**

The benchmark aims to mirror the digital sample’s reporting and significance structure. LSIs are represented at their highest available level of consolidation. For SI-affiliated digital units that act as subsidiaries rather than group heads, I exclude parent institutions of digital banks while allowing other group members to enter. For non-digital SIs that report at both consolidated and solo/sub-consolidated levels, I retain the latter and drop the head. I require at least eight quarters of reporting. The resulting supervisory benchmark contains 3,078 entities: 86% solo/sub-consolidated, 75% LSIs, and only one SI head office.

### **2.4 BSI (MFI Balance Sheet Items)**

BSI provides an independent, monthly source for deposit and loan volumes and also reports notional stocks for assets. Notional stocks of loans better reflect lending to the economy irrespective of post-origination risk transfers that affect outstanding amounts. The panel spans end-2019 to June 2025.

Two differences vis-à-vis supervisory data are essential: consolidation and geography. BSI follows a host-country, individual-institution basis most comparable to supervisory solo accounts; supervisory reporting follows the home principle. Thus, foreign branches enter the host BSI population but form part of the home entity’s perimeter in supervisory data.

In BSI I identify 202 digital entities: 131 map directly to supervisory digital banks, 67 are affiliated, four are otherwise uncovered (two foreign branches and two subsidiaries of non-digital parents). After trimming for mergers and group structures, the BSI digital sample includes 147 banks (78% LSIs). The BSI benchmark selects non-digital banks at their highest available consolidation but excludes parents of digital banks. It comprises 1,320 entities (83% LSIs).

## 2.5 Web-scraped deposit offer rates

As the final data source, I use a weekly panel of quoted deposit rates from late-August 2023 to mid-November 2025 assembled internally at the Monetary Policy Department of the ECB. The collection relies on four comparison portals (Confrontaconti, Rankia, Spaarrente, Verivox) and spans German, Spanish, Italian and Dutch market. Unlike supervisory data, these are offered (not realised) rates, and all covered banks are digitally enabled (their deposits are offered online). The panel also includes entities licensed outside the euro area that market deposits cross-border.<sup>7</sup>

Within this dataset I identify 112 digital entities and the benchmark consists of 163 hybrid institutions. On a bank–country basis (counting each bank–country pair), the digital and benchmark samples include 183 and 205 units, respectively. Among digital entities, 14 are brands of hybrid banks and 8 are non-euro-area entities. The remainder appear in supervisory and/or BSI samples or are affiliated.

## 2.6 Preparation of variables

Because supervisory reports do not contain deposit or loan rates and individual-bank MFI interest-rate data sparsely cover the digital set, I construct effective rates from FINREP by dividing interest expense (income) by the corresponding deposit (loan) stocks. These stock-based measures capture pricing on outstanding volumes and therefore adjust slowly when market rates move rapidly. To approximate new-business pricing, I complement them with COREP funding spreads by maturity, aggregated using new-funding weights.

For quantities, I build quarterly series of total assets, loans and deposits from FINREP, and derive the structure of funding from COREP.<sup>8</sup> I focus on mid-2016 onward due to early-sample changes in FINREP/COREP templates and coverage. All supervisory and BSI variables undergo standard cleaning: removal of extreme outliers, and, where appropriate, replacement of isolated missing or implausible values with the mean of adjacent observations. Variable definitions appear in Table 1 and descriptive statistics are reported in Table 2.

---

<sup>7</sup>Appendix C details the representativeness checks against MFI interest-rate statistics.

<sup>8</sup>FINREP and BSI deliver funding by instrument/sector (households, NFCs, MFIs), while COREP adds counterparty categories and spread/maturity buckets.

### 3 Looking at digital banks in the euro area

This section offers a concise profile of euro-area digital banks at end-2024. It traces the segment's expansion and market position, compares digital and traditional banks across core balance-sheet items, and examines income and cost structures by business model. These facts set the stage for the policy-transmission analysis that follows.

#### 3.1 Expansion and market structure

By end-2024, euro-area digital banks held about EUR 1.4 trillion in assets, or 3.3% of the banking system (Figure 3). This marks a sharp increase from 1.6% in mid-2016, reflecting almost tripling of digital bank assets (growth by 180%) compared to a 40% increase in the euro area banking system. Their market shares in non-financial private sector loans and deposits are similar, 3.2% and 3.6%, respectively.<sup>9</sup>

Penetration varies widely across countries. Digital banks' asset shares are highest in several newer member states — led by Lithuania (close to 90%) and followed by Estonia and Slovakia (each above 20%). The highest digital-bank shares of NFPS loans and deposits are observed in the Baltics as well as Germany, Finland, and Malta (Figure 4). At the other end, Greece, Austria, Slovenia, and Belgium exhibit the lowest penetration.

The segment is composed mostly of small institutions and is only moderately concentrated. The median digital bank held about EUR 1.6 billion in assets at end-2024. ING-DiBa alone accounts for roughly 15% of digital-bank assets; three other large players contribute about 10% each. Yet institutions with individual shares below 5% make up half of the segment, and those under 1% account for 23% (Figure 6).

Roughly 30% of digital-bank assets are in less significant institutions (LSIs). This subsegment of digital banks is also most dynamically growing, more than doubling their total assets since the end of 2018. Branches of non-euro-area parents account for about 3.5% of digital-bank assets, and significant institutions (SIs)—including digital-only subsidiaries of traditional groups—make up the remainder (Figure 5a). Among the five largest digital banks, two (including ING-DiBa) are SI subsidiaries and one (FinecoBank) is an SI headquartered in the euro area.

Digital retail banks dominate the sector, comprising 71% of assets. Service banks represent 12%, and wholesale banks 17% (Figure 5b).

---

<sup>9</sup>For comparison, Erel et al. (2023) report U.S. digital banks at roughly 16% of assets and 13% of deposits.

## 3.2 Digital banks' assets

Digital banks hold broadly similar shares of loans to the non-financial private sector (NFPS) as traditional banks, but they keep substantially more cash. As shown in Figure 7, NFPS loans account for 41% of digital banks' assets versus 44% at benchmark banks. By contrast, cash represents 21% of assets at digital banks, almost double the 11% at peers, offset by lower holdings of securities and loans to institutional borrowers. The headline takeaway is a more liquid asset profile for digital banks.

Within the digital segment, e-retail banks have the deepest NFPS intermediation. Their loan books comprise high household exposure (around 39% of assets) and a meaningful, though smaller, NFC share (22%). The composition differs sharply from benchmarks: household lending is dominated by consumer and other credit (about 55% of household loans, versus less than 10% at peers), while the corporate book skews away from SMEs (under 40% of NFC loans, versus over 70% at peers).

E-service banks are exceptionally liquidity-heavy. Roughly 55% of assets are in cash; loans are only about 15% of assets and are dominated by repo and call credit (together close to 50% of the loan book) and credit-card balances (about 6%).<sup>10</sup>

E-wholesale banks hold sizeable trading and investment positions: securities, equity and derivatives together amount to about 31% of assets, alongside large cash buffers and loans to institutional clients. Their loan books also feature a high share of call credit (around 37%), consistent with a treasury and markets-centric model.

Finally, a branchless footprint does not, in itself, translate into broader lending footprints. The share of non-domestic loans on digital banks' balance sheets is similar to that of traditional banks—around 60% (Figure 8). The notable exceptions are e-payment and e-wholesale banks, where cross-border shares approach 90%, reflecting business models oriented to pan-European platforms and wholesale clients.

## 3.3 Digital banks' funding

Digital banks rely heavily on household-based funding. Household deposits finance about 45% of digital banks' assets (55% for e-retail) versus 32% for benchmark banks (Figure 10). Consistently, retail funding covers about 50% of assets at digital banks and 64% at e-retail banks, compared

---

<sup>10</sup>“Repo and call credit” here refers to short-term secured and callable exposures reported in supervisory templates.

with 32% among peers.<sup>11</sup>

Most of this retail base is overnight. Overnight household deposits alone fund more than one-third of digital banks' assets, versus roughly one-fifth for traditional banks (Figure 11). The reliance is most pronounced for e-service banks: 54% of their assets are financed by overnight household deposits. Moreover, a relatively high portion of e-service banks' retail funding is not covered by the deposit-guarantee scheme (DGS): about half of their total retail funding (which itself equals 62% of assets) is uninsured.<sup>12</sup>

The second most important funding category of digital banks are financial sector deposits, which cover on average over 20% of their assets, alike for the benchmark banks. They rely to a lesser degree than their more traditional peers on non-financial corporate deposits, that cover 7% of their assets, as compared to 15%. Finally, the make less use of bond issuance and security funding covers a mere 7% of their assets (and is absent for e-service banks) compared to 1% in the non-digital population.

Unsecured funding, which broadly corresponds with financial and non-financial corporate deposits, makes up 30% of digital banks assets but most of this funding concentrates in digital LSI banks.<sup>13</sup> Unsecured funding is over 50% for LSIs, and its relevance drops to 20% for banks entering SI groups. Hence, though overall, the funding structure of the euro area digital banks does not fit well with the findings of Koont (2023) that banks with digital platform increase their ratio of uninsured deposit funding. Small digital banks are the closest to the U.S. patterns.

Unsecured funding - broadly, deposits and other liabilities without collateral from financial, non-financial and public entities - amounts to about 30% of assets at digital banks, but is concentrated among LSIs.<sup>14</sup> For LSIs, unsecured funding exceeds 50% of assets; for digital banks within SI groups it drops to about 20%. Hence, taken together, euro-area digital banks' liability mix does not uniformly match the U.S. evidence that banks with digital platforms

---

<sup>11</sup>Retail funding (from COREP) refers to funds from retail customers, primarily natural persons. It should encompass most household deposits reported in FINREP, but excludes large, mobile balances that behave like institutional money (e.g. HNWI deposits) and may include small SME deposits.

<sup>12</sup>This reflects the payment/brokerage profile of many e-service banks. Balances in foreign non-EEA currencies (e.g. USD), transitory funds with uncertain final ownership, and certain client money arrangements typical of brokerage and payment flows may fall outside national DGS coverage.

<sup>13</sup>Unsecured funding refers to liabilities without collateral backing provided by non-financial, financial and public entities. It covers corporate and public sector deposits (FINREP), excluding repo deposits. It can also include deposits of households in special circumstances when these do not enter retail funding, uncollateralized interbank loans, commercial paper, unsecured bonds or promissory notes.

<sup>14</sup>Unsecured funding includes corporate and public-sector deposits (FINREP, excluding repos), uncollateralised interbank loans, commercial paper, unsecured bonds and promissory notes. Certain household balances can be included when they do not qualify as retail funding per COREP.

rely more on uninsured deposits (e.g. Koont, 2023): the closest parallels arise among small, stand-alone digital LSIs.

Capitalisation is comparable across groups. Equity finances roughly 8–9% of assets at both digital and non-digital banks, with the exception of e-service banks, whose equity share is lower (about 5%).

### 3.4 Income generation and expenditures

Income structures of digital banks vary by business model. E-retail and e-wholesale banks are primarily interest-income institutions, consistent with meaningful involvement in maturity transformation (Figure 12): for e-retail banks, interest accounts for about 76% of total income (versus above the 70% at traditional banks), and for e-wholesale banks roughly 55%. By contrast, e-service banks derive close to 70% of income from fees and commissions (and e-wholesale banks around 40%), a mix that provides partial insulation from policy-rate fluctuations.

The fee and commission structure also points to non-traditional revenue models. Digital banks report an unusually large share in the other fees subcategory, which bundles monetisation of customer engagement (extra cards, premium FX/crypto pricing, spending insights and budgeting tools) and Banking-as-a-Service (BaaS) provided to third parties — especially prominent among e-service banks. Some institutions further experiment with models uncommon in traditional retail banking (e.g., tipping, carbon-offset add-ons with margins, or platform/crowd-style fees), which are also recorded within this residual category.

On costs, average administrative expenses (as a share of assets) are similar across groups—around 1.1% of assets for both digital and non-digital banks. However, scaling patterns differ (Figure 13). Small digital banks tend to have higher costs per asset than same-size benchmarks, but their cost ratios fall rapidly with balance-sheet growth. A break-even emerges above about 20 million euro in assets for total administrative expenses, and somewhat earlier (above 10 million euro) for staff costs alone. Beyond these thresholds, digital banks' administrative and staff expense shares drop below those of peers. This pattern aligns with the high-tech production function of digital banks: digital platforms require substantial upfront infrastructure and specialised staff, but once built, they scale more efficiently than models that rely heavily on relationship-intensive distribution.

## 4 Digital banks in the monetary cycle

This section documents how pricing and balance sheets evolved for digital versus traditional banks around the ECB policy cycle. It links the structural facts in Section 3 to the identification strategy in Sections 5–6.

### 4.1 Bank interest rates

Before 2022, digital banks already offered higher household deposit and lending rates than peers, while corporate deposit rates and unsecured funding costs were broadly similar across groups. Median household deposit rates stood around 0.3% for digital banks versus 0.1% for benchmarks (Figure 14). Effective lending rates to the NFPS were also higher at digital banks (median 3.6%, compared to 2.4% for other banks), consistent with their higher funding costs (Figure 15). By contrast, pre-tightening corporate deposit rates and unsecured spreads showed little difference.

With the tightening cycle, the pricing gap on household deposits opened sharply in favour of digital banks' customers. By early 2024 their median household deposit rate was 1.2 percentage point higher than at other banks, and retail funding spreads compressed far less (2.5 percentage point difference) than for peers, indicating stronger pass-through to funding costs on the digital side. A similar, though somewhat weaker, divergence appeared for unsecured funding. These developments were accompanied by a widening cross-sectional dispersion in deposit rates and funding spreads, in line with asymmetric stickiness over the cycle (Driscoll and Judson (2013); Duffie and Krishnamurthy (2016)).

After the ECB began easing (from mid-2024), household deposit rates and funding costs started to converge. Digital banks' offered deposit rates moderated somewhat more than peers (by about 0.4 versus 0.2 percentage points), and the retail-spread gap narrowed by over 1 percentage points to early 2024. The unsecured-funding differential also narrowed materially.

Loan pricing showed less divergence throughout. Digital banks raised NFPS lending rates, but the increase was smaller in proportion to their rising funding costs, than for their peers. Their lending rates increased by only a half percentage point more than those of their peers, while their household deposits rates shot up by almost a percentage point stronger. Into the easing phase, loan rates at digital banks proved relatively sticky downward. Their lending rates were hovering near 6.5% in 2025 versus about 3.5% for benchmarks.

The combination of stronger pass-through to funding costs and more muted pass-through

to loan rates weakened digital banks' profitability relative to peers. Before tightening, ROA at digital banks slightly exceeded that of the benchmark. During and after the hikes, peers' ROA moved above digital banks' ROA and remained higher into 2025 (Figure 16). A desire to restore profitability is one possible factor for the relatively slow pass-through of policy easing into digital banks' lending rates.

An economic interpretation is consistent with competition on both sides of the balance sheet: arm's-length, search-intensive deposit markets push digital banks to reprice more to retain retail funding, while competitive lending conditions limit their ability to pass higher funding costs through to borrowers, compressing margins and franchise value.

## 4.2 Funding, deposits and balance-sheet growth

In the low-rate period, digital banks expanded faster across core balance-sheet lines. Median quarterly growth in household deposits and retail funding was about 1.8–1.9% for digital banks, roughly 0.5–0.7 percentage points above peers (Figure 17). Corporate deposits and unsecured funding also grew more quickly at digital banks, and the same held for total assets and loans to the NFPS, where pre-tightening growth reached 2.9% versus 1.7% for benchmarks.

Tightening did not interrupt retail inflows at digital banks. Through 2022–2024, their household deposits and retail funding continued to grow near 2% per quarter, whereas peers slowed markedly (to roughly 0.4–0.6%). Funding structures re-termed as rates rose. Overnight household balances contracted sharply, while agreed-maturity products surged, lifting the non-overnight share of retail funding system-wide. Corporate deposits and unsecured funding cooled for both groups, but this was not enough to dent digital banks' overall momentum: asset growth remained about 1.8% per quarter versus 0.3% at peers.

Lending broadly tracked funding. Relative to the pre-tightening boom, NFPS loan growth at digital banks moderated (to about 1.7%), yet it still exceeded the 0.3% median at peers. The pattern is consistent with a stronger deposit channel at digital banks: generous household deposit pricing coupled with the lending margin compression tempered the pace of new lending.

As the ECB began easing in mid-2024, funding trends inverted. Digital banks' household-deposit and retail-funding inflows slowed, while peers' inflows picked up. At the same time, stabilising funding costs, relatively high lending rates and improving margins, supported a gradual recovery in their loan growth. Overall, while the early easing phase shows how the erosion of their deposit-rate premium and reduces their advantage in attracting funding flows, their

lending proved robust.

## 5 Method

This section sets out the difference-in-differences (DiD) strategy used to compare digital and brick-and-mortar banks over the ECB policy cycle that begins in July 2022. The approach quantifies how the digital banks adapt to changes in policy, as compared to benchmark banks, first during the tightening episode and then, with caution given limited horizons, during the early easing phase.

The baseline specification focuses on the tightening window:

$$Y_{i,t} = \alpha_i + \alpha_t + \beta_1 (Ebank_i \times PostTightening_t) + \varepsilon_{i,t}, \quad (1)$$

where  $i$  indexes banks and  $t$  quarters (months in robustness checks). The outcome  $Y_{i,t}$  is a bank-level variable (interest rates, log volumes, or growth rates; see Section 2).  $Ebank_i$  equals 1 for digital-only banks.  $PostTightening_t$  equals 1 from 2022Q3 (August 2022) onward and 0 beforehand, reflecting the 27 July 2022 increase in the Deposit Facility Rate (DFR) from  $-0.50\%$  to  $0\%$ , followed by two 75 basis point hikes (DFR reached  $4.00\%$  by September 2023). Bank fixed effects  $\alpha_i$  absorb time-invariant heterogeneity, and time fixed effects  $\alpha_t$  absorb common shocks. The coefficient of interest,  $\beta_1$ , is the average change in the digital–benchmark gap during tightening. The sample for equation (1) ends in 2024Q2.

I then extend the model to allow for a second treatment window covering the initial easing phase:

$$Y_{i,t} = \alpha_i + \alpha_t + \beta_1 (Ebank_i \times PostTightening_t) + \beta_2 (Ebank_i \times PostEasing_t) + \varepsilon_{i,t}, \quad (2)$$

where  $PostEasing_t$  equals 1 from 2024Q2 (June 2024) onward, capturing the first 25 basis point cut on 12 June 2024 and the subsequent measured reductions (the DFR reached  $2\%$  by June 2025). Here,  $\beta_2$  measures the digital–benchmark gap during easing. The sample for equation (2) runs through 2025Q3. Standard errors are clustered at the bank level in all specifications.

The DiD interpretation relies on parallel trends: absent policy changes, outcomes for digital and traditional banks would evolve similarly. I probe this assumption with an event-study:

$$Y_{i,t} = \alpha_i + \alpha_t + \sum_{v=-1} \beta_v (Ebank_i \times \mathbf{1}\{t - t_0 = v\}) + \varepsilon_{i,t}, \quad (3)$$

where  $t_0 = 2022Q3$  is the first tightening quarter, and  $v$  indexes event time (quarters) relative to  $t_0$ ;  $v = -1$  is omitted as the reference. Under parallel trends, the lead coefficients ( $v \leq -2$ ) should be statistically indistinguishable from zero, while the lag coefficients trace the evolution of the digital–benchmark gap after the shock.

Finally, I summarise cross-sectional associations between changes in outcomes over the tightening episode. For bank  $i$ :

$$\Delta Y_i = \theta_0 + \theta_1 \Delta X_i + \gamma_0 Ebank_i + \gamma_1 (Ebank_i \times \Delta X_i) + u_i, \quad (4)$$

with  $\Delta Y_i \equiv \bar{Y}_{i, [2022Q3, 2024Q2]} - Y_{i, 2022Q2}$ , where  $\bar{Y}_{i, [2022Q3, 2024Q2]}$  is the mean (log) level of  $Y_i$  over the indicated period, and  $\Delta X_i$  defined analogously. Here,  $\theta_1$  is the average slope for benchmark banks, and  $\gamma_1$  is the differential slope for digital banks. These regressions are descriptive rather than causal. They complement the DiD by quantifying co-movements between variables across banks over the episode.

## 6 Results

This section tests whether digital banks respond differently to monetary policy shocks than traditional banks. The baseline estimates compare digital versus benchmark banks. Appendix A further disaggregates digital banks into e-retail, e-service, and e-wholesale subtypes.

### 6.1 Policy tightening, deposit and funding rates

Table 3 reports DiD estimates for effective interest rates and funding spreads. Even-numbered columns show two-way fixed-effects regressions, while odd-numbered columns add a control for country-level internet-banking penetration in the relevant market. The lower panel reports semi-elasticities (betas) with respect to the DFR. Figure 18 presents the event-study dynamics and pre-trend checks.

Following tightening, digital banks increased household deposit rates by about 37 bp more than peers. The DFR beta for digital banks is about 0.15 higher. Their retail funding spreads compressed less, by just over 1.1 pp relative to benchmarks. Country internet-banking pene-

tration also mattered: a 10 pp higher penetration was associated with roughly 20 bp higher household deposit rates and about 10 bp higher retail funding spreads after tightening. Controlling for this market characteristic leaves the digital-bank DiD effects largely unchanged. Accordingly, the effects cumulate for digital banks.

On the corporate side, digital banks' corporate deposit rates rose by roughly 40 bp more (with a beta higher by about 0.15) and unsecured-funding spreads compressed about 76 bp less. These differentials weaken when controlling for internet-banking penetration, while the penetration term remains significant and economically sizable.

The dynamic DiD provides timing detail. Because effective deposit rates proxy pricing on outstanding volumes, whereas funding spreads proxy new funding costs, the former adjust more slowly. A mild pre-trend decline in digital banks' retail funding spreads warrants caution for this outcome in simple DiD. Finally, the unsecured funding premium at digital banks appears at least partially short-lived: it is highest in the first year of hikes and fades thereafter.

To gauge the role of customer attachment, Table 4 splits digital banks into stand-alone versus connected (affiliated to non-digital SI banks). Stand-alone digital banks raised household deposit rates by about 49 bp more than traditional banks, and their retail spreads remained higher by over 140 bp; both effects survive controls for internet penetration. Connected digital banks, that are more likely to draw on group branch or ATM networks and reputational capital, moved largely in line with the rest of banks. This pattern is consistent with group reputation dampening the need to reprice.

Term-structure patterns in Table 5 show the largest digital–benchmark gaps at the overnight tenor: post-tightening, overnight retail spreads are roughly 150 bp higher for digital banks (unsecured about 80 bp). Gaps narrow along the curve to 60–80 bp for tenors up to one year and to just over 50 bp for longer maturities.

## 6.2 Policy tightening and lending rates

Loan prices at digital banks rose by a similar magnitude to that of other banks (last columns of Table 3). If anything, non-financial private sector loan rates at digital banks increased slightly less than at peers (the negative coefficient is insignificant or only weakly significant). By contrast, internet-banking penetration in the lending market enters positively and significantly: banks operating in more digitally engaged markets raised household lending rates by nearly 80 bp more.

These results are suggestive of a lower ability of digital banks to pass higher funding costs through to loan pricing. To examine this, I estimate the cross-sectional regressions as in equation (4), relating the change in NFPS loan rates to the change in deposit rates over the tightening window. Table 6 indicates weaker pass-through for digital banks: among non-digital banks, pass-through is close to 80% using household deposit rates (and above 50% using corporate rates). For digital banks it is near zero with household rates and about 35% with corporate rates.

### 6.3 Policy tightening and funding volumes

A natural interpretation of sharper deposit-rate increases is more intense funding competition. I estimate DiD regressions in both log-levels and quarter-on-quarter growth rates. The level specification facilitates comparison with the U.S. evidence by Erel et al. (2023) and Koont et al. (2024) but is not consistent with parallel-trends identification because pre-intervention trends differ, whereas growth rates mitigate that concern (Figure 19).

Digital banks maintained their pre-tightening advantage in household deposits after the policy shift. Table 7 shows no significant relative slowdown in household deposit or retail funding growth at digital banks versus benchmarks. In levels, this corresponds to roughly 40% higher household-deposit and retail-funding inflows at digital banks, on average, during the tightening phase.

Neither did digital banks experience materially larger outflows of corporate deposits. DiD coefficients on corporate deposit volumes and unsecured funding are negative but statistically insignificant.

Finally, I also separate retail funding covered versus uncovered by deposit-guarantee schemes (DGS). Although uninsured retail funding is a small share for digital banks, it may be more prone to outflows. Table 8 shows that indeed the growth rate of uncovered retail funding slowed more at digital banks than at peers following tightening. In contrast, for covered retail funding, the relative slowdown is not statistically significant. The covered–uncovered contrast provides some indirect evidence of stronger ex-ante funding pressure at digital banks.

Overall, the euro-area pattern suggests adjustment via prices rather than volumes: digital banks' higher deposit rates preserved an existing structural inflow. It contrasts with the results of Koont et al. (2024) who document higher deposit outflows at U.S. banks with internet platforms after tightening, and the conclusions of Erel et al. (2023) on a step-up in trend deposit growth.

Although the log-level results align with Erel et al. (2023), they should be read jointly and critically with different pre-trends.

To test whether funding volumes at digital banks are more sensitive to offered rates, I estimate equation (4) with deposit or funding volumes as outcomes and the corresponding rates as regressors. Table 9 shows significantly stronger rate sensitivity of household deposits and retail funding at digital banks: a 1 pp increase in the household deposit rate is associated with an 11.7% larger increase in household deposits than at non-digital banks. For retail funding, the differential is about 4% (0.4% for new funding). No analogous positive relationship appears for corporate deposits or unsecured funding, consistent with limited ability to pay up for those flows.

A general take-away is that digital banks appear to face greater pressure to prevent household and retail-funding outflows — consistent with more rate-sensitive depositor bases and lower switching frictions.

#### **6.4 Assets and lending behaviour**

Tighter policy weighed more on digital banks' balance sheet expansion. The last two columns of Table 7 show that digital banks reduced quarterly loan growth by about 3.2 pp more than peers. This is consistent with a proportionately larger pass-through of tightening to lending via the funding channel for digital banks.

This result squares with margin compression, fewer entries, and the first reported exits of digital banks during the tightening episode (Section 2). Finally, the patterns above are present across all digital models but are weakest for e-wholesale banks, which appear least exposed to corporate-funding tensions and maintained comparatively robust lending growth during the tightening (Appendix A).

### **7 Exiting the tightening cycle**

The evidence so far indicates that digital banks faced greater funding pressure during tightening and responded with larger increases in retail — and, to a lesser extent, corporate — rates. An equally relevant question is whether this heterogeneity persists when policy eases. This section provides preliminary evidence from the first quarters of the ECB's easing phase.

Because the easing window currently spans only a few quarters and monetary-policy trans-

mission is lagged, estimates for  $\beta_2$  should be read with caution. To extend coverage and raise frequency, I validate the supervisory results with weekly web-scraped offered deposit rates and monthly individual-institution BSI data.

## 7.1 Interest rates

The upper part of Table 10 reports results for bank interest rates and funding spreads. The gap between digital banks and peer deposit rates opened even wider than in the tightening episode. However, because effective deposit rates reflect pricing on outstanding stocks, some persistence is mechanically expected.

For new funding, the estimates provide tentative evidence that digital banks cut prices more decisively than peers after the first ECB rate reductions. Retail and unsecured funding spreads decline more at digital banks, although only in the latter case the difference for the average spread is statistically significant. The additional regressions on funding spreads by maturity (Table 11), indicate that retail and unsecured funding spreads decline strongest at digital banks at longer retail maturities (above one quarter): the digital premium that emerged during tightening was smaller at longer tenors and appears to unwind fastest once easing begins.

At the same time, loan interest rates of digital banks show the catch-up pattern exhibited also by deposit rates. Digital banks reduced their lending rates by less (although the difference is only weakly statistically significant) than their peers, not unlikely in an attempt to restore their corroded interest rate margins.

Table 12 employs web-scraped offered rates which, alike funding spreads, focus on new-business pricing. Digital banks reduce overnight offers significantly more than peers (about 16 bp), while cuts on agreed-maturity offers are somewhat smaller and not statistically significant. However, the latter become very strong (83 bp) and significant once the regressions control for local internet-banking penetration. Overall, these patterns are consistent with higher sensitivity of digital banks' pricing across the cycle: they reprice stronger and quicker on the way up and by more also on the way down. There is some asymmetry across maturities: shorter tenors led the hikes, while longer tenors lead the cuts.

## 7.2 Funding and asset volumes

The lower panels of Table 10 indicate that the onset of easing coincides with comparatively weaker household deposit dynamics at digital banks. The retail inflow advantage that digital banks maintained during tightening diminishes: relative to peers, they experience larger losses (or smaller gains) in household deposits. At the same time, growth in corporate or unsecured funding, total assets and lending looks broadly similar to peers.

BSI-based results in Table 13 mirror the supervisory evidence. During tightening, there is no significant relative slowdown in household or corporate deposit inflows at digital banks, and digital banks accumulate more household deposits overall. BSI provides less support for the finding of a relative slowdown in NFPS lending at digital banks during tightening. The corresponding coefficients are mostly negative but not statistically significant.

In the early easing phase, digital banks exhibit a clear relative slowdown in household deposit accumulation compared with peers. Their asset and loan expansion remains relatively compressed, especially for notional stocks, despite their generally higher underlying growth rates.

Looking across different digital models, while stronger reprising of deposits downwards compared to non-digital peers, is discernible for all, the relative slowdown in household funding volumes is clearest for e-retail banks. They are also the only business model experiencing a comparative deceleration of lending to the non-financial private sector (Appendix ??).

Taken together, the evidence that digital banks strengthen monetary transmission is strongest in the tightening phase: they raise deposit rates more than peers, amplifying the funding channel. As policy turns accommodative, digital banks partially unwind their deposit-rate premium, but the growth of their funding base and assets lags that of peers. In the easing phase, therefore, the lending channel appears less supportive for digital banks than for traditional banks, even as margin repair begins.

## 8 Robustness

The main results show that digital banks reprice retail funding more aggressively than peers, sustain retail inflows through the tightening. Although digital banks experienced a more pronounced slowdown in lending growth after the policy shift, their expansion remained stronger than that of traditional banks. This section probes the stability of those findings under alter-

native specifications and samples. Detailed tables are reported in Appendix B.<sup>15</sup>

## 8.1 The role of competition

A natural concern is whether stronger pass-through merely reflects competitive conditions rather than digital bank type. I therefore augment the DiD regressions for interest rates and volumes with competition controls and their interactions with the policy windows: (i) bank-level market share and (ii) the national Herfindahl–Hirschman Index (HHI), both weighted by each bank’s country exposure. Table 18 and Table 19 show that adding these controls leaves the digital bank coefficients essentially unchanged in sign, magnitude, and significance. Market structure matters in its own right, but it does not account for the digital–benchmark differentials.

## 8.2 Sub-sample analysis

The digital sample is dominated by LSIs (Section 2), though LSIs represent only about 30% of digital-bank assets (Section 3). If smaller institutions offer fewer services, they might have to pay a deposit premium (d’Avernas et al., 2023), potentially conflating size with digitalisation. I therefore re-estimate the models separately for LSIs and for SIs (including SI-affiliated digital subsidiaries) in order to compare institutions with similar ex ante product breadth. Table 20 and Table 21 indicate that among LSIs, digital banks’ deposit-rate increases and higher retail funding spreads are larger than in the baseline, and volume results are likewise unchanged. Among SIs, the digital–benchmark gap in deposit rates is smaller but remains statistically significant, while digital banks’ loan rate increases are weaker than peers’, consistent with persistent margin compression. On volumes, SI digital banks show weak evidence of relatively faster funding growth during tightening, supporting comparable lending growth to non-digital SIs. Overall, the pattern — stronger funding-channel transmission at digital banks — persists within both size strata, and the weaker differential for SIs aligns with the mitigating role of group reputation and branch proximity.

Because entities report at mixed consolidation levels, I also split the sample by reporting perimeter (solo versus sub/consolidated). Results are similar across both subsets and to the baseline, with only somewhat clearer signs of corporate and unsecured funding pressure in solo reporters compared to higher consolidation reporters.

---

<sup>15</sup>Unless noted otherwise, DiD specifications in this section cover both the tightening and the early easing windows, nesting the baseline estimates that focus on tightening only.

### 8.3 Relevance of activity

Measurement error is likely higher where an activity is marginal in a bank’s business model (e.g., household deposits at market-funded institutions). To reduce noise, I re-estimate DiD specifications using analytical weights inversely proportional to the share of the relevant portfolio in total assets.<sup>16</sup> Table 25 shows coefficient magnitudes and significance closely tracking the baseline. If anything, the evidence of margin compression strengthens: weighted regressions imply an additional approximately 50 bp relative reduction in digital banks’ loan rates versus peers.

### 8.4 Alternative benchmark group

Although the selection of benchmark institutions respects the composition of the digital sample in terms of bank size and reporting level, other bank characteristics are not directly acknowledged. To address selection on observables, I construct a matched benchmark via nearest neighbours (minimum Euclidean distance) using pre-treatment (2022Q2) characteristics motivated by Section 3: (log) total assets, the ratios of cash, institutional and individual (household and SME) loans, marketable (bonds and equities) assets to total assets; institutional funding (institutional deposits and securities), household deposits, overnight household deposits, corporate deposits to total assets; interest income, fee/commission income—total and “other”, administrative costs to total assets. I then estimate DiD on the matched panel, retaining the full time dimension. As reported in Table 25, results are materially unchanged, confirming that observable balance-sheet structure does not drive the baseline differentials.

### 8.5 Variable transformations

Quarter-on-quarter growth rates can be noisy for small, fast-growing institutions. I therefore revisit Table 7 and Table 13 using (i) annual growth rates and (ii) midpoint growth (relative to the two-period average level). Findings are robust: no additional slowdown in digital-bank retail funding during tightening beyond what peers experience, a relative slowdown in the first easing quarters, and the associated imprint on asset and loan growth. The direction and economic magnitudes remain consistent with the baseline narrative.

---

<sup>16</sup>Equivalently, the use of analytical weights can be justified on the merits that bank-level variables represent the sums or averages of individual contracts. Analytical weights approximate (by capturing the size of a respective portfolio) a number of such contracts (sample size).

## 9 Conclusions

This paper studies how digitalisation conditions the transmission of monetary policy to bank prices and quantities in the euro area. I provide a hand-checked sample of digital banks with their classification, and link it to supervisory microdata. Digital banks are also classified in three broad categories: those that serve primary retail customers and SMEs, those that specialize in payment technologies, and those that target large institutional clients.

I start by documenting the trends in digital bank sector. Digital banks have sharply increased their presence in the euro area banking sector assets, from 1.6% in 2016 to 3.3% at the end of 2024. Digital banks emerge as a distinct business model with distinct balance sheets and activity profile. They differ from their more traditional peers in their heavy reliance on fee income, overnight deposits, and cash buffers. Then, they tend to offer higher deposit rates and charge higher lending rates.

Then, I show that during the 2022–23 tightening cycle digital banks re-priced deposit funding more and faster than traditional banks, especially at overnight maturities and among stand-alone less significant banks. The digital – benchmark gap in household deposit pricing persists even after controlling for market digital adoption, and funding-spread betas by tenor reveal pronounced short-maturity effects. Despite higher funding costs, loan rates at digital banks rose by a similar magnitude to peers, implying margin compression and weaker cross-sectional pass-through from funding costs to lending rates.

On volumes, digital banks sustained a strong inflow of household deposits and retail funding through tightening, with no relative slowdown in growth rates and higher inflows in levels. Household deposits at digital banks are markedly more rate-sensitive than at peer banks. Late in the cycle, lending growth at digital banks decelerated more than at peers, consistent with compressed margins and higher funding costs.

In contrast, although interest on corporate deposits and unsecured funding of digital banks show higher increase than that of benchmark banks following the monetary tightening, this result is not always robust to different specifications. The corresponding volumes show also no analogously higher price sensitivity as household deposits or retail funding. This supports the conjecture that it is indeed the weaker relationship between digital banks and their customers that contributes to the identified differences in household and retail deposit segment.

Digitalisation strengthens the funding leg of monetary transmission in the euro area. Al-

though, digital banks' assets and NFPS loans grew faster pre-tightening and remained stronger post-tightening, they contracted as compared to the high expansion before the monetary policy tightening and when contrasted with the loan dynamics of brick-and-mortar banks. Digitalisation accelerates repricing of funding costs without necessarily amplifying the loan pricing channel, which is reflected in the relative strengthening of the impact of monetary impulses on their lending volumes.

The initial results show how digital banks transmit policy through funding prices when monetary policy loosens. In the first quarters of easing, digital banks cut the marginal deposit and funding rates more decisively than peers, although the digital–benchmark premium on outstanding household deposit rates persists. They also experience a relative slowdown in deposit inflows, especially for longer durations, commensurate with the shrinking digital interest rate premium.

Three sets of implications follow. For monetary policy, digitalisation appears to intensify the funding cost channel. It accelerates deposit competition and deposit repricing following monetary policy tightening, with the impact on banks' lending. Moreover, the competitive deposit market may respond stronger to policy also on the way down, although such adjustment appears more staggered. As digital banking continue to grow, the ECB's rate policy may ask for readjustment.

For supervisory and macroprudential policy, the relative flightiness of digital banks' retail deposits, and their greater sensitivity to monetary policy changes, show the potential for digitalisation becoming the facilitating factor for new type of bank runs. Monetary policy tightening, especially when sudden or sharp, can also lead to greater compression of banks' franchise value in more digital markets. Monitoring should focus on the composition and stability of retail funding (insured vs. uninsured), the speed of maturity rebalancing at the short end, and the group structures that can obscure brand-level digital activity in entity-level data. Scenario and stress-testing frameworks may wish to incorporate greater rate-sensitivity of retail funding and the observed asymmetry between upward and downward cycles.

For banks' strategy, the results highlight the trade-off facing digital banks: rapid price adjustment can preserve retail inflows but compress margins when loan-rate pass-through is not proportionate; extending funding duration helps, but at a cost that depends on market digital adoption and competition.

Several limitations suggest directions for future research. First, brand-level digital offerings

within large groups are under-captured in entity-level datasets. This fact likely understates the full footprint of digitalisation. A richer mapping of brands to legal entities, or classifying banks along a continuous measure of their digitalisation, would refine measurement. Second, effective rates employed in the analysis are stock based, and calculated at an entity level. The consistent analysis of interest rates based on more granular, contract-level new-business rates would sharpen the analysis. Third, the easing window in the data is short, and dynamic asymmetries warrant reassessment as more observations arrive. Finally, understanding depositor behaviour at the micro level — how search frictions, aggregators, and platform design affect switching — could illuminate why digital banks' deposit volumes are so rate-sensitive while corporate and unsecured flows are not.

## References

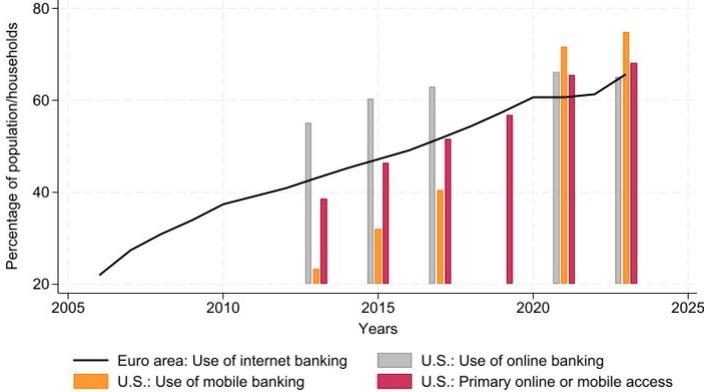
- E. Anenberg, A. C. Chang, S. Grundl, K. B. Moore, and R. Windle. The branch puzzle: Why are there still bank branches? Technical report, Board of Governors of the Federal Reserve System, August 2018.
- E. Benmelech, J. Yang, and M. Zator. Bank branch density and bank runs. Working Paper 31462, National Bureau of Economic Research, July 2023.
- R. N. Bolton, P. K. Kannan, and M. D. Bramlett. Implications of loyalty program membership and service experiences for customer retention and value. *Journal of the Academy of Marketing Science*, 28(1):95–108, 2000.
- T. A. Burnham, J. K. Frels, and V. Mahajan. Consumer switching costs: A typology, antecedents, and consequences. *Journal of the Academy of Marketing Science*, 31(2):109–126, 2003.
- M. Choi and G. Rocheteau. A model of retail banking and the deposits channel of monetary policy. *Journal of Monetary Economics*, 139:127–147, 2023.
- A. Citterio, B. P. Marques, and A. Tanda. The Early Days of Neobanks in Europe: Identification, Performance, and Riskiness. *Journal of Financial Services Research*, 5(3):205–224, September 2024.
- M. Colgate and B. Lang. Switching barriers in consumer markets: An investigation of the financial services industry. *Journal of Consumer Marketing*, 18(4):332–347, 2001.
- A. d’Avernas, A. L. Eisfeldt, C. Huang, R. Stanton, and N. Wallace. The deposit business at large vs. small banks. Technical Report 31865, NBER, November 2023.
- I. Drechsler, A. Savov, and P. Schnabl. The deposits channel of monetary policy. *The Quarterly Journal of Economics*, 132(4):1819–1876, May 2017.
- I. Drechsler, A. Savov, and P. Schnabl. Banking on deposits: Maturity transformation without interest rate risk. *Journal of Finance*, 76(3):1091–1143, June 2021.
- J. C. Driscoll and R. A. Judson. Sticky deposit rates. Finance and Economics Discussion Series 2013-80, Board of Governors of the Federal Reserve System (U.S.), 2013.

- D. Duffie and A. Krishnamurthy. Passthrough efficiency in the fed’s new monetary policy setting. In *In Proceedings - Economic Policy Symposium - Jackson Hole*, page 21–102, August 2016.
- I. Erel, J. Liebersohn, C. Yannelis, and S. Earnest. Monetary policy transmission through online banks. Working Paper 31380, National Bureau of Economic Research, June 2023.
- R. Gropp and C. Kok. *Competition and contestability in bank retail markets*, pages 365–383. Edward Elgar Publishing Ltd., October 2017.
- C. Haendler. Keeping Up in the Digital Era: How Mobile Technology Is Reshaping the Banking Sector. Working paper, Boston College, 2022.
- D. M. Hanssens, R. T. Rust, and R. K. Srivastava. Marketing strategy and wall street: Nailing down marketing’s impact. *Journal of Marketing*, 73(6):115–118, 2009. .
- E. X. Jiang, G. Y. Yu, and J. Zhang. Bank competition amid digital disruption: Implications for financial inclusion. manuscript, August 2022.
- D. Johnson and K. Grayson. Cognitive and affective trust in service relationships. *Journal of Business Research*, 58(4):500–507, 2005. Special Section: Attitude and Affect.
- N. Koont. The Digital Banking Revolution: Effects on Competition and Stability. Technical Report 4624751, Available at SSRN, 2023.
- N. Koont, T. Santos, and L. Zingales. Destabilizing Digital “Bank Walks”. NBER Working Papers 32601, National Bureau of Economic Research, Inc, 2024.
- B. Larivière and D. Van den Poel. Predicting customer retention and profitability by using random forests and regression forests techniques. *Expert Systems with Applications*, 29(2): 472–484, 2005.
- P. Liang, M. Sampaio, and S. Sarkisyan. Digital payments and monetary policy transmission. Technical Report 2024-03-014, Board of Governors of the Federal Reserve System, May 2025.
- E. Lieber and C. Syverson. 188189 online versus offline competition. In *The Oxford Handbook of the Digital Economy*. Oxford University Press, August 2012.
- S. Sarkisyan. Instant payment systems and competition for deposits. manuscript, May 2025.

- P. C. Verhoef. Understanding the effect of customer relationship management efforts on customer retention and customer share development. *Journal of Marketing*, 67(4):30–45, 2003.
- Y. Wang, T. M. Whited, Y. Wu, and K. Xiao. Bank market power and monetary policy transmission: Evidence from a structural estimation. *The Journal of Finance*, 77:2093–2141, 2022.
- K. Xiao. Monetary transmission through shadow banks. *The Review of Financial Studies*, 33(6):2379–2420, August 2020.
- Y. Z. Xu Lu, Yang Song. The Making of an Alert Depositor: How Payment and Interest Drive Deposit Dynamics. Research paper, The Wharton School, 2024.
- M. Xue, L. M. Hitt, and P. Chen. Determinants and outcomes of internet banking adoption. *Management Science*, 57(2):291–307, February 2011.
- J. Zhang, T. Muir, and S. Kundu. Diverging Banking Sector: New Facts and Macro Implications. manuscript, 2024.

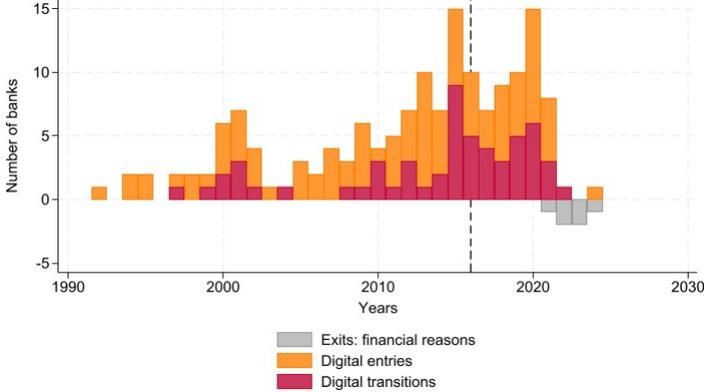
# Tables and Figures

Figure 1: Share of adults using internet banking



Notes: Euro area: share of adults using internet banking in the past 3 months. U.S.: share of adults reporting online or mobile banking as primary or a used access channel in the past 12 months.  
 Source: Eurostat EU survey on the use of Information and Communication Technologies (ICT), FDIC, Pew Research Center.

Figure 2: Entries and exits of digital banks



Notes: Exits shown as negative counts. Vertical line marks start of the main sample used in regressions.  
 Source: Own calculations.

Table 1: Variable definitions and data sources

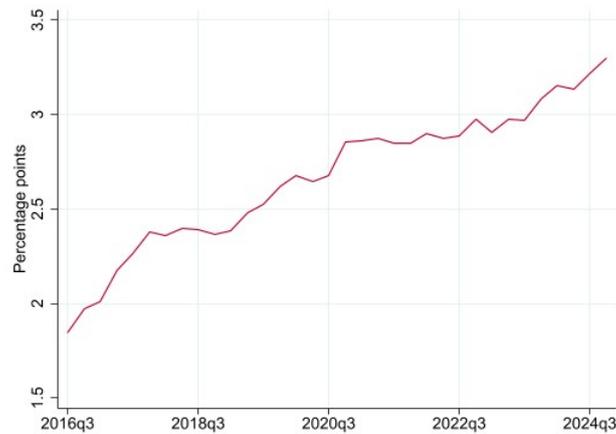
Variable	Description	Freq.	Source
<b>Interest rates</b>			
Household deposit rate	Interest expenditures related to household deposits divided by outstanding household deposits.	Quarter	FINREP
Corporate deposit rate	Interest expenditures related to non-financial corporate, MFIs and other financial corporates deposits divided by their outstanding deposits.	Quarter	FINREP
Retail funding spread	The weighted sum of retail funding spreads by maturity.	Quarter	COREP
Retail funding spread by maturity	-	Quarter	COREP
Unsecured funding spread	The weighted sum of unsecured funding spreads by maturity.	Quarter	COREP
Household loan rate	Interest income related to household loans divided by outstanding loans.	Quarter	FINREP
Non-financial corporate loan rate	Interest income related to non-financial private sector loans divided by outstanding loans.	Quarter	FINREP
Non-financial private sector loan rate	Interest income related to household and non-financial corporate loans divided by outstanding loans.	Quarter	FINREP
Offered overnight deposit rate	Offered interest rates on household overnight deposits in Dutch, German, Italian and Spanish markets.	Week	Confrontaconti, Rankia, Spaarrente and Verivox
Offered term deposit rate	Offered interest rates on household term deposits in Dutch, German, Italian and Spanish markets.	Week	Confrontaconti, Rankia, Spaarrente and Verivox
<b>Volumes</b>			
Household deposits	Outstanding household deposits.	Quarter	FINREP
Corporate deposits	Outstanding non-financial corporate, MFIs and other financial corporates deposits.	Quarter	FINREP
Retail funding volumes	Outstanding retail funding volumes summed up by maturity.	Quarter	COREP
Unsecured funding volumes	Outstanding unsecured funding volumes summed up by maturity.	Quarter	COREP
Total assets	Total assets held by the reporting institution.	Quarter	FINREP
Non-financial private sector loans	Outstanding household and non-financial private sector corporate loans.	Quarter	FINREP
Household deposits	Outstanding household deposits.	Month	BSI
Corporate deposits	Outstanding non-financial corporate and MFIs deposits.	Month	BSI
Non-financial private sector loans	Outstanding household and non-financial private sector corporate loans.	Month	BSI
<b>Control variables</b>			
Market internet penetration	Country-level share of working age population using internet banking (available on an annual frequency) weighted by the bank's relevant exposures (household deposits, corporate deposits, loans to the non-financial private sector) to the destination. Covers euro area countries only.	Quarter	EC, FINREP
Market share	The share of a bank's assets or liabilities of relevance (household deposits, corporate deposits, loans to the non-financial private sector) in the corresponding total assets or liabilities in a country weighted by the bank's relevant exposures to the destination. Covers euro area countries only.	Quarter	FINREP
Bank HHI	Country-level Herfindahl–Hirschman Index (HHI) for total assets (available on an annual frequency) weighted by the bank's relevant exposures (household deposits, corporate deposits, loans to the non-financial private sector) to the destination. Covers euro area countries only.	Quarter	ECB SDW, FINREP

Table 2: Variable statistics

Variable	Sample	Mean	Median	S.D.	10 perc.	90 perc.	Obs.
<b>Interest rates (annualised, %)</b>							
Household deposit rate	2016q3 - 2025q3	0.46	0.24	0.58	0.03	1.13	27715
Corporate deposit rate	2016q3 - 2025q3	0.80	0.43	0.96	0.03	2.14	31370
Retail funding spread	2016q3 - 2025q3	0.02	0.41	1.06	-1.90	0.73	51874
Unsecured funding spread	2016q3 - 2025q3	0.07	0.38	0.94	-1.32	0.72	56980
Non-financial private loan rate	2016q3 - 2025q3	3.23	2.73	1.88	1.65	5.24	32491
Retail funding spread: O/N	2016q3 - 2025q3	-0.12	0.39	1.19	-2.23	0.52	45931
Retail funding spread: < 1Y	2016q3 - 2025q3	0.19	0.46	0.91	-1.12	0.92	49747
Retail funding spread: > 1Y	2016q3 - 2025q3	0.21	0.39	0.96	-1.11	1.17	48974
Offered overnight deposit rate	2023m8 - 2025m11	2.09	2.02	0.83	1.00	3.21	15232
Offered term deposit rate	2023m8 - 2025m11	2.60	2.65	0.93	1.50	3.70	21131
<b>Volumes (quarter-on-quarter, %)</b>							
Household deposits	2016q3 - 2025q3	1.53	1.03	8.57	-1.66	4.30	67770
Corporate deposit	2016q3 - 2025q3	0.93	0.92	13.38	-9.15	11.01	72459
Retail funding	2016q3 - 2025q3	1.38	1.08	7.13	-2.19	4.59	43423
Unsecured funding	2016q3 - 2025q3	1.63	1.25	19.72	-14.55	18.79	63565
Total assets	2016q3 - 2025q3	1.18	0.98	5.20	-2.26	4.54	73721
Non-financial private sector loans	2016q3 - 2025q3	1.31	0.88	13.93	-2.33	4.76	33100
Household deposits: O/N	2016q3 - 2025q3	1.82	1.55	14.59	-3.78	6.72	29686
Household deposits: agreed maturity	2016q3 - 2025q3	2.60	-0.35	24.66	-11.30	17.87	28517
Retail funding: O/N	2016q3 - 2025q3	2.16	2.02	9.79	-3.28	7.41	58227
Retail funding: term	2018q2 - 2025q3	2.83	-0.96	29.90	-15.44	22.07	27305
Household deposits (BSI)	2019m12 -2025m9	2.05	0.20	17.46	-4.90	11.11	114875
Corporate deposit (BSI)	2019m12 -2025m9	1.40	0.28	32.93	-15.76	19.55	128286
Non-financial private loans (BSI)	2019m12 -2025m9	1.53	1.33	14.54	-2.20	5.37	130813
Non-financial private loans (notional)	2019m12 -2025m9	1.53	1.33	14.54	-2.20	5.37	130813
Assets (BSI)	2019m12 -2025m9	1.53	1.33	14.54	-2.20	5.37	130813
Assets (notional)	2019m12 -2025m9	1.53	1.33	14.54	-2.20	5.37	130813
<b>Other control variables</b>							
Internet penetration: HH deposits (%)	2016q3 - 2025q3	52.43	55.56	14.04	30.83	59.36	7376
Internet penetration: corp. dep. (%)	2016q3 - 2025q3	52.92	55.56	13.82	30.83	61.10	7572
Internet penetration: loans (%)	2016q3 - 2025q3	51.28	52.97	19.40	30.83	84.61	4620
Market share: household deposits (%)	2016q3 - 2025q3	0.24	0.04	1.45	0.00	0.27	7559
Market share: corporate deposits (%)	2016q3 - 2025q3	0.27	0.02	1.61	0.00	0.27	7797
Market share: loans (%)	2016q3 - 2025q3	0.33	0.05	1.51	0.00	0.40	4563
Bank HHI: household deposits (%)	2016q3 - 2025q3	5.09	2.50	4.84	2.45	11.02	7376
Bank HHI: corporate deposits (%)	2016q3 - 2025q3	5.40	2.50	5.19	2.45	11.38	7572
Bank HHI : loans (%)	2016q3 - 2025q3	8.35	5.79	6.79	2.45	21.45	4620

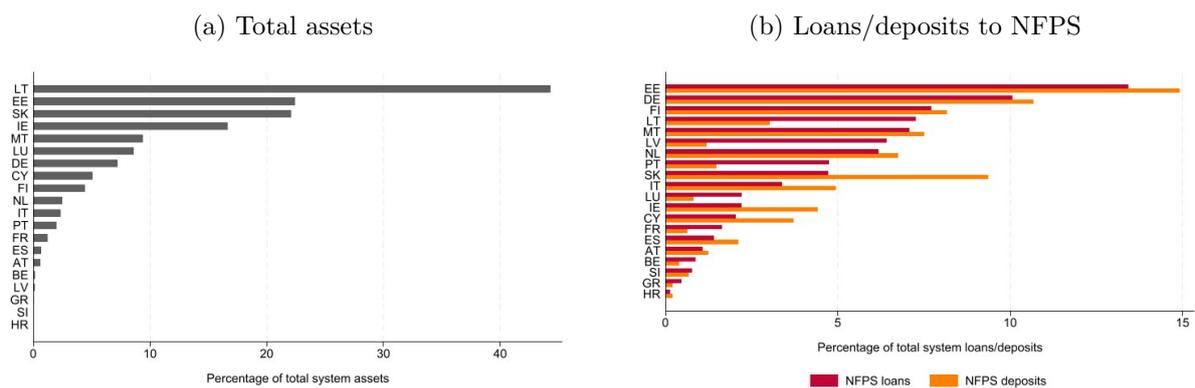
Source: FINREP, COREP, BSI, comparison portals (Confrontaconti, Rankia, Spaarrente, Verivox), own calculations.

Figure 3: Share of digital banks in the euro area banking system assets



Notes: Banking system assets include branches of foreign banks active in the euro area. End period values.  
Source: FINREP, own calculations.

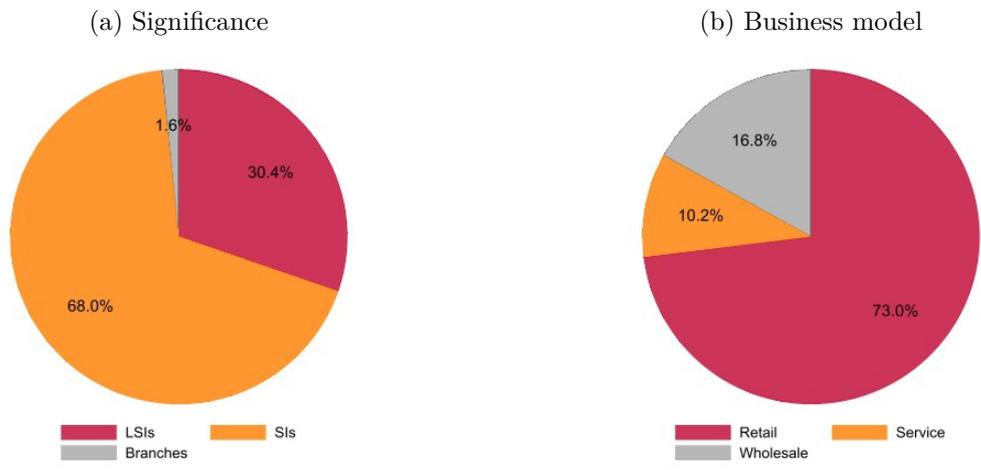
Figure 4: Share of digital banks in national banking systems' assets, non-financial private sector loans and deposits



Notes: End 2024. Country-level bank total assets calculated based on home-country statistics. Country-level bank loans and deposits are calculated as the sum of euro area banks' exposures to a reference location (locational statistics).

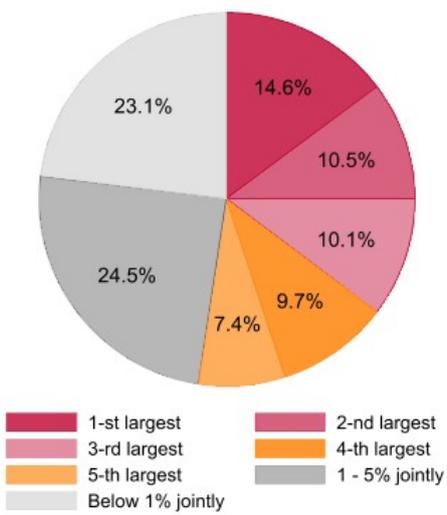
Source: FINREP, own calculations.

Figure 5: Break-down of digital bank total assets by systemic significance and business model



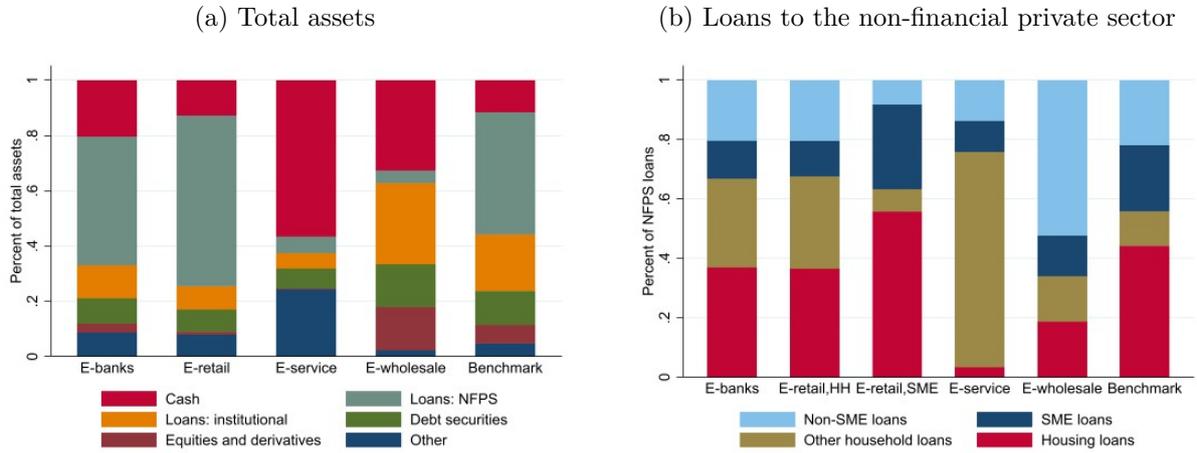
Legend: End 2024. The euro area banking system assets include assets of branches of foreign entities which are active in the euro area. Label "Branches" stands for branches of foreign entities.  
 Source: FINREP, own calculations.

Figure 6: Asset concentration in digital bank segment



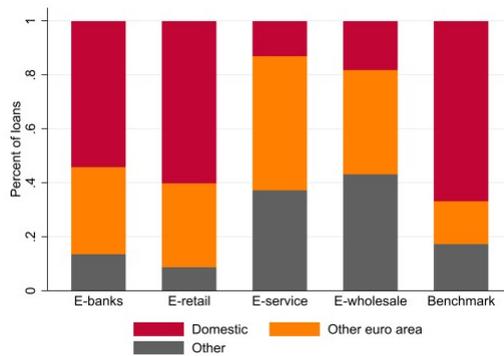
Notes: End 2024.  
 Source: FINREP, own calculations.

Figure 7: Assets and loans of digital compared to benchmark banks



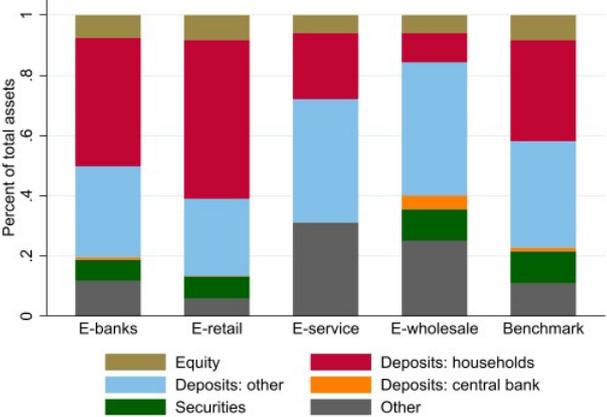
Notes: End 2024. "Cash" includes balances at central banks. "Institutional" sector includes MFIs, other financial corporations, and public sector. NFPF stands for non-financial private sector. Source: FINREP, own calculations.

Figure 8: Geographical dispersion of loans of digital compared to benchmark banks



Notes: End 2024. Source: FINREP, own calculations.

Figure 9: Equity and liabilities as a share of total assets of digital compared to benchmark banks

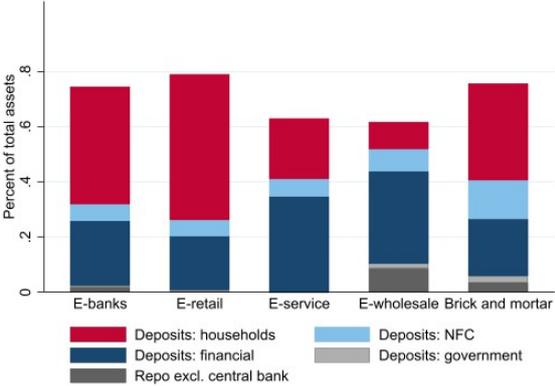


Notes: End 2024. "Other" includes derivatives, other financial liabilities, provisions, hedges, taxes, and capital payable on demand. "Deposits: other" includes deposits of financial, government, and non-financial corporate sector.

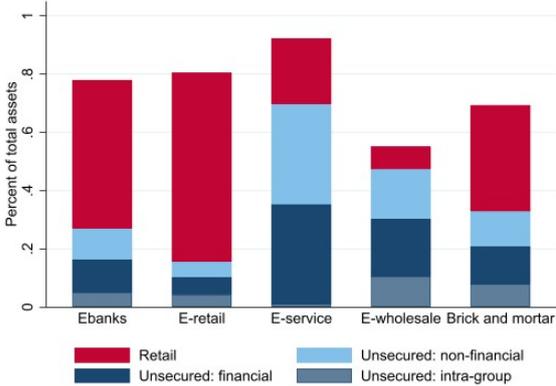
Source: FINREP, own calculations.

Figure 10: Deposits and funding of digital compared to benchmark banks

(a) Non-central bank deposits



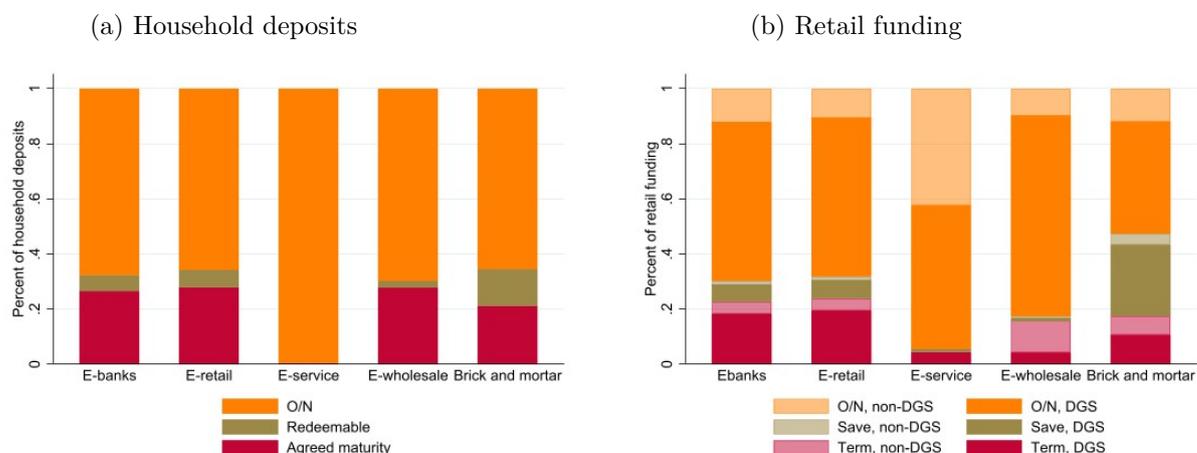
(b) Retail and unsecured wholesale funding



Notes: End 2024. Unsecured intra-group funding is deducted from unsecured non-financial and financial funding proportionately. Repo deposits are excluded (as a part of secured funding).

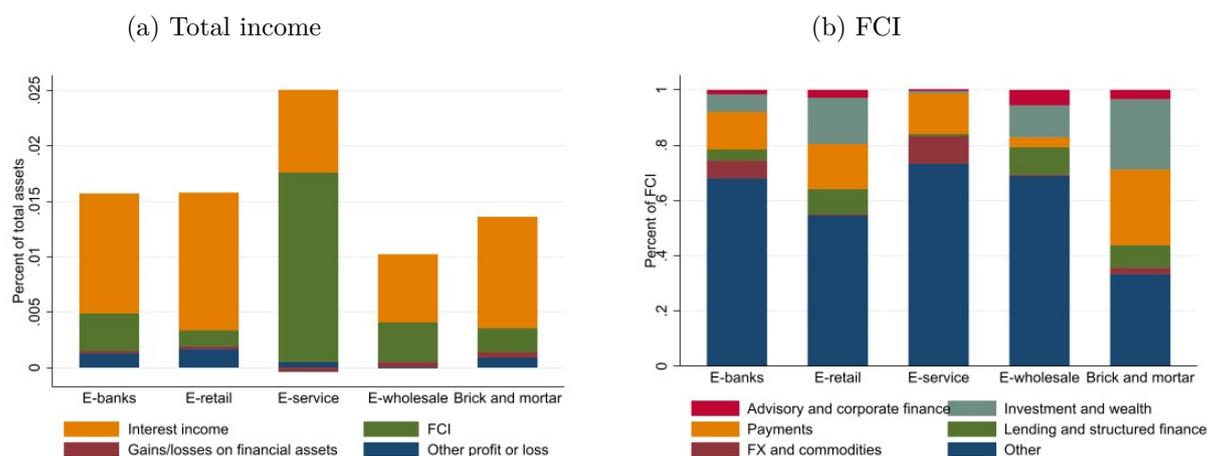
Source: FINREP, COREP, own calculations.

Figure 11: Household deposits and retail funding of digital compared to benchmark banks



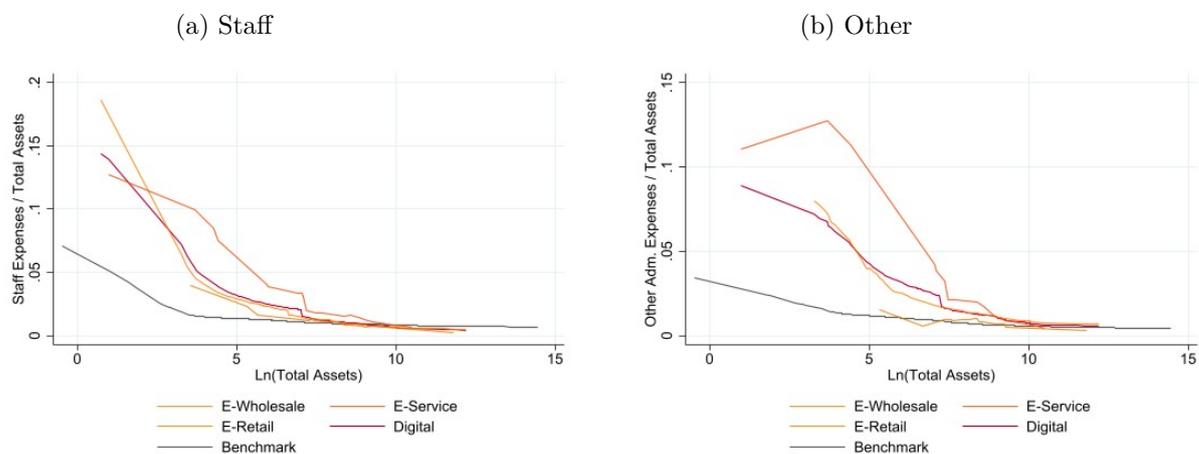
Notes: End 2024. O/N stands for overnight, DGS for the Deposit Guarantee Scheme.  
Source: FINREP, COREP, own calculations.

Figure 12: Income of digital compared to benchmark banks



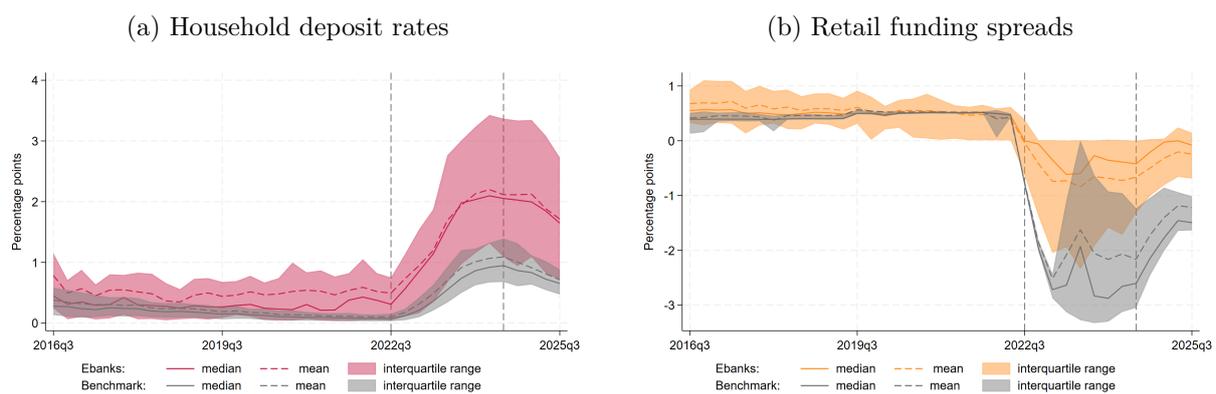
Notes: End 2024. LHS: "Gains/losses on financial assets" includes also dividend income. "Other profit or loss" includes other operating income, negative goodwill, share of profit or loss of investments in subsidiaries and similar, profit or loss before tax from extraordinary or discontinued operations, and from non-current assets and disposal groups. RHS: "Investment and wealth" includes income from securities issuance and other services related to securities, managing, safeguarding or administering customer investments classified in FINREP as "Securities", "Clearing and settlement", "Asset management", "Custody", "Central administrative services for collective investment", "Fiduciary transactions". "Advisory and corporate finance" includes fees related to advisory for advisory for M&A, treasury, and other high-level financial planning for corporates, classified in FINREP as "Corporate Finance" or "Fee based advice". "Payments" includes fees related to current accounts, credit, debit and other card payments. "Lending and structured finance" includes Fees linked to the origination, syndication, servicing, and guarantees for loans classified under "Structured finance", "Loan servicing activities", "Loan commitments given", "Financial guarantees given" or "Loans granted" in FINREP. "Markets and trading" includes commissions from FX, commodity and trading-related services, under "Foreign exchange" or "Commodities" in FINREP. "Other" includes intermediary roles and residuals, grouped in FINREP under "Other fee and commission income" and "Customer resources distributed but not managed".  
Source: FINREP, own calculations.

Figure 13: Administrative expenses versus asset size of digital compared to benchmark banks



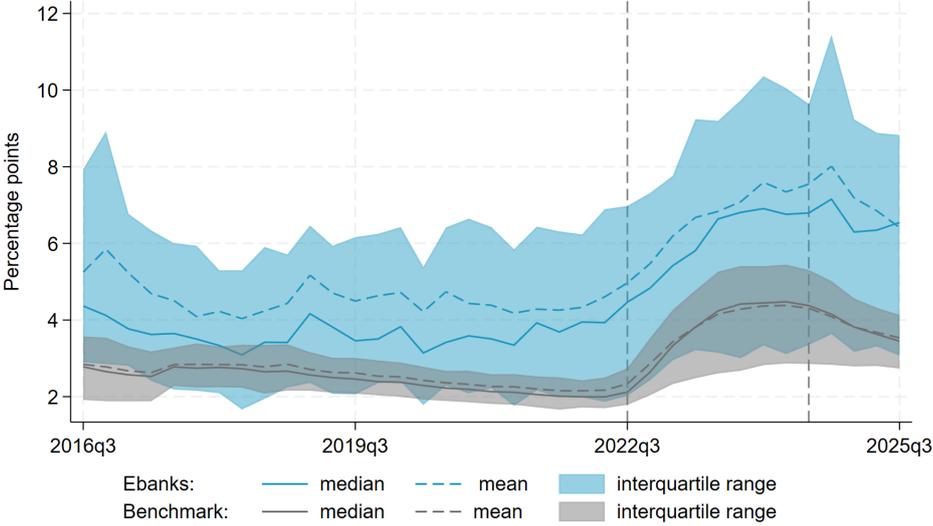
Notes: End 2024. Locally weighted regressions of annualized administrative expenses to total assets, mean-smoothing.  
Source: FINREP, own calculations.

Figure 14: Household deposit rates and retail funding spreads over time: digital and benchmark banks



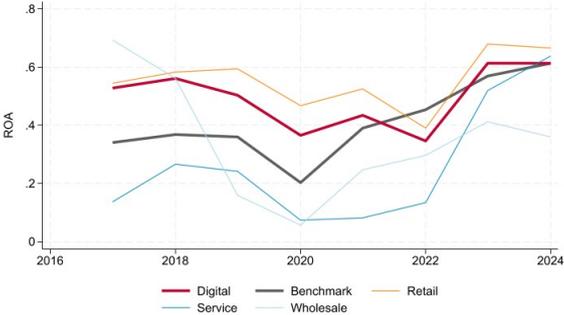
Notes: Household deposit rates are annualised.  
Source: FINREP, COREP, own calculations.

Figure 15: Lending rates for non-financial private sector over time: digital and benchmark banks



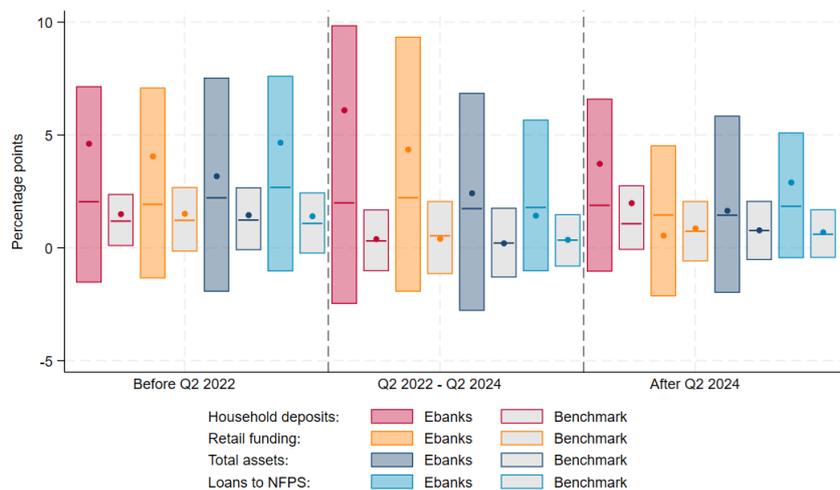
Notes: Lending rates are annualised.  
Source: FINREP, own calculations.

Figure 16: Return-on-assets of digital compared to benchmark banks



Notes: End year values.  
Source: FINREP, own calculations.

Figure 17: Deposit, funding, and asset growth in monetary policy windows



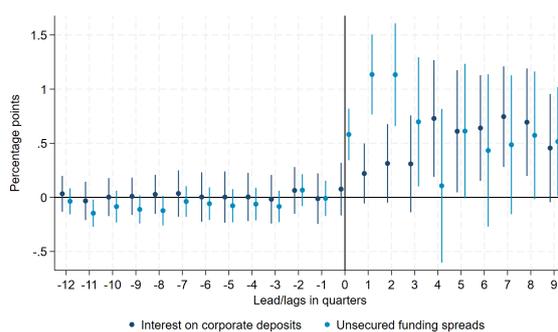
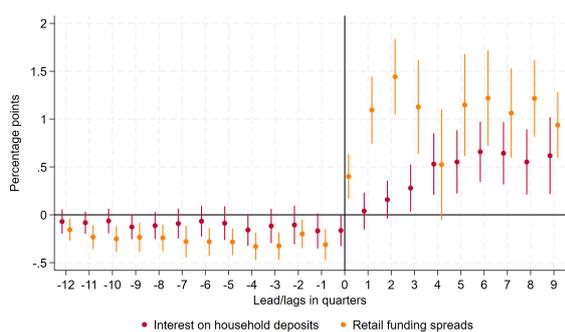
Notes: Quarter-on-quarter growth rates. A horizontal line shows the sub-sample mean, dot shows the corresponding median, bars, the interquartile range.

Source: FINREP, COREP, own calculations.

Figure 18: Dynamic Difference-in-Differences for household deposit rates and funding spreads

(a) Household deposit rates/Retail funding spreads

(b) Corporate deposit rates/Unsecured funding spreads

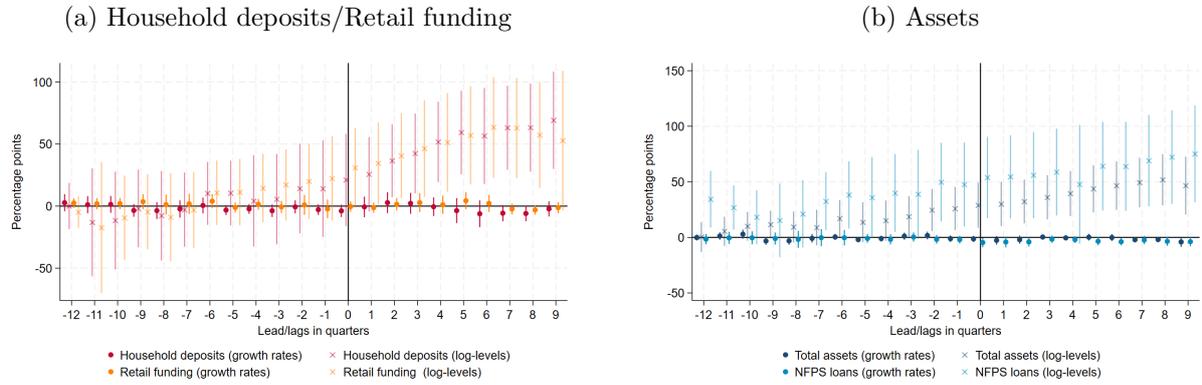


Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *InternetUse* stands for internet penetration defined as in Table 1. Standard errors clustered at bank level. Quarter 0 is 2022Q3.

Vertical bars denote 99% confidence intervals.

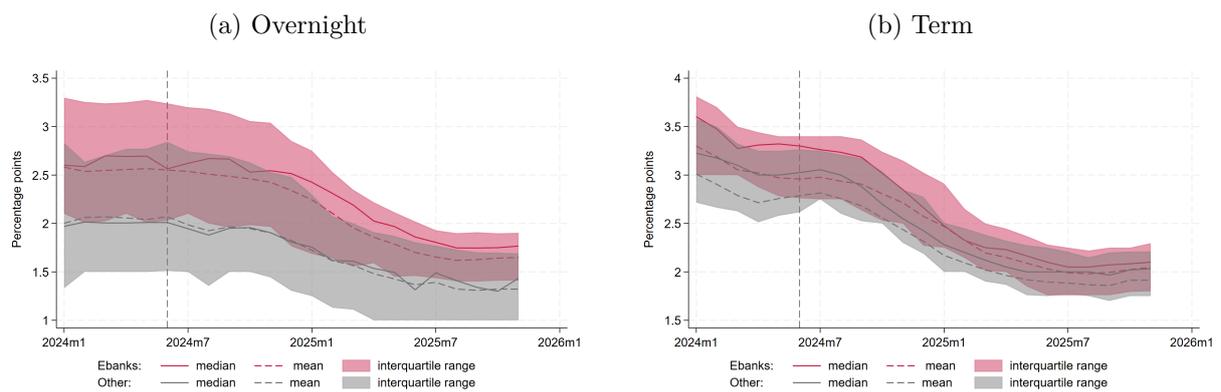
Source: FINREP, COREP, own calculations.

Figure 19: Dynamic Difference-in-Differences for deposit, funding, assets and loan volumes



Notes: Growth rates are quarter-on-quarter. Two-way fixed effects with bank and time effects. Standard errors clustered at bank level. Quarter 0 is 2022Q3. Vertical bars denote 99% confidence intervals. Source: FINREP, COREP, own calculations.

Figure 20: Household deposit rates based on web scraping



Source: Confrontaconti, Rankia, Spaarrente and Verivox, own calculations.

Table 3: Difference-in-Differences regressions for bank interest rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Deposit HH		Retail fund.		Deposit corp.		Unsec. fund.		Loan NFPS	
<i>Ebank</i>	0.369***	0.351***	1.131***	1.095***	0.400***	0.281**	0.764***	0.573***	-0.125	-0.206
$\times PostTightening$	(0.065)	(0.066)	(0.131)	(0.135)	(0.122)	(0.122)	(0.157)	(0.158)	(0.250)	(0.250)
<i>InternetUse</i>		0.221***		1.046***		1.299***		2.609***		0.779***
$\times PostTightening$		(0.076)		(0.210)		(0.167)		(0.287)		(0.276)
<i>Ebank</i> $\times$ <i>DFR</i>	0.154***	0.146***	0.356***	0.342***	0.149***	0.103**	0.177***	0.117*	-0.039	-0.064
$\times PostTightening$	(0.024)	(0.025)	(0.050)	(0.053)	(0.046)	(0.046)	(0.060)	(0.060)	(0.077)	(0.077)
<i>InternetUse</i> $\times$ <i>DFR</i>		0.091***		0.465***		0.480***		0.878***		0.259**
$\times PostTightening$		(0.030)		(0.113)		(0.066)		(0.140)		(0.103)
Obs.	22410	22402	47983	47452	25453	25401	52664	51729	26518	26486
Clusters	1069	1068	2378	2296	1186	1183	2483	2388	1212	1209

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *InternetUse* stands for internet banking penetration defined as in Table 1. Standard errors clustered at bank level. DFR semi-elasticities shown where indicated. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 4: Difference-in-Differences regressions for deposit interest rates and funding spreads with a break-down of digital banks into stand-alone and connected

	(1)	(2)		(3)	(4)	(5)	(6)		(7)	(8)
	Deposit households		Retail funding							
	Stand-alone	Connected		Stand-alone	Connected					
<i>Ebank</i> $\times$ <i>PostTightening</i>	0.487***	0.466***	0.112	0.096	1.425***	1.343***	0.171	0.128		
	(0.083)	(0.084)	(0.074)	(0.075)	(0.136)	(0.141)	(0.201)	(0.219)		
<i>InternetUse</i> $\times$ <i>PostTightening</i>		0.229***		0.255***		1.052***		1.250***		
		(0.075)		(0.077)		(0.211)		(0.217)		
Obs.	21774	21766	21254	21246	47336	46907	46161	45641		
Clusters	1042	1041	1005	1004	2349	2271	2291	2210		
	(9)	(10)		(11)	(12)	(13)	(14)		(15)	(16)
	Deposit corporate		Unsecured fund.							
<i>Ebank</i> $\times$ <i>PostTightening</i>	0.280*	0.139	0.609***	0.523***	0.845***	0.656***	0.517	0.276		
	(0.146)	(0.148)	(0.209)	(0.198)	(0.175)	(0.186)	(0.325)	(0.258)		
<i>InternetUse</i> $\times$ <i>PostTightening</i>		1.311***		1.340***		2.604***		2.874***		
		(0.165)		(0.172)		(0.290)		(0.296)		
Obs.	24746	24694	24277	24225	52039	51170	50934	49999		
Clusters	1155	1152	1117	1114	2450	2359.000	2397	2302		

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *InternetUse* stands for internet banking penetration defined as in Table 1. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 5: Difference-in-Differences regressions for funding spreads by duration

	(1)	(2)			(3)	(4)	(5)	(6)			(7)	(8)
	Retail funding		Unsecured funding									
	O/N	$\leq$ 3-months <sup>#</sup>	$\leq$ 1-year <sup>#</sup>	$>$ 1-year	O/N	$\leq$ 3-months*	$\leq$ 1-year**	$>$ 1-year				
<i>Ebank</i> $\times$ <i>PostTightening</i>	1.458***	0.847***	0.879***	0.514***	0.813***	0.728*	0.818***	0.567***				
	(0.159)	(0.295)	(0.118)	(0.119)	(0.202)	(0.415)	(0.146)	(0.163)				
Obs.	42627	23398	46243	45796	47342	22691	43770	34176				
Clusters	2291	1545	2261	2205	2350	1570	2243	2107				

Notes: <sup>#</sup> - excl. O/N, <sup>#</sup> - excl. maturities below or equal 3-months. Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 6: Regressions of non-financial private sector loan interest rates on deposit rates

	(1)	(2)
	NFPS loans %	NFPS loans %
<i>Deposit HH %</i>	0.788***	
	(0.108)	
<i>Ebank × Deposit HH %</i>	-0.690***	
	(0.138)	
<i>Deposit corp. %</i>		0.538***
		(0.048)
<i>Ebank × Deposit corp. %</i>		-0.180**
		(0.075)
<i>Const.</i>	1.050***	0.840***
	(0.060)	(0.063)
Obs.	782	875
Adj. R-squared	0.669	0.682

Notes: Interest rate changes calculated as the difference between the level in 2022 Q2 and the mean level between 2022Q3 and 2024Q2. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 7: Difference-in-Differences regressions for funding and asset volumes

	(1)	(2)	(3)	(4)	(5)	(6)
	Growth rates (quarter-on-quarter)					
	Deposits HH	Retail funding	Deposits corp.	Unsec. funding	Total assets	Loans NFPS
<i>Ebank × PostTightening</i>	-1.235	0.318	-0.992	-3.618	-1.031	-3.228***
	(1.861)	(1.337)	(1.633)	(2.613)	(0.658)	(1.095)
Obs.	55783	39746	59805	59268	60981	27264
Clusters	2345	2122	2499	2553	2543	1255
	Log-levels					
<i>Ebank × PostTightening</i>	45.280***	42.675***	24.501**	-3.984	27.550***	35.596***
	(9.577)	(8.693)	(10.146)	(13.780)	(5.900)	(10.071)
Obs.	58468	42314	62480	60028	63737	28580
Clusters	2390	2177	2539	2569	2593	1293

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 8: Difference-in-Differences regressions for retail funding volumes: covered and not covered by Deposit Guarantee Scheme

	(1)	(2)
	Growth rates (quarter-on-quarter)	
	Covered	Uncovered
<i>Ebank × PostTightening</i>	-2.121	-7.686**
	(1.823)	(2.999)
Obs.	39199	40092
Clusters	2104	211
	Log-levels	
<i>Ebank × PostTightening</i>	38.632***	45.878***
	(10.258)	(12.216)
Obs.	41759	42554
Clusters	2161	2160

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 9: Regressions of changes in volumes on changes in interest rates

	(1)	(2)	(3)	(4)	(5)	(6)
	Household deposits	Retail funding	New retail funding	Corporate deposits	Unsec. funding	New unsec. funding
$\Delta$ Interest rate	6.140*** (2.068)	-0.009** (0.004)	0.004*** (0.001)	0.903 (1.211)	0.487 (0.453)	5.372*** (1.318)
$Ebank \times \Delta$ Interest rate	11.682*** (2.427)	0.041*** (0.005)	0.004*** (0.002)	-4.331** (1.784)	-3.722*** (1.283)	-9.857*** (3.758)
Cons.	-2.221** (1.110)	0.014 (0.030)	-0.075** (0.038)	0.046 (1.554)	-0.858 (0.710)	11.705*** (2.062)
Obs.	779	1524	1537	895	1822	1811
Adj. R-squared	0.087	0.056	0.029	0.004	0.004	0.009

Notes: Interest rate/volume changes calculated as the difference between the level in 2022 Q2 and the mean level/log-level between 2022Q3 and 2024Q2. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 10: Staggered Difference-in-Differences regressions for interest rates and volumes

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep HH.	Retail fund.	Dep. corp.	Unsec. fund.	Assets	Loans NFPS
$Ebank \times PostTightening$	0.371*** (0.068)	1.147*** (0.130)	0.409*** (0.121)	0.754*** (0.159)		-0.144 (0.254)
$Ebank \times PostEasing$	0.298*** (0.073)	-0.092 (0.080)	0.105 (0.084)	-0.225*** (0.084)		0.299* (0.169)
Obs.	27679	51822	31331	56924		32459
Clusters	1089	2385	1209	2489		1231
	Volume growth rates					
$Ebank \times PostTightening$	-0.583 (1.785)	0.285 (1.316)	-0.930 (1.575)	-4.341 (2.792)	-0.738 (0.655)	-3.092*** (1.069)
$Ebank \times PostEasing$	-3.966*** (1.533)	-3.877*** (1.296)	1.470 (1.612)	4.753 (3.762)	-1.641 (1.004)	0.528 (0.981)
Obs.	67735	43380	72423	63517	73684	33070
Clusters	2355	2129	2511	2561	2553	1273

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3.  $Ebank$  is a dummy indicator for digital-only banks,  $PostTightening$  equals 1 from 2022Q3 and 0 otherwise,  $PostEasing$  equals 1 from 2024Q2 and 0 otherwise. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 11: Staggered Difference-in-Differences regressions for funding spreads by duration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	O/N	Retail funding			O/N	Unsecured funding		
		$\leq$ 3-months <sup>#</sup>	$\leq$ 1-year <sup>##</sup>	$>$ 1-year		$\leq$ 3-months*	$\leq$ 1-year**	$>$ 1-year
$Ebank \times PostTightening$	1.467*** (0.161)	0.843*** (0.299)	0.889*** (0.116)	0.508*** (0.117)	0.800*** (0.202)	0.769* (0.425)	0.795*** (0.145)	0.543*** (0.160)
$Ebank \times PostEasing$	0.037 (0.093)	0.143 (0.146)	-0.314*** (0.081)	-0.531*** (0.097)	-0.142 (0.093)	-0.166 (0.172)	-0.464*** (0.099)	-0.528*** (0.108)
Obs.	45870	25256	49680	48921	51325	24599	46917	36698
Clusters	2300	1568	2275	2223	2359	1586	2270	2131

Notes: <sup>#</sup> - excl. O/N, <sup>##</sup> - excl. maturities below or equal 3-months. Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3.  $Ebank$  is a dummy indicator for digital-only banks,  $PostTightening$  equals 1 from 2022Q3 and 0 otherwise,  $PostEasing$  equals 1 from 2024Q2 and 0 otherwise. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 12: Difference-in-Differences regressions for offered deposit interest rates based on web scraping

	(1)	(2)	(3)	(4)
	Overnight		Term	
<i>Ebank</i> × <i>PostEasing</i>	-0.160** (0.075)	-0.143 (0.333)	-0.116 (0.071)	-0.828*** (0.302)
<i>InternetUse</i> × <i>PostEasing</i>		-0.024 (0.445)		1.040** (0.443)
Obs.	15540	15540	21572	21572
Clusters	143	143	232	232

Notes: Two-way fixed effects with bank and time effects. Standard errors clustered at bank level. Sample: mid-August 2023 - mid-November 2025. *Ebank* is a dummy indicator for digital-only banks, *PostEasing* equals 1 from the second week of July 2024 and 0 otherwise, *InternetUse* stands for internet banking penetration on a country level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 13: Difference-in-Differences regressions for deposit, assets and loan volumes: BSI data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Growth rates (quarter-on-quarter)							
	Deposit HH	Deposit HH	Deposit HH	Deposit	Loan NFPS	Loan NFPS	Assets	Assets
		ON	AM	NFC/MFI		Not.stock		Not.stock
<i>Ebank</i> × <i>PostTightening</i>	1.418 (2.461)	1.820 (2.252)	0.968 (3.941)	0.963 (2.784)	-2.361 (1.866)	0.592 (0.477)	-2.001 (1.316)	-0.453 (0.547)
<i>Ebank</i> × <i>PostEasing</i>	-4.674** (1.832)	-3.019 (2.107)	-8.001*** (3.074)	-3.013 (2.509)	-1.410 (1.221)	-1.208*** (0.388)	-2.667* (1.550)	-1.331*** (0.498)
Obs.	59294	58191	53909	71275	67503	66361	74824	74590
Clusters	1008	997	944	1213	1134	1088	1263	1241
	Log-levels							
<i>Ebank</i> × <i>PostTightening</i>	17.455*** (6.537)	12.557 (7.813)	6.048 (12.019)	4.096 (8.330)	17.020** (8.671)	6.710** (2.717)	15.703*** (5.903)	8.542*** (2.428)
<i>Ebank</i> × <i>PostEasing</i>	9.447 (7.564)	6.317 (9.689)	13.799 (9.442)	1.530 (7.219)	5.688 (5.321)	4.905** (2.072)	3.613 (3.857)	4.578** (2.118)
Obs.	62447	61453	57135	74980	70895	69522	78468	78101
Clusters	1033	1025	967	1239	1158	1088	1284	1241

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from August 2024 and 0 otherwise. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## A Appendix: Heterogeneity across digital bank types

Table 14: Difference-in-Difference regressions for interest rates and funding spreads with a breakdown of digital banks by business model

	(1)	(2)	(3)	(4)	(5)
	Deposit HH	Retail fund.	Deposit corp.	Unsec fund.	Loan NFPS
Retail digital banks					
<i>Ebank</i> × <i>PostTightening</i>	0.371*** (0.073)	0.847*** (0.144)	0.324** (0.155)	0.590*** (0.185)	-0.422 (0.265)
<i>Ebank</i> × <i>PostEasing</i>	0.339*** (0.082)	0.035 (0.088)	0.138 (0.103)	-0.157 (0.102)	0.459*** (0.156)
Obs.	27204	50917	30583	55863	31744
Clusters	1067	2349	1172	2443	1196
Service digital banks					
<i>Ebank</i> × <i>PostTightening</i>	0.401** (0.201)	1.971*** (0.316)	0.915*** (0.189)	1.360*** (0.342)	0.056 (0.859)
<i>Ebank</i> × <i>PostEasing</i>	0.042 (0.136)	-0.544*** (0.207)	-0.160 (0.220)	-0.440*** (0.168)	0.288 (0.585)
Obs.	25670	49532	29302	54833	30094
Clusters	1007	2290	1123	2396	1134
Wholesale digital banks					
<i>Ebank</i> × <i>PostTightening</i>	0.343 (0.267)	1.657*** (0.264)	0.417* (0.224)	0.549 (0.452)	1.411* (0.831)
<i>Ebank</i> × <i>PostEasing</i>	0.201 (0.249)	-0.167 (0.169)	0.176 (0.164)	-0.162 (0.186)	-0.796 (0.834)
Observations	25691	49353	29430	54616	30041
Clusters	1005	2282	1120	2388	1129

Notes: Classification of banks as in Section 2. Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 15: Difference-in-Difference regressions for deposit, funding, asset and loan volume growth with a break-down of digital banks by business model

	(1) Deposits HH	(2) Retail funding	(3) Deposits corp.	(4) Unsec. funding	(5) Total assets	(6) Loans NFPS
Retail digital banks						
<i>Ebank</i> × <i>PostTightening</i>	-0.054 (2.005)	-0.654 (1.625)	-1.851 (2.188)	-3.240 (3.745)	-0.724 (0.825)	-1.974* (1.168)
<i>Ebank</i> × <i>PostEasing</i>	-5.111*** (1.577)	-2.600** (1.292)	2.502 (1.857)	3.768 (5.504)	-1.366 (0.914)	-1.296*** (0.479)
Obs.	66743	42698	71049	62420	72174	32274
Clusters	2311	2093	2458	2512	2494	1232
Service digital banks						
<i>Ebank</i> × <i>PostTightening</i>	-2.670 (6.363)	0.556 (2.825)	-0.639 (3.099)	-10.624** (4.307)	-2.038 (1.623)	-5.609** (2.683)
<i>Ebank</i> × <i>PostEasing</i>	0.331 (5.597)	-0.046 (1.912)	-2.588 (3.604)	7.840** (3.513)	1.557 (2.799)	6.591 (5.767)
Obs.	64978	41536	69458	61317	70236	30365
Clusters	2249	2040	2398	2462	2426	11650
Wholesale digital banks						
<i>Ebank</i> × <i>PostTightening</i>	-0.667 (2.356)	5.821* (3.020)	1.932 (2.597)	-0.236 (6.787)	0.904 (1.187)	-7.170** (3.514)
<i>Ebank</i> × <i>PostEasing</i>	-3.349 (3.266)	-16.706*** (5.003)	1.552 (5.063)	3.867 (7.067)	-6.944* (4.058)	6.806 (5.192)
Obs.	64838	41408	69344	61160	70016	30357
Clusters	2239	2030	2387	2453	2413	1160

Notes: Classification of banks as in Section 2. Quarter-on-quarter growth rates. Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 16: Difference-in-Differences regressions for offered deposit interest rates based on web scrapping with a break-down of digital banks by business model

	(1) Overnight	(2) Term
Retail digital banks		
<i>Ebank</i> × <i>PostEasing</i>	-0.158* (0.092)	-0.171** (0.074)
Obs.	12912	18308
Clusters	115	196
Payment and wholesale digital banks		
<i>Ebank</i> × <i>PostEasing</i>	-0.202 (0.157)	0.027 (0.126)
Obs.	7310	13085
Clusters	84	170

Notes: Classification of banks as in Section 2. Quarter-on-quarter growth rates. Sample: mid-August 2023 - mid-November 2025. *Ebank* is a dummy indicator for digital-only banks, *PostEasing* equals 1 from the second week of July 2024 and 0 otherwise. Two-way fixed effects with bank and time effects. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 17: Difference-in-Difference regressions for deposit, assets and loan volume growth with BSI data and a break-down of digital banks by business model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Growth rates (quarter-on-quarter)							
	Deposit HH	Deposit HH	Deposit HH	Deposit	Loan NFPS	Loan NFPS	Assets	Assets
		ON	AM	NFC/MFI		Not.stock		Not.stock
Retail digital banks								
<i>Ebank</i> ×	2.376*	1.336	3.046	-1.848	-0.714	0.813	-0.718	-0.864
<i>PostTightening</i>	(1.255)	(1.550)	(3.585)	(3.111)	(1.520)	(0.619)	(1.336)	(0.823)
<i>Ebank</i> ×	-3.155***	-0.762	-5.416**	-0.580	-3.330**	-2.075***	-2.200	-1.767***
<i>PostEasing</i>	(1.011)	(1.481)	(2.416)	(2.702)	(1.295)	(0.594)	(1.369)	(0.682)
Obs.	54044	52747	47821	65101	62512	65962	68135	71871
Clusters	979	957	922	1171	1122	1081	1219	1197
Service digital banks								
<i>Ebank</i> ×	-6.873**	-2.122	-6.577	-1.604	-2.042	3.087**	-3.189	-0.621
<i>PostTightening</i>	(3.356)	(3.353)	(4.639)	(4.921)	(4.061)	(1.427)	(2.220)	(1.956)
<i>Ebank</i> ×	4.759***	1.584	3.284	2.406	3.971	-3.946***	2.198	0.131
<i>PostEasing</i>	(1.813)	(1.872)	(8.110)	(3.195)	(7.518)	(1.399)	(1.409)	(1.289)
Obs.	51070	50326	45113	61994	58753	61856	64537	68106
Clusters	922	914	870	1119	1053	1017	1162	1139
Wholesale digital banks								
<i>Ebank</i> ×	-6.957	-1.565	-0.373	3.663	-12.615**	-2.508*	-4.113	0.143
<i>PostTightening</i>	(5.347)	(3.137)	(5.595)	(4.023)	(6.067)	(1.382)	(3.641)	(1.668)
<i>Ebank</i> ×	-1.711	-3.149	-9.940***	-7.576	4.049	2.359***	-1.339	-0.800
<i>PostEasing</i>	(2.204)	(5.484)	(3.651)	(6.603)	(4.230)	(0.854)	(4.319)	(1.518)
Obs.	51013	50117	45291	61874	58719	61715	64058	67762
Clusters	919	907	872	1113	1052	1013	1151	1131

Notes: Quarter on quarter growth rates. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from August 2024 and 0 otherwise. Two-way fixed effects with bank and time effects. Standard errors clustered at bank level. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## B Appendix: Robustness checks

Table 18: Difference-in-Difference regressions for interest rates: robustness with market shares and HHI

	(1)	(2)	(3)	(4)	(5)
	Market share				
	Deposit HH	Retail fund.	Deposit corp.	Unsec fund.	Loan NFPS
<i>Ebank</i> × <i>PostTightening</i>	0.372*** (0.068)	1.183*** (0.132)	0.413*** (0.120)	0.754*** (0.154)	-0.151 (0.256)
<i>Ebank</i> × <i>PostEasing</i>	0.299*** (0.073)	-0.082 (0.082)	0.109 (0.084)	-0.221** (0.087)	0.298* (0.169)
<i>MShare</i> × <i>PostTightening</i>	-0.357* (0.188)	0.751 (0.779)	0.827 (0.516)	3.348*** (1.052)	0.715 (0.655)
<i>MShare</i> × <i>PostEasing</i>	-0.073 (0.158)	0.528 (0.523)	0.882*** (0.299)	-0.459 (0.612)	0.103 (0.255)
Obs.	27651	51204	31237	55804	32388
Clusters	1088	2303	1206	2394	1228
	(1)	(2)	(3)	(4)	(5)
	HHI index on total assets				
<i>Ebank</i> × <i>PostTightening</i>	0.380*** (0.068)	1.090*** (0.138)	0.355*** (0.122)	0.562*** (0.162)	-0.371 (0.261)
<i>Ebank</i> × <i>PostEasing</i>	0.277*** (0.074)	-0.075 (0.083)	0.093 (0.086)	-0.121 (0.090)	0.258 (0.177)
<i>HHI</i> × <i>PostTightening</i>	-0.223 (0.183)	3.055*** (0.676)	2.005*** (0.437)	6.116*** (0.689)	5.043*** (0.630)
<i>HHI</i> × <i>PostEasing</i>	0.794*** (0.186)	0.737 (0.468)	0.451* (0.247)	-1.557*** (0.465)	0.864** (0.430)
Obs.	27651	51204	31237	55804	32388
Clusters	1088	2303	1206	2394	1228

Notes: Market share is defined as a bank-exposure weighted share of activity in a national market. HHI index is derived by weighting national HHI indices for total bank assets, by a relevant bank exposure to the national market. For household deposits and retail funding, the corresponding shares are calculated based on household deposit data. For corporate deposits and unsecured funding, they are based on corporate deposit information. For total assets and loans to the non-financial private sector, based on loans to the non-financial private sector. The weights are calculated for the euro area countries only, and rescaled to sum up to 100%. Two-way fixed effects with bank and time effects. Standard errors in parentheses. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 19: Difference-in-Difference regressions for growth rates of volumes: robustness with market shares and HHI

	(1)	(2)	(3)	(4)	(5)	(6)
	Deposit HH		Market share		Assets	Loan NFPS
	HH	Retail fund.	Deposit corp.	Unsec fund.		
<i>Ebank</i> × <i>PostTightening</i>	-0.585 (1.785)	0.207 (1.358)	-0.926 (1.576)	-3.660 (2.848)	-0.901 (0.652)	-3.059*** (1.069)
<i>Ebank</i> × <i>PostEasing</i>	-3.964*** (1.533)	-3.934*** (1.333)	1.440 (1.613)	4.562 (3.880)	-1.319 (0.995)	0.521 (0.979)
<i>MShare</i> × <i>PostTightening</i>	-0.603 (0.929)	-0.864 (1.519)	11.881*** (2.529)	1.557 (5.085)	1.632 (1.147)	5.267*** (1.521)
<i>MShare</i> × <i>PostEasing</i>	-4.026*** (1.001)	0.875 (1.287)	11.219*** (3.458)	-2.228 (3.982)	-1.453 (1.540)	0.032 (1.582)
Obs.	67701	43140	72350	62292	68540	33002
Clusters	2352	2110	2506	2455	2372	1268
	(1)	(2)	(3)	(4)	(5)	(6)
	HHI index on total assets					
<i>Ebank</i> × <i>PostTightening</i>	-0.447 (1.826)	0.296 (1.371)	-1.105 (1.526)	1.124 (1.199)	-0.884 (0.667)	-3.056*** (1.077)
<i>Ebank</i> × <i>PostEasing</i>	-3.552** (1.592)	-3.921*** (1.327)	-0.037 (1.584)	-4.449*** (1.283)	-1.592 (1.033)	0.168 (0.946)
<i>HHI</i> × <i>PostTightening</i>	-3.257 (2.257)	-2.863 (2.613)	4.307 (5.481)	-2.962 (2.676)	-0.305 (1.727)	-0.686 (3.290)
<i>HHI</i> × <i>PostEasing</i>	-9.128*** (2.254)	-1.746 (2.965)	30.007*** (4.599)	-0.242 (2.855)	4.959** (2.435)	6.772** (2.695)
Obs.	67701	43140	72350	43161	68779	33002
Clusters	2352	2110	2506	2111	2380	1268

Notes: Market share is defined as a bank-exposure weighted share of activity in a national market. HHI index is derived by weighting national HHI indices for total bank assets, by a relevant bank exposure to the national market. For household deposits and retail funding, the corresponding shares are calculated based on household deposit data. For corporate deposits and unsecured funding, they are based on corporate deposit information. For total assets and loans to the non-financial private sector, based on loans to the non-financial private sector. The weights are calculated for the euro area countries only, and rescaled to sum up to 100%. Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 20: Difference-in-Difference regressions for interest rates: robustness to the split of sample into SIs and LSIs

	(1)	(2)	(3)	(4)	(5)
			LSIs		
	Deposit HH	Retail fund.	Deposit corp.	Unsec fund.	Loan NFPS
<i>Ebank</i> × <i>PostTightening</i>	0.457*** (0.086)	1.492*** (0.137)	0.443*** (0.152)	0.928*** (0.178)	0.286 (0.352)
<i>Ebank</i> × <i>PostEasing</i>	0.260*** (0.087)	-0.145 (0.094)	-0.040 (0.097)	-0.257** (0.110)	0.155 (0.228)
Obs.	17427	44337	19456	48058	19892
Clusters	711	2029	783	2080	807
	(1)	(2)	(3)	(4)	(5)
	SIs				
<i>Ebank</i> × <i>PostTightening</i>	0.226** (0.098)	0.028 (0.195)	0.323* (0.191)	-0.033 (0.328)	-0.831*** (0.318)
<i>Ebank</i> × <i>PostEasing</i>	0.362*** (0.134)	0.211 (0.138)	0.373** (0.159)	0.061 (0.095)	0.605*** (0.205)
Obs.	10252	7485	11875	8866	12567
Clusters	378	356	426	409	424

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 21: Difference-in-Difference regressions for growth rates of volumes: robustness to the split of sample into SIs and LSIs

	(1)	(2)	(3)	(4)	(5)	(6)
			LSIs			
	Deposit HH	Retail fund.	Deposit corp.	Unsec fund.	Assets	Loan NFPS
<i>Ebank</i> × <i>PostTightening</i>	-1.989 (1.926)	-0.790 (1.624)	-0.588 (2.034)	-0.112 (3.046)	-0.712 (0.715)	-3.927*** (1.448)
<i>Ebank</i> × <i>PostEasing</i>	-4.150*** (1.596)	-4.547*** (1.549)	1.729 (2.038)	-0.176 (2.931)	-2.571** (1.155)	0.668 (1.314)
Obs.	56457	35494	59272	51109	60605	20467
Clusters	1964	1799	2066	2136	2101	840
	(1)	(2)	(3)	(4)	(5)	(6)
	SIs					
<i>Ebank</i> × <i>PostTightening</i>	4.040 (4.363)	3.638* (1.979)	-1.335 (1.896)	3.638* (1.979)	-0.763 (1.545)	-1.118 (1.110)
<i>Ebank</i> × <i>PostEasing</i>	-3.261 (4.200)	-3.143 (2.281)	0.035 (2.137)	-3.143 (2.281)	1.467 (1.944)	0.049 (0.641)
Obs.	11278	7886	13151	7886	13079	12603
Clusters	391	330	445	330	452	433

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 22: Difference-in-Difference regressions for interest rates: robustness to the split of sample into institutions reporting on a solo and consolidated (subconsolidated) level

	(1)	(2)	(3)	(4)	(5)
			Solo		
	Deposit HH	Retail fund.	Deposit corp.	Unsec fund.	Loan NFPS
<i>Ebank</i> × <i>PostTightening</i>	0.365*** (0.082)	1.177*** (0.162)	0.415*** (0.156)	0.769*** (0.194)	0.064 (0.310)
<i>Ebank</i> × <i>PostEasing</i>	0.336*** (0.089)	-0.049 (0.103)	0.165* (0.096)	-0.188* (0.100)	0.458*** (0.156)
Obs.	20182	44852	22611	48608	23629
Clusters	838	2106	925	2185	935
	(1)	(2)	(3)	(4)	(5)
	Consolidated (subconsolidated)				
<i>Ebank</i> × <i>PostTightening</i>	0.337*** (0.122)	0.823*** (0.235)	0.366* (0.186)	0.410 (0.283)	-0.395 (0.410)
<i>Ebank</i> × <i>PostEasing</i>	0.203 (0.132)	-0.041 (0.128)	-0.016 (0.157)	-0.117 (0.159)	-0.017 (0.383)
Obs.	7491	6960	8716	8307	8821
Clusters	311	357	349	383	362

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 23: Difference-in-Difference regressions for growth rates of volumes: robustness to the split of sample into institutions reporting on a solo and consolidated (subconsolidated) level

	(1)	(2)	(3)	(4)	(5)	(6)
			Solo			
	Deposit HH	Retail fund.	Deposit corp.	Unsec fund.	Assets	Loan NFPS
<i>Ebank</i> × <i>PostTightening</i>	-0.833 (2.607)	0.614 (1.712)	-0.351 (1.806)	-8.089** (3.547)	-0.207 (0.899)	-2.437** (1.121)
<i>Ebank</i> × <i>PostEasing</i>	-4.413** (2.246)	-3.792** (1.617)	1.145 (2.085)	8.857 (5.586)	-1.982 (1.389)	1.179 (1.400)
Obs.	58889	37656	61911	54391	63201	24037
Clusters	2052	1875	2175	2243	2215	978
	(1)	(2)	(3)	(4)	(5)	(6)
	Consolidated (subconsolidated)					
<i>Ebank</i> × <i>PostTightening</i>	-0.377 (1.127)	0.169 (1.660)	-0.117 (2.901)	0.169 (1.660)	-1.116* (0.629)	-4.380* (2.252)
<i>Ebank</i> × <i>PostEasing</i>	-2.728* (1.429)	-3.998* (2.386)	0.589 (2.464)	-3.998* (2.386)	-0.734 (0.917)	-1.076 (0.997)
Obs.	8837	5715	10497	5715	10473	9029
Clusters	382	303	424	303	428	362

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 24: Difference-in-Difference regressions for interest rates and growth rate of volumes: robustness to weighting

	(1)	(2)	(3)	(4)	(5)
	Interest rates				
	Deposit HH	Retail fund.	Deposit corp.	Unsec fund.	Loan NFPS
<i>Ebank</i> × <i>PostTightening</i>	0.398*** (0.075)	1.366*** (0.145)	0.489*** (0.128)	0.321 (0.241)	-0.468** (0.220)
<i>Ebank</i> × <i>PostEasing</i>	0.331*** (0.063)	-0.060 (0.076)	0.265*** (0.091)	-0.151* (0.091)	0.497*** (0.134)
Obs.	26685	38425	29176	49778	32276
Clusters	1056	2079	1170	2311	1228
	(1)	(2)	(3)	(4)	(5)
	Volume growth rates (quarter-on-quarter)				
<i>Ebank</i> × <i>PostTightening</i>	-0.710 (1.420)	-0.670 (1.318)	-4.012** (1.581)	-2.872 (1.807)	-2.172** (0.976)
<i>Ebank</i> × <i>PostEasing</i>	-4.630*** (1.397)	-3.596*** (1.044)	2.907** (1.191)	3.108 (2.207)	0.005 (1.235)
Obs.	66315	42995	69286	56037	32923
Clusters	2293	2112	2441	2386	1269

Notes: Based on analytical weights inversely proportional to the size of a relevant portfolio in a preceding period. Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 25: Difference-in-Difference regressions for interest rates and growth rate of volumes: matched sample

	(1)	(2)	(3)	(4)	(5)	(6)
	Interest rates					
	Deposit HH	Retail fund.	Deposit corp.	Unsec fund.	Assets	Loan NFPS
<i>Ebank</i> × <i>PostTightening</i>	0.351*** (0.080)	0.846*** (0.168)	0.264 (0.161)	0.419** (0.196)		-0.369 (0.283)
<i>Ebank</i> × <i>PostEasing</i>	0.198** (0.087)	-0.014 (0.129)	0.074 (0.109)	-0.085 (0.132)		0.397** (0.156)
Obs.	4053	5491	4496	5748		4934
Clusters	152	226	166	230		176
	(1)	(2)	(3)	(4)	(5)	(6)
	Volume growth rates (quarter-on-quarter)					
<i>Ebank</i> × <i>PostTightening</i>	-0.109 (1.519)	-0.012 (1.316)	-2.855* (1.587)	-1.043 (1.980)	-0.407 (0.698)	-1.877* (1.033)
<i>Ebank</i> × <i>PostEasing</i>	-3.628** (1.427)	-3.815*** (1.128)	1.374 (1.476)	2.696 (2.864)	-1.354 (1.162)	0.500 (1.398)
Obs.	6881	4449	7778	5675	8389	5350
Clusters	243	215	262	234	277	190

Notes: Based on nearest neighbor matching (with the smallest Euclidean distance) with two neighbors. The matching variables: (log) asset size, the ratio of cash, institutional and individual (household and SME) loans, market assets (bonds and equities) to total assets, institutional funding (institutional deposits and securities), household deposits, overnight household, and corporate deposit volumes to total assets, interest income, FCI income, other FCI income and total administrative costs to total assets. Variables are matched using pre-treatment characteristics measured in 2Q 2022. Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 26: Difference-in-Difference regressions for volume growth: robustness to transformations

	(1)	(2)	(3)	(4)	(5)	(6)
	Annual growth rates					
	Deposits HH	Retail funding	Deposits corp.	Unsec. funding	Total assets	Loans NFPS
<i>Ebank</i> × <i>PostTightening</i>	-1.107 (4.036)	-0.161 (3.982)	-3.837 (5.170)	-12.112 (11.104)	-2.404 (2.401)	-10.431** (4.204)
<i>Ebank</i> × <i>PostEasing</i>	-12.392** (5.535)	-10.709*** (3.581)	5.716 (4.963)	8.613 (12.471)	-3.686 (3.906)	1.421 (3.579)
Obs.	60614	36564	64827	55070	66064	29480
Clusters	2271	2051	2423	2384	2464	1212
	Midpoint growth rates					
<i>Ebank</i> × <i>PostTightening</i>	-0.552 (1.278)	0.467 (1.168)	-0.734 (1.374)	-3.481 (2.117)	-0.698 (0.627)	-2.850*** (0.955)
<i>Ebank</i> × <i>PostEasing</i>	-3.470*** (1.126)	-3.939*** (1.229)	1.221 (1.463)	3.522 (2.590)	-1.598* (0.922)	0.441 (0.936)
Obs.	67735	43380	72423	63517	73684	33070
Clusters	2355	2129	2511	2561	2553	1273

Notes: Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3.

*Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from 2024Q2 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 27: Difference-in-Difference regressions for volume growth in BSI data: robustness to transformations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Annual growth rates							
	Deposit HH	Deposit HH ON	Deposit HH AM	Deposit NFC/MFI	Loan NFPS	Loan NFPS Not.stock	Assets	Assets Not.stock
<i>Ebank</i> × <i>PostTightening</i>	2.683 (4.321)	2.065 (3.702)	-0.762 (8.437)	-5.839 (6.307)	-2.355 (3.416)	2.080 (1.412)	-2.557 (2.970)	-0.487 (1.775)
<i>Ebank</i> × <i>PostEasing</i>	-6.436** (3.255)	-5.512 (4.214)	-8.816 (6.476)	0.253 (5.159)	-6.923* (3.759)	-4.022** (1.667)	-6.623* (3.795)	-3.869** (1.551)
Obs.	49947	48840	43239	60704	57294	60947	63558	67442
Clusters	998	976	918	1187	1123	1101	1244	1236
	Quarterly mid-point growth rates							
<i>Ebank</i> × <i>PostTightening</i>	-0.578 (0.895)	-0.244 (0.933)	0.199 (1.640)	-0.125 (1.552)	-0.414 (0.943)	0.474 (0.421)	-1.259* (0.736)	-0.559 (0.536)
<i>Ebank</i> × <i>PostEasing</i>	0.349 (0.741)	0.518 (1.008)	-3.317*** (1.253)	-0.560 (1.593)	-0.693 (0.796)	-1.390*** (0.389)	-0.149 (0.689)	-0.898** (0.430)
Obs.	55570	54444	48621	67249	63501	68003	70462	75337
Clusters	1014	994	943	1212	1147	1103	1268	1241

Notes: Quarterly mid-point growth rate is calculated by summing up three adjacent quarters of monthly mid-point growth rates. Two-way fixed effects with bank and time effects. Sample: 2016Q3 - 2025Q3. *Ebank* is a dummy indicator for digital-only banks, *PostTightening* equals 1 from 2022Q3 and 0 otherwise, *PostEasing* equals 1 from August 2024 and 0 otherwise. Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## C Appendix: Additional information on deposit offer statistics

This appendix provides further details on the deposit rates dataset collected via web scraping.

The raw sample contains 304 unique deposit-offering institution names and 401 institution–country pairs. Twelve institutions (13 institution–country pairs) are non-banks and are excluded. Among the remaining 292 institutions (388 institution–country pairs) classified as banks, 11 (17) are non-SSM institutions active in euro area markets, and 15 (16) are brands rather than standalone legal entities of SSM banks. Table 28 reports the country breakdown of bank–country pairs, with German units dominating the sample. Finally, almost all euro area domiciled legal person banks (264 of 266) could be matched to RIAD identifiers.

For analyses that align most closely with supervisory statistics, we use a sub-consolidated view that treats brands and subsidiaries as part of the same entity. On this basis, the dataset includes 287 original entities, of which 275 are banks or bank brands.

Table 28: Deposit-offer coverage by country (bank–country pairs)

Country	Entities	of which: brands	of which: foreign
Germany	222	8	11
Spain	55	2	2
Italy	29	5	0
Netherlands	82	1	4
Total	388	15	17

To gauge representativeness for euro area trends, we benchmark the scraping-based series to the individual Monetary Interest Rate statistics (MIR). The MIR data provide bank-level (solo) information on rates for new business and outstanding amounts.

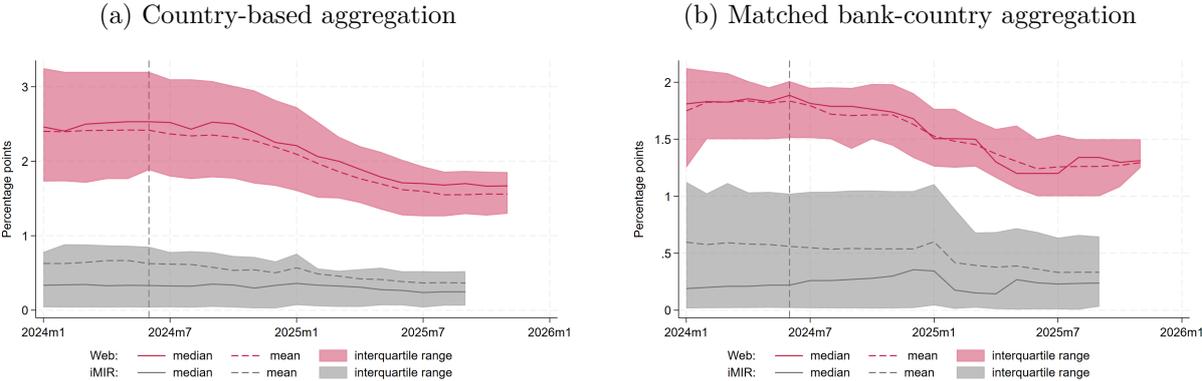
Figure 21 and Figure 22, together with Table 29, implement two comparisons. The left-hand panels (and the upper panel of the table) compare country-level aggregates for the full set of scraped observations with the full set of MIR banks in Germany, France, Spain, and Italy. The right-hand panels (and the lower panel of the table) restrict both datasets to individually matched bank–country pairs.

For term deposits, the scraping data track MIR agreed maturity dynamics closely. In both the full and matched samples, scraped rates are, on average, 10–20 basis points higher, but co-move tightly with MIR. In variance terms, the scraping series explain about 41% of within-bank time variation and over 64% of between-bank cross-sectional variation in MIR.

For overnight deposits, scraped offered rates exceed MIR new business rates by a wider mar-

gin. In the full country-based comparison, the level gap is large; in the matched bank–country sample it narrows from roughly 150 to below 90 basis points but remains material. Trends, however, are similar in both datasets, including the gradual decline in rates during the 2024 easing. For overnight products, the scraping series explain about 7% of within and 5% of between variation in the comparable MIR sample, consistent with conceptual differences between posted offers and transacted new-business rates.

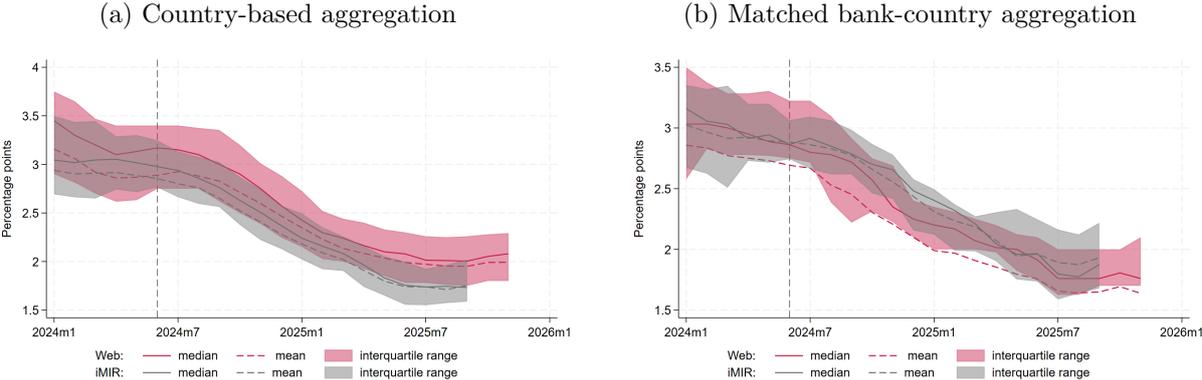
Figure 21: Overnight deposit rates: web scraping versus MIR



Notes: The country-based comparison uses simple averages for all scraped observations and all MIR-reporting banks in Germany, France, Spain and Italy. The matched comparison restricts both datasets to common bank–country pairs.

Source: Confrontaconti, Rankia, Spaarrente and Verivox, individual MIR data, own calculations.

Figure 22: Term/agreed maturity deposit rates: web scraping versus MIR



Notes: The country-based comparison uses simple averages for all scraped observations and all MIR-reporting banks in Germany, France, Spain and Italy. The matched comparison restricts both datasets to common bank–country pairs.

Source: Confrontaconti, Rankia, Spaarrente and Verivox, individual MIR data, own calculations.

Table 29: Matched web-scraped versus MIR rates: levels and correlations

Variable	Dataset	Mean	Std. dev.	Min	Max	Correl. coef.			Entities	Obs.
						Total	Within	Between		
Country-based selection										
Overnight	web	2.04	0.82	0.00	4.08				154	3696
	MIR	0.53	0.73	0.00	3.90				92	2332
Term/agreed maturity	web	2.60	0.91	0.00	5.05				167	5325
	MIR	2.48	0.83	0.00	5.70				82	2037
Matched bank-country sample										
Overnight	web	1.59	0.44	0.50	2.90				14	318
	MIR	0.74	0.78	0.00	3.27	0.05	0.07	0.05	14	318
Term/agreed maturity	web	2.37	1.04	0.00	4.02				20	384
	MIR	2.58	0.63	1.32	3.99	0.42	0.41	0.64	20	384

## Acknowledgements

I would like to thank for comments to Carlo Altavilla, Lorenzo Burlon, and Gerhard Rünstler.

## Katarzyna Budnik

European Central Bank, Frankfurt am Main, Germany; email: [katarzyna.budnik@ecb.europa.eu](mailto:katarzyna.budnik@ecb.europa.eu)

© European Central Bank, 2026

Postal address 60640 Frankfurt am Main, Germany

Telephone +49 69 1344 0

Website [www.ecb.europa.eu](http://www.ecb.europa.eu)

All rights reserved. Any reproduction, publication and reprint in the form of a different publication, whether printed or produced electronically, in whole or in part, is permitted only with the explicit written authorisation of the ECB or the authors.

This paper can be downloaded without charge from [www.ecb.europa.eu](http://www.ecb.europa.eu), from the [Social Science Research Network electronic library](#) or from [RePEc: Research Papers in Economics](#). Information on all of the papers published in the ECB Working Paper Series can be found on the [ECB's website](#).

PDF

ISBN 978-92-899-7824-8

ISSN 1725-2806

doi:10.2866/7071577

QB-01-26-095-EN-N