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THE IMPACT OF THE INTRODUCTION OF THE DIGITAL EURO ON FINANCIAL  
STABILITY – AN OUTLOOK ON FUNDING STRUCTURE AND LIQUIDITY RISK

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## **Abstract**

The Digital Euro is a digital currency to be issued by the ECB and made available to residents of the Euro Area. This thesis examines the potential impact of a CBDC on financial stability, with a focus on institutions' balance sheets. The study investigates the implications of a CBDC on capital adequacy, credit risk, and liquidity risk, addressing gaps in the existing literature and providing a comprehensive analysis of key balance sheet components. By exploring a scenario with no holding limits, the research offers insights into strategic and regulatory challenges associated with CBDC integration, intending to ensure stability and resilience in the financial system.

## **Keywords**

Digital Euro; Financial stability; Deposits outflow; Funding sources; Liquidity risks; Money creation; Capital adequacy; Capital Requirements; NPL ratio; Bank risk

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## **GROUP PART**

### **1. Introduction**

#### **1.1. What is the Digital Euro? - Overview**

The global financial scene is in constant transformation with the swift advancement of digital technologies and the digitisation of payments, as exemplified by the widespread adoption of digital wallets. With the intention to maintain monetary and financial stability and ensure the smooth functioning of the payments system, central banks are increasingly considering the inception of a Central Bank Digital Currency (CBDC). In fact, a report by the Bank for International Settlements, shared how eighty-four of eighty-six central banks<sup>1</sup> in 2023 were investigating CBDCs (Iorio, Kosse, and Mattei 2024). The introduction of a Euro Area (EA) CBDC – the Digital Euro – could represent a significant advance in currency digitisation, but it could also have considerable downturns for financial stability, the role of the monetary authority and the efficiency of the payment framework.

Building on existing initiatives, the Digital Euro aims to address gaps left by current systems. For instance, the European Payments Initiative (EPI) was created to build a European-wide digital payment framework, aiming to provide a viable alternative to the current reliance on non-European card schemes (Mai 2023). In parallel, instant payment infrastructures like the TARGET Instant Payment Settlement (TIPS) and RT1 systems have been developed to support faster, cross-border payments across the Euro Area (Passacantando 2022). While these initiatives represent progress, they have not yet achieved full coverage or adoption, leaving Europe’s payment structure fragmented.

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<sup>1</sup> The sample was composed of eighty-six respondents (central banks), which accounts for ninety-four percent of global economic production, and eighty-one percent of the global population. In addition, thirty-three percent of central banks of the sample correspond to advanced economies and sixty-seven percent represent emerging markets and developing economies (Iorio, Kosse, and Mattei 2024).

The Digital Euro’s proposal consists of a liability for the European Central Bank (ECB), captured in digital form, that complements cash and bank deposits. It is designed as a retail<sup>2</sup>, non-interest bearing Central Bank Digital Currency (CBDC), in accordance with the current proposal for regulation of the Digital Euro (European Commission 2023).

In contrast to cryptocurrencies, a Digital Euro would be backed by the same institution that backs cash – the ECB. Furthermore, it would always be worth its face value, just as cash is. It will be free of charge for natural persons for any digital payment (European Commission 2023, 42, 43, 47, 48). From the perspective of legal persons, the CBDC will be able to be accepted as means of exchange. Indeed, the proposal for a regulation alludes to the attribution of the legal tender status to the Digital Euro, leaving merchants with no option other than mandatory acceptance<sup>3</sup> (European Commission 2023, 5, 12).

## **1.2. Thesis statement and objectives**

This thesis examines the possible effects of implementing a CBDC to the financial stability of the EA, with a specific emphasis on how it may affect institutions’ balance sheets. Its objectives include examining the effect on capital adequacy, credit risk, as well as liquidity risk, so to fill the gaps in literature, and deliver a holistic perspective of the principal risks inherent to the principal components of institutions’ balance sheets. The scope of research is geographically confined to the Euro Area, and it is premised on the assumption that there are no holding limits

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<sup>2</sup> While a retail CBDC is designed for the public to hold digital central bank money, a wholesale CBDC is intended for authorized financial institutions to use (similar to digital reserves of the central bank). The Digital Euro’s proposal to be only a retail CBDC stems from the already well-regulated framework for digital wholesale payments (with TARGET2), CB-money securities settlement (with TARGET2 SECURITIES), as well as for instant payments (with TIPS).

<sup>3</sup> Although merchants will be obliged to accept the CBDC as a means of payment, the application of a zero-holding limit to this group is on the table. In this scenario, the amounts received in Digital Euro would be reversed into physical Euro via a “waterfall” mechanism (European Central Bank 2024a, 7).

for retail users of the Digital Euro, considering the present situation where the European competent authorities are still debating the specific limits to be implemented.

This research is timely, considering the ECB's continuing progress on the development of the Digital Euro, with a decision on its launch anticipated by October 2025 (European Central Bank 2024c). Overall, the thesis aims to contribute valuable insights into the strategic planning and regulatory frameworks necessary for the seamless integration of the Digital Euro in the financial system.

## **2. The case for the Digital Euro**

### **2.1. Motivation and institutional support**

The potential introduction of a retail digital euro has collected strong encouragement from key European institutions, including the ECB, Member States, and the European Parliament (European Commission 2023). During the Euro Summit in March 2021, Member Countries urged for more robust payment systems as well as a more creative and effective digital financial sector, promoting preliminary research into the potential launch of a digital euro (European Council 2021). This came after the Council and European Commission jointly issued a statement in 2019, emphasizing the potential risks of “stablecoin” initiatives reaching a global scale (European Council 2019), and incentivizing the ECB, in addition to further central banks and national authorities to assess the pros and cons of central bank digital currencies and to foster discussions with European payment actors on how the private sector can help fulfil the demand for fast, easy and affordable cross-border payments. In 2022, the Council Recommendation on the Economic Policy of the Euro Area highlighted the potential of a digital

euro to support public digital money, promote innovation, and enhance the euro's international position and the open strategic autonomy of the Union (European Council 2022).

Today, 13 out of 20 EA countries rely primarily on international card schemes for digital payments (European Central Bank 2024c). This reliance not only raises concerns about resilience but also limits the ability of the European Union (EU) to maintain control over its financial systems, especially in a politically fragmented global economy. A digital euro could supply a safe, effective, and widely accepted payment option within the EA, aligning with Europe's long-term economic and geopolitical interests.

With this institutional backing and strategic motivation in place, it is essential to analyse the practical implications the Digital Euro could bring upon the financial system. The following section expands on the foreseen impacts of Digital Euro.

## **2.2. Implications of the Digital Euro**

This section explores how Digital Euro is being conceived to strengthen retail payments, foster competitiveness and innovation, and safeguard the financial stability and sovereignty of the EA, by assessing its potential to modernise payments and financial operations across Member States.

### **Enhancement of retail payments**

The ability of the EU to keep control over its payment systems and lessen dependency on non-European service providers is known as strategic autonomy in the payments sector. According to Article 127 of the Treaty on the Functioning of the European Union (TFEU), the ECB and the European System of Central Banks (ESCB) have the mission to guarantee "the smooth operation of payment systems" (European Union 2016). This duty is reinforced in Article 22 from the Statute of the ESCB and the ECB, clearly stating that the ECB and national central banks can and should establish policies and services that ensure that payment and money

transfer systems operate consistently and smoothly both inside the EU and with other nations (European Central Bank 2011). In short, these articles mandate the ESCB – which includes the Eurosystem – to promote efficient and secure payment systems, as well as to implement the necessary regulations to do so, with the goal of safeguarding the stability and integrity of the EA’s payment structure.

CBDCs offer a secure, flexible and efficient form of digital currency, allowing seamless integration into existing financial systems (Ulrich Bindseil, Panetta, and Terol 2021). By adopting CBDCs, central banks can ensure that their monetary systems remain resilient and adaptable to technological advances. Today, the infrastructure supporting international payments and transfers remains fragmented, ineffective and expensive, resulting in significant delays and high charges. One of the key potential applications of CBDCs is in cross-border payments. An EA CBDC could represent the much-needed solution and help to streamline these processes, thereby reducing costs and fostering greater integration of the global financial system. The efficiency of worldwide trade as well as economic cooperation would increase, benefiting both consumers and businesses, if an EA CBDC is able to facilitate seamless cross-border transactions (European Central Bank 2020).

### **Promotion of competition and innovation**

The current European payment’s structure is heavily dependent on non-European providers, as expressed several times by the ECB (European Central Bank 2022). Global payment services providers (e.g., Visa, Mastercard, and American Express) easily dominate digital payments within the EA and have control over a significant share of cross-border transactions and card payments (European Central Bank 2019). These non-European card and mobile/online payment providers are currently the only ones to facilitate cross-border euro transactions inside the monetary union (Mai 2023). Euro cash is the only truly European solution that functions throughout the union, but cash usage is declining (Khiaonarong & Humphrey 2022, 3).

The institution of a CBDC is designed to foster greater competition within the retail payments market. Presently, the market is dominated by a few key players in the private sector, which can result in inefficiencies, high fees, and limited consumer choice (Wong and Maniff 2020). On the authority of the ECB, the advent of a public digital currency could serve to diversify the market by introducing a new, state-backed player. Such a measure may contribute to a reduction in market concentration, thus fostering a more competitive environment that benefits consumers through a reduction in transaction costs, an improvement in service quality, and an expansion of access to payment services (European Commission 2023; European Central Bank 2020).

The advent of Digital Euro also represents a monumental opportunity for the advancement of financial inclusion within the EU and beyond. It is estimated that a significant proportion of the population is still unable to access fundamental financial services (WSBI-ESBG 2022), a shortcoming that could potentially be addressed through the introduction of CBDCs (Lannquist and Tan 2023, 37). While the Payment Accounts Directive (Directive 2014/92/EU 2014) has the goal to guarantee all individuals have access to fundamental financial services, encompassing payment accounts, the Digital Euro builds upon this directive by including several measures to address broader barriers to financial inclusion. These include an offline functionality, which enables access in areas with poor internet connectivity, as well as compliance with the European Accessibility Act (Directive (EU) 2019/882 2019) to ensure usability for individuals with disabilities, and the availability of a physical payment-card for those with low digital literacy or without smartphones. Additionally, onboarding processes through public entities (e.g., postal offices) will facilitate access for unbanked and vulnerable populations, while support in all EU languages and an universally designed app will further increase accessibility (European Central Bank 2023).

It is reasonable to assume that the implementation of the Digital Euro will play an instrumental role in the advancement of these objectives, offering enhanced and secure means of payment.

### **Safeguarding public money as the monetary system anchor**

The issuance of public money by central banks has long been regarded as a fundamental component of the monetary system. Its distinctive attributes, most notably its legal tender status and the absence of default and liquidity risks, contribute to its reputation as the safest form of money. In this context, the inception of the Digital Euro is regarded as a crucial milestone in safeguarding the role of public money in the digitalised financial system. Such a measure would help to maintain the convertibility of private deposits at par with public money, which is essential for maintaining the trust of the public in the currency and the stability of the financial system (Ulrich Bindseil, Panetta, and Terol 2021).

Furthermore, CBDC could strengthen the resilience of the monetary system by ensuring a stable and secure digital alternative to private money during times of financial instability. In periods of crisis, confidence in financial institutions may erode, leading to runs on deposits. Without the availability of central bank money, such scenarios could lead to significant liquidity shortages and threaten financial stability. A CBDC would offer a digital haven for public savings, mitigating the risk of destabilizing shifts between private and public money and reducing the likelihood of large-scale runs (Ulrich Bindseil, Panetta, and Terol 2021).

### **Preservation of financial stability**

The Digital Euro may bolster monetary sovereignty through the reinforcement of the Euro's dominance in the EU and countering displacement by private digital currencies. As a state-backed, risk-free alternative, it enhances financial stability by reducing dependence on volatile private digital assets (Lambert et al. 2024).

During periods of economic stress, a digital euro mitigates risks of depositors shifting funds to private or foreign assets, preserving financial institutions' liquidity. Safeguards, such as holding limits, are necessary to prevent significant outflows from institutions, ensuring stability while limiting large-scale withdrawals (Lambert et al. 2024).

The following section oversees the possible impacts on financial stability, considering the chance of disintermediation.

### **3. Impact on financial stability: disintermediation effect**

#### **3.1. Substitutability between the Digital Euro, cash and deposits**

The Digital Euro will behave as a store of value instrument and a means of exchange. Taking that into account, a competitive dynamic between the Digital Euro, the physical Euro and deposits will emerge. Because of this, substitutability among the three assets is estimated to certain degree (Adalid et al. 2022, 7; Burlon et al. 2022, 7; Huynh et al. 2020, 22; Jiang 2020, 3-5; Lambert et al. 2024, 4; Li, Usher, and Zhu 2024, 24-26).

The substitutability between the physical and the Digital Euro represents merely the transformation of one type of central bank money – coins and banknotes – into another – digital money. In this scenario, a decline in Euro coins and banknotes and an increase in Digital Euro will be registered on both households and Eurosystem balance sheets. In this context, financial institutions' balance sheet will be not affected (Bindseil 2020, 9; Bindseil and Panetta 2020, 2; Lambert et al. 2024, 4).

By contrast, the substitutability between deposits and the Digital Euro will pose implications for institutions' balance sheet via a decrease in deposit funding (Adalid et al. 2022, 7-12; Burlon et al. 2022, 4-5; García et al. 2020, 1; Li, Usher, and Zhu 2024, 23-26). Considering the

case of the Digital Euro, which is most likely to be non-interest bearing and available only for use by natural persons, it is expected to decrease demand deposit funding provided by retail customers (García et al. 2020, 2; Gorelova, Lands, and teNyenhuis 2022, 2; Meller and Soons 2023, 4; Usher et al. 2021, 7).

Besides the Digital Euro's direct competition with retail demand deposits, its attractiveness over other types of retail deposits should also be acknowledged. This will depend on the prevailing interest rate environment. A non-remunerated Digital Euro would be less attractive than savings and term deposits in a positive interest rate environment but much more desirable during periods of low or even negative interest rates (Adalid et al. 2022, 7). With that in mind, different levels of substitutability may occur across different macroeconomic cycles *ceteris paribus*<sup>4</sup> (Li, 2021; Nocciola and Zamora-Pérez 2024).

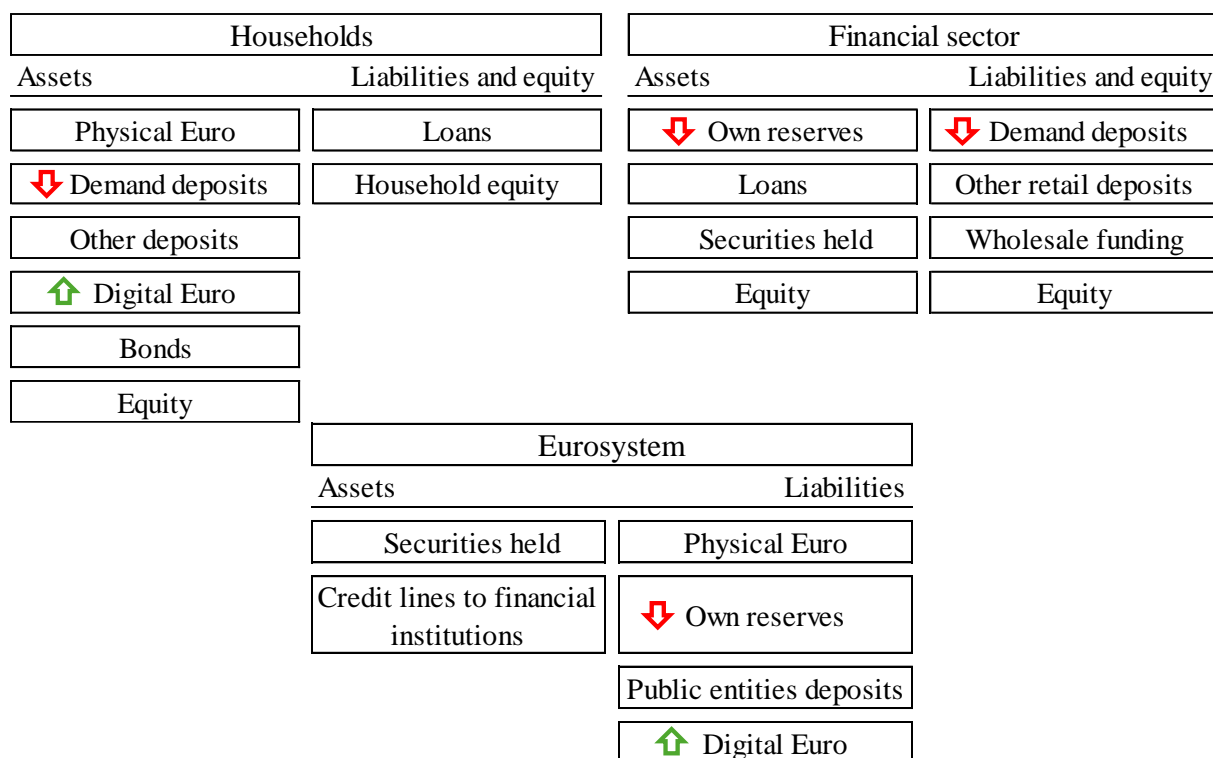
### **3.2. Structural disintermediation: a definition**

The substitutability between retail deposits and the Digital Euro naturally leads to 'disintermediation' – a process characterized by the shrinking of institutions' balance sheet due to a decrease in retail deposits (Carapella and Jean Flemming 2020).

Assuming financial institutions behave as intermediaries in the distribution of the Digital Euro, this reduction in retail demand deposit funding is paired with a decrease in institutions' own excess reserves (Figure 1). In more detail, institutions acquire the Digital Euro by purchasing it from the Eurosystem using their own reserves. Subsequently, they facilitate the exchange of demand deposits for the Digital Euro with retail customers (Adalid et al. 2022, 15-16).

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<sup>4</sup> Apart from the remuneration earned, other factors – such as perceived acceptance, privacy, branch network, possibility of obtaining complementary financial products – may influence the level of substitutability between deposits and the Digital Euro (Li, 2021; Li et al., 2024; Nocciola and Zamora-Pérez 2024).



**Figure 1 - Disintermediation mechanism**

*Source: Own elaboration*

The concept of disintermediation can be categorized into two facets: (i) structural disintermediation, which refers to the one-off decrease in deposits by the inception of the CBDC; and (ii) cyclical disintermediation, where institutions suffer further deposit outflows throughout periods of financial distress (Adalid et al. 2022, 35-43; Bindseil 2020, 13-16; Carapella et al. 2024, 16-18; Landau 2021, 16; Williamson 2022).

## **INDIVIDUAL PART**

### **4. An outlook on funding structure and liquidity risk**

#### **4.1. Introduction**

This chapter aims to establish a pecking order for institutions' balance sheet adjustment strategies to intermediate the retail demand for the Euro Digital (i.e., interchangeable means to structurally manage deposit outflows). This pecking order includes adjustment strategies where financial institutions utilise own resources, such as excess reserves, as well as strategies that involve seeking new funding, if they lack sufficient internal resources.

The second objective of this chapter is to evaluate the likelihood of different institutions business models depleting the established pecking order, as this reflects their susceptibility to experiencing significant impacts on funding structures with the issuance of the Digital Euro.

Subsection 4.2 will elaborate on the importance of retail demand deposits in institutions' funding structure, as well as analyse the degree of reliance on this type of deposits across different types of financial institutions. Institutions with the greatest dependence on retail demand deposits are, at the outset, most susceptible to significant impacts on funding structure arising from the introduction of the Digital Euro. In Subsection 4.3., balance sheet adjustment strategies available to institutions will be detailed, distinguishing between those that utilise existing resources and those that involve raising new funding.

The subsequent section will explore the key determinants, i.e., constraints, that influence the establishment of the pecking order: (i) the availability of own resources to autonomously address the demand for the Euro Digital; (ii) the availability of collateral to raise borrowing; (iii) the availability of liquidity to raise borrowing; and (iv) funding costs. This section will

also assess the relative positioning of various types of financial institutions with respect to these factors.

Finally, the concluding section will define the hierarchical framework and conduct a benchmark analysis to assess the likelihood of different types of institutions exhausting the pecking order and experiencing impacts on funding structures. This benchmark will specifically consider institutions' internal resource availability and liquidity positions, as analysed in Subsection 4.5..

## **4.2. Retail demand deposits: importance in funding structure and scale**

As previously outlined in Section 3, the introduction of the Digital Euro will heighten competition in the retail deposit market, leading to structural disintermediation of the financial sector through a decrease in retail demand deposit funding.

In this regard, understanding the role of retail demand deposits as a key component of institutions' funding structures is crucial for assessing the impact of structural disintermediation. These deposits correspond to a zero-cost, stable, unsecured funding source, entailing three key advantages compared to other types of funding (CPMI 2018, 15; García et al. 2020, 1, 5; Gorelova et al. 2022, 2; Lambert et al. 2024, 15; Li 2021, 3). First, as they do not earn interest for depositors, they constitute the cheapest financial liability. Second, they are stable – i.e., less likely to be withdrawn (García et al. 2020, 5; Gorelova et al. 2022, 2). The stability of retail deposits – both demand and other retail deposits – is justified by the protection provided by the Deposit Guarantee Scheme (DGS), which ensures the savings of eligible EU depositors' (i.e., natural persons) up to €100 000, as stipulated in Directive 2014/49/EU. Finally, retail deposit funding does not require institutions to post collateral as a guarantee to retail depositors. This advantage also results from the protection provided by the DGS.

It is equally important to grasp the potential scale of structural disintermediation in the EA with the issuance of the Digital Euro. As highlighted by Adalid et al. (2022, 28), this scale is determined by institutions' reliance on retail demand deposits.

To provide deeper insights and assess in detail whether differences in business models influence both the scale of structural disintermediation and, on top of that, the potential impacts of the Digital Euro on funding structures, the analysis will be conducted based on financial sector specialisation, using data from 2023<sup>5</sup>.

In this context, Table 1 shows that, in the aggregate, retail demand deposits amount to €1 039 205.22 million (mn.), representing 47.1% of total financial sector liability funding.

<b>Specialisation</b>	<b>Assets share</b>	<b>Demand Deposits</b>	<b>Demand deposit funding</b>
Private banking, Investment & trust corporation	0.49	6 913.44	57.5
Savings bank	38.71	487 400	56.52
Cooperative bank	30.7	364 600	50.29
Commercial bank	18.24	158 800	45.14
Investment bank	2.88	17 968.1	35.4
Finance company & Other non-banking credit institution	0.78	465.78	5.32
Real estate & mortgage finance institution	8.2	3 057.89	2.09
<b>Total</b>	<b>100</b>	<b>1 039 205.22</b>	<b>47.07</b>

*Table 1 - Demand deposits provided by retail customers by financial sector specialisation (absolute and relative terms)*

*Source: Calculations based on 2023 data from Orbis BankFocus.*

*Note: Asset share (%) represents the share of each institution category's assets relative to the total assets of the financial sector. Demand deposits (mn.) correspond to the absolute value of retail demand deposits held by each institution category, expressed in millions. Demand deposit funding (%) is calculated as the share of demand deposits in total funding liabilities. Total demand deposit funding (%) is weighted by institutions' asset size.*

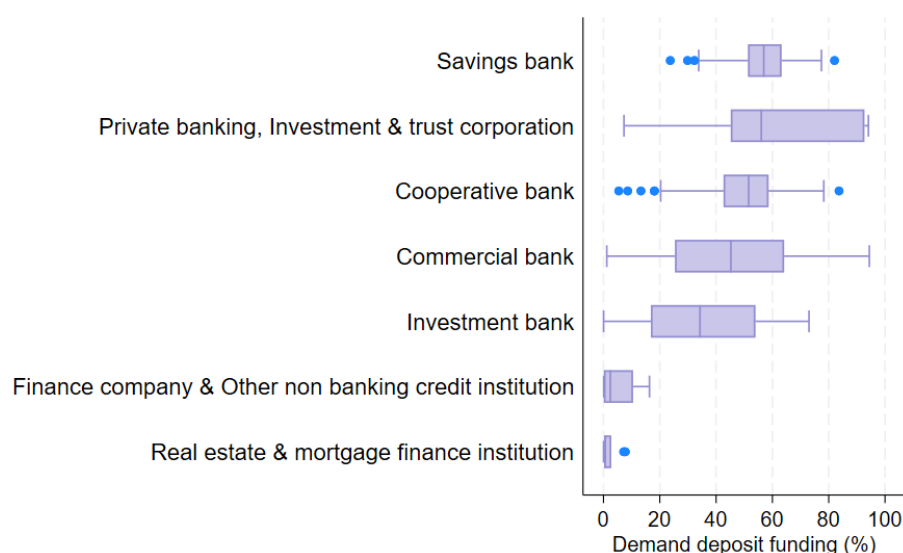
*Refer to Appendix I for the number of observations in the full sample and by institution specialisation.*

Nonetheless, reliance on demand deposit funding is not homogeneous across different types of institutions. For instance, private banking institutions exhibit the greatest reliance (57.5%),

<sup>5</sup> While extending the analysis to include additional years could provide a broader temporal perspective, it would reduce the number of observations to around half of the present sample, potentially compromising the representativeness of the EA financial sector.

followed by savings banks (56.5%), cooperative banks (50.3%), commercial banks (45.1%) and investment banks (35.4%). At the bottom of the ranking are finance companies and other non-banking credit institutions (5.3%) and real estate and mortgage institutions (2.1%). The former group is composed of non-traditional banks, which are generally not allowed to receive deposits from the public – doing so demands a banking license<sup>6</sup> – but provides specialised credit, such as consumer credit, leasing, and factoring. Given this, even those that receive retail deposits have a history of relatively low reliance. The latter group specialises in offering mortgages, a form of long-term credit. Since demand deposits are short-term liabilities, a higher reliance on them to fund long-term credit increases maturity and interest rate risks for these institutions. Because of this, they typically adopt strategies to maintain relatively lower levels of demand deposits.

Interpreting the average potential scale of structural disintermediation is not sufficient. Figure 2 facilitates an understanding of the dispersion in reliance on retail demand deposits across different institutions categories.



**Figure 2 - Retail demand deposits (% of funding liabilities) by financial sector specialisation**

Source: Calculations based on 2023 data from Orbis BankFocus.

<sup>6</sup> According to Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013.

Savings and cooperative banks indicate relatively low dispersion in their reliance on retail demand deposit funding. In contrast, commercial banks and the private banking group show significantly higher levels of dispersion. For commercial banks, reliance ranges from as low as 1.2% to as high as 94.4% (Appendix 2, which provides summary statistics). Similarly, for private banking, the reliance varies between 7.3% and 94.1%, with a noticeably longer right whisker.

While the data provide an overview of the dispersion in retail demand deposit funding across different institutions categories, it is important to acknowledge that data should be interpreted with caution for categories with a small number of observations, such as private banking (7), real estate and mortgage institutions (10), other non-banking credit institutions (4), and investment banks (4). The small sample size may introduce biases or limit the generalisability of the findings, particularly for categories with higher variability. This limitation affects not only the analysis of retail demand deposit funding but also the interpretation of other variables presented in the chapter.

### **4.3. Balance sheet adjustments strategies**

Building on the analysis of the potential scale of structural disintermediation, institutions must reassess their ongoing business models to address deposit outflows, when intermediating the demand for the Digital Euro by retail customers. This section explores two primary adjustment strategies available to institutions: (i) utilising own resources, resulting in a balance sheet contraction; or (ii) raising alternative funding sources, sustaining their activity levels (García et al. 2020, 1; Gorelova, Lands, and teNyenhuis 2022, 2).

This discussion of possible adjustment strategies<sup>7</sup> that institutions may adopt assumes a partial equilibrium setting, with fixed funding costs – i.e., financial institutions do not adjust interest rates on savings or term deposits, innovate financial products, or change their lending volumes in response to deposit outflows.

When using their own resources and accepting a reduction in the size of their balance sheets, institutions draw down excess reserves to meet demand of the Digital Euro from retail customers, as explained in subsection 3.2..

For institutions that lack sufficient excess reserves or are unwilling to draw them down to intermediate the demand for the Digital Euro, they may increase borrowing. The following funding channels are available for this purpose: (i) interbank funding; (ii) wholesale funding other than interbank funding; and (iii) central bank funding.

As a first option, banks may resort to interbank funding (Adalid et al. 2022, 17; Das et al. 2023, 9; Lambert et al. 2024, 7; Meller and Soons 2023, 10). By conducting lending and borrowing operations between banks with excess liquidity and those with liquidity deficits, they make use of existent excess reserves within the banking system. This adjustment channel emerges as a valid path to counteract a deposit outflow, considering excess reserves are unevenly distributed and the adoption of the Digital Euro may vary across the banking sector. However, the effectiveness of interbank funding depends on banks' willingness to lessen their current levels of excess reserves (Meller and Soons 2023, 10). If no banks are willing to do so, this adjustment channel cannot be effectively utilised.

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<sup>7</sup> To simplify the information presented, the available adjustment channels will be presented separately. Nevertheless, institutions may utilise them simultaneously.

Likewise, institutions can increase reliance on wholesale funding<sup>8</sup> other than interbank funding, which involves raising funds from non-bank financial institutions like money market funds (MMFs,) pension funds and other entities (CPMI 2018; Das et al. 2023, 9; Meller and Soons 2023, 10).

Lastly, central bank funding may serve as a strategy to offset institutions' deposit losses, contingent on the Eurosystem's monetary policies being favourable of such an approach (Adalid et al. 2022, 18; Brunnermeier and Niepelt 2019, 2; Burlon et al. 2022, 28; Meller and Soons 2023, 10; Lambert et al. 2024, 7). The Eurosystem could increase the volume of existing facilities/operations – such as the marginal lending facility (MLF), main refinancing operations (MROs), longer-term refinancing operations (LTROs) or targeted longer-term refinancing operations (TLTROs) (European Central Bank 2024c) – or introduce new mechanisms specifically designed to return liquidity to the financial sector. In this scenario, from the perspective of the Eurosystem's balance sheet, an increase in the Digital Euro – a liability – is followed by an increase in credit to financial institutions – an asset (Adalid et al. 2022, 18).

#### **4.4. Constraints on balance sheet adjustment strategies**

This section explores how constraints on own excess reserves, collateral and liquidity shape institutions' responses (i.e., balance sheet adjustment strategies) to intermediate the Digital Euro demand. These constraints may challenge the neutrality of the Digital Euro regarding institutions' intermediation capacity<sup>9</sup>.

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<sup>8</sup> Wholesale funding is commonly referred to as market funding.

<sup>9</sup> The concept of Digital Euro neutrality, also referred to as the “equivalence result”, is supported by the early literature on the topic of CBDCs (Brunnermeier & Niepelt, 2019, 37; Fernández-Villaverde et al., 2021, 233).

Neutrality is achieved when institutions have sufficient own excess reserves and collateral (accounting for haircuts) to raise funding. Crucially, the absence of liquidity constraints – stemming from regulatory standards and institutions’ individual risk appetite – is also necessary for achieving the Digital Euro neutrality (Adalid et al. 2022, 23; Lambert et al. 2024, 6; Meller and Soons 2023, 10).

The following subsections explore these constraints in detail: (i) institutions' own excess reserves; (ii) institutions’ collateral; and (iii) institutions’ liquidity under the LCR and NSFR frameworks.

#### **4.4.1. Constraints on using own resources: excess reserves**

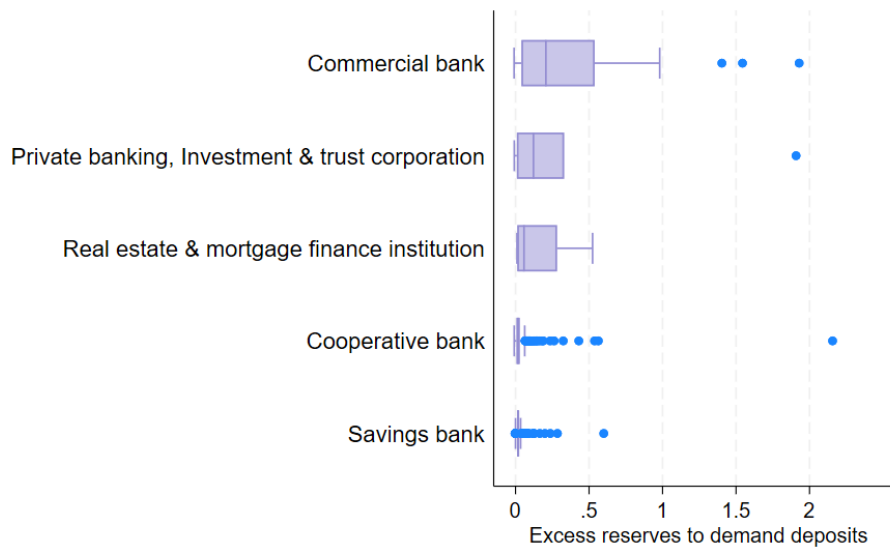
Owning excess reserves provides institutions with the autonomy to independently address the Digital Euro demand. In this regard, institutions’ level of excess reserves must be analysed, measured as the ratio of excess cash and balances held at the Eurosystem to retail demand deposits<sup>10</sup>. This variable of interest is represented in Figure 3, categorized by financial sector specialisation.

Finance companies and other non-banking credit institutions are the ones holding relatively higher excess reserves to demand deposits. However, due to the small number of observations for this group (4) and their distinctive dispersion from other financial groups, their

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<sup>10</sup> Due to limitations on that data collection, an auxiliary computation was carried out. The formula used was  $\frac{\text{Reserves} * \frac{\text{Total customer deposits}}{\text{Total customer deposits} + \text{Total debt}} - 1\% * \text{Demand deposits}}{\text{Demand deposits}}$ , in which 1% corresponds to the minimum reserve ratio established under the Article 6 of the Regulation (EU) 2021/379 (European Central Bank 2021). To clarify the limitations of the proxy variable for excess reserves to retail demand deposits, the minimum reserves term (right term of the numerator) does not account for other deposits that institutions may resort on (e.g., interbank overnight deposits), which are also subject to minimum reserve requirement. Additionally, the reserves related to deposit liabilities (the left term of the numerator) does not include other deposits than total customer deposits in both the numerator and denominator. Due to data collection limitations, it is not possible to obtain an accurate measure for excess reserves. Nevertheless, the proxy variable still holds value, when conducting a comparative analysis.

representation is excluded from the main figure and detailed separately in Appendix 3. This dispersion should be interpreted with caution, as the limited sample size may not fully capture the variability within this group. Nevertheless, considering the specificities of their business model (low reliance in retail demand deposits), the representation in the appendix may still offer a reasonable reflection of reality.



**Figure 3** - Excess reserves to retail demand deposits by financial sector specialisation

Source: Own computations based on 2023 data provided by Orbis BankFocus.

Note: Finance companies & Other non-banking credit institutions and Investment banks are excluded from the Figure due to data visualisation purposes, as they present a distinctive dispersion. For a detailed view, refer to Appendix 3.

Commercial banks and real estate and mortgage finance institutions occupy an intermediate position. Lastly, cooperative and savings banks, which are heavily reliant on demand deposits, have the lowest capacity to address the Digital Euro demand independently.

#### 4.4.2. Constraints on raising borrowing: collateral and liquidity

This subsection examines collateral requirements and liquidity risks as constraints when institutions lack sufficient excess reserves or are unwilling to draw them down, necessitating to raise funding to intermediate the Digital Euro demand from retail customers.

Regarding liquidity risks, the regulatory framework governing these risks – the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) will be considered. These

regulations, alongside institutions' risk appetite, may constrain institutions' ability to intermediate the Digital Euro demand and affect the neutrality of the Digital Euro for the financial sector. After theoretically explaining constraint by constraint, it follows an analysis of institutions' current positions concerning those specific constraints.

Before delving into the specifics of constraints, it is crucial to recall the borrowing options available, as the following discussion will build on this. First, with regard to collateral requirements, institutions must choose between secured, which requires the delivery of collateral to the creditor, and unsecured funding, which does not involve the provision of collateral. Second, concerning the duration of the funding: short-term (up to 1-month), medium-term (between 6- to 12-months), and long-term (12-months or more). Lastly, with respect to the counterparty: market or central bank funding.

With this context in mind, it is also important to note that institutions' preferences will naturally lean toward the cheaper funding option. Considering that collateralised short-term<sup>11</sup> market<sup>12</sup> funding is relatively cheaper, this would be institutions' first choice. However, this choice also has the greatest impact on institutions' collateral and liquidity, as will be explored below. As noted by Adalid et al. (2022, 26) and Meller and Soons (2023, 10), institutions face a trade-off between liquidity risk and profitability. Throughout the subsection, the trade-off will be further discussed.

## **Collateral**

To begin with, it is essential to address collateral requirements as a constraint when raising secured funding. Usually, wholesale secured funding is backed by unencumbered HQLA.

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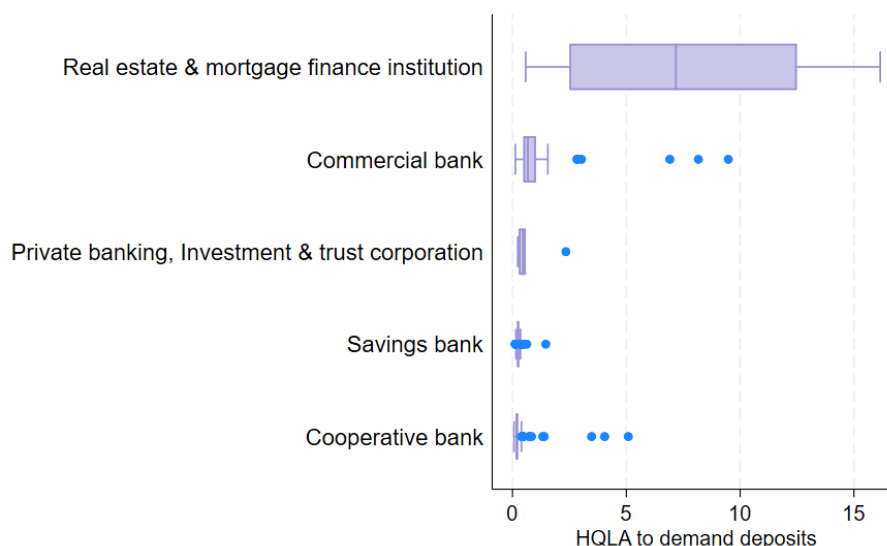
<sup>11</sup> In general, short-term borrowing is relatively cheaper than long-term borrowing. However, the opposite may occur in a macroeconomic scenario with an inverted yield curve.

<sup>12</sup> Market funding is relatively cheaper than central bank funding. The wholesale sector, including banks, has no interest in borrowing above the key interest rate defined by the Central Bank – Marginal Lending Facility (MLF).

HQLA are assets consisting of “cash or securities that can be quickly converted into cash with little or no loss of value” (Basel Committee on Banking Supervision 2013, 10) For HQLA to qualify as unencumbered, they cannot be pledged as collateral in existing credit operations and remain available for use when needed.

Nonetheless, central bank secured funding may involve other eligible assets, such as credit claims or covered bank bonds (European Central Bank 2024b). Given this, the collateral requirements discussed here are primarily relevant as a constraint to wholesale secured funding, as central bank funding often offers greater flexibility regarding the eligible types of assets that can be posted as collateral.

To provide a clear picture of institutions’ capacity to pledge down HQLA to rely on wholesale secured funding, Figure 4 shows the relationship between HQLA and demand deposits across different types of financial institutions. Real estate and mortgage finance institutions stand out with the highest dispersion and significantly higher values compared to other groups, reflecting greater HQLA coverage for their retail demand deposits. Commercial, savings, and cooperative banks show significantly lower and more concentrated ratios, indicating a lower reliance on HQLA to cover their deposits. Private banking, investment, and trust corporations fall at an intermediate level, but with less dispersion. Finally, finance companies and other non-banking credit institutions and investment banks are excluded from the figure due to data visualization purposes, as they present distinctive dispersion and a low number of observations.



**Figure 4 - HQLA to retail demand deposits by financial sector specialisation**

Source: Own computations based on 2023 data provided by Orbis BankFocus.

Note: Finance companies & Other non-banking credit institutions and Investment banks are excluded from the Figure due to data visualisation purposes, as they present a distinctive dispersion. For a detailed view, refer to Appendix 4.

## LCR

The LCR monitoring tool “aims to ensure that a bank has an adequate stock of unencumbered HQLA [...] to meet its liquidity needs for a 30 calendar day liquidity stress scenario” (Basel Committee on Banking Supervision 2013). As follows, the regulatory standard<sup>13</sup> requires that the stock of unencumbered high-quality liquid assets (HQLA) should be, at the minimum, equal to net cash outflows over a 30-days period, in absence of a distressed period:

$$LCR = \frac{\text{Stock of unencumbered HQLA}}{\text{Total cash outflows} - \text{Total cash inflows (over the next 30 calendar days)}} \geq 100\%$$

When replacing retail demand deposits with wholesale and central bank funding, two impacts on the LCR must be weighted: (i) reduced liquidity due to an increase in expected total cash outflows; and (ii) reduced liquidity due to a decrease in unencumbered HQLA, if decided to rely on wholesale secured funding.

<sup>13</sup> Not applicable to non-deposit-taking institutions, i.e. non-banking financial institutions.

Focusing on the total cash outflows component of LCR computations (Table 2), only financial liabilities with up to 30-days maturity and other financial liabilities with undefined maturity (i.e., withdrawal at any time) are considered eligible to be withdrawn and, thus, run-off from institutions' balance sheet.

Item	Run-off rate
Retail deposits (run-off rate varies based on the insurance coverage - DGS guarantee)	0% - 10%
Unsecured wholesale and central bank funding:	
Provided by small business customers	5% - 10%
Provided by other wholesale counterparties and Central Banks	40%
Secured wholesale and central bank funding (run-off varies based on the quality of the collateral posed)	0% - 25%

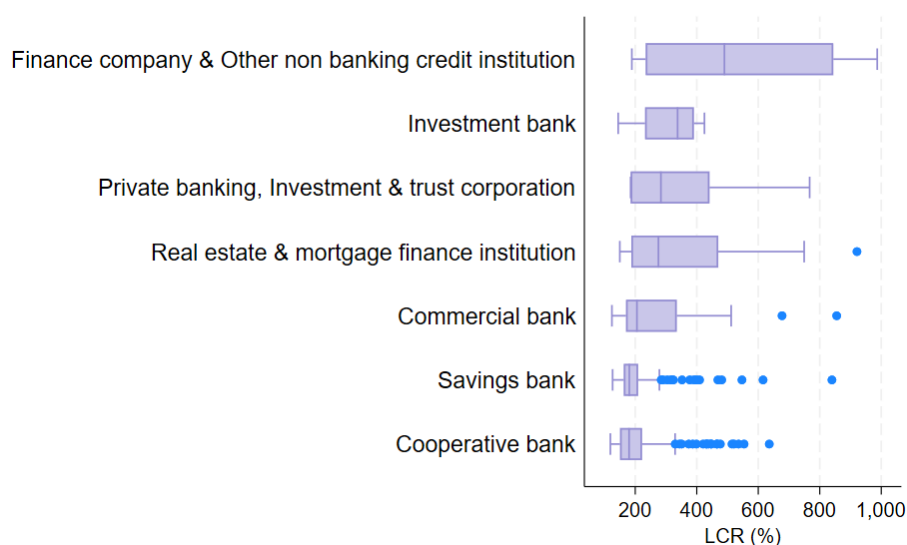
**Table 2** - Summary of cash outflows and corresponding run-off rates from institutions' balance sheet

*Source: Basel Committee on Banking Supervision. 2013. "Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools." Basel.*

To better explain the differences in run-off rates between the different financial liabilities: retail demand deposits fall under the bucket with the lowest run-off rates, while wholesale and central bank funding are subject to higher run-off rates during distressed periods. This distinction arises because retail deposits are guaranteed by the DGS, whereas wholesale and central bank funding are not. Delving further into wholesale funding, there is a difference in run-off rates between secured and unsecured funding. Secured funding, which backs the creditor with collateral, is less likely to be withdrawn compared to unsecured funding. Given this, a lower (higher) run-off rate is estimated to secured (unsecured) borrowing. Consequently, the substitution between retail demand deposits by unsecured funding will yield a comparatively higher impact on banks' liquidity.

Bridging the gap between liquidity risks and funding costs, reliance on unsecured funding as an adjustment strategy, while potentially cheaper, increases the liquidity risks faced by institutions.

Taking stock of the institutions' LCR levels (Figure 5), savings and cooperative banks hold the lowest levels of unencumbered HQLA relatively to the expected net cash outflows over a 30-days distress period. This indicates that, in the event of needing to rely on wholesale or central bank funding, they are more likely to breach the minimum requirement. At the other end of the spectrum are commercial banks. Institution categories with a smaller number of observations and some data dispersion, such as non-banking credit institutions and investment banks, pose limitations to the reliability of LCR levels.



**Figure 5 - LCR by financial sector specialisation**

Source: Own computations based on 2023 data provided by Orbis BankFocus.

## NSFR

As a complementary monitoring tool to the LCR, the NSFR was introduced to measure reliance on short-term wholesale funding, which, while relatively cheap, is an unstable source of funding that increases the risk of institution failure during periods of stress (Basel Committee on Banking Supervision 2014). According to the regulatory standard<sup>14</sup>, banks should fund themselves through stable funding that at least equivalent to the amount required by their

<sup>14</sup> Not applicable to non-deposit-taking institutions, i.e. non-banking financial institutions.

assets' characteristics such as residual maturity, quality, credit creation, and roll-over expectations, as it is described below:

$$NSFR = \frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} \geq 100\%$$

The available amount of stable funding (ASF) component is computed by multiplying each bank's funding source by an ASF factor, with the latter capturing the stability of each funding source. The assignment of ASF factors considers both the residual maturity of the funding and the type of counterparty providing it (retail, wholesale and central banks counterparties) (Table 3). For example, replacing retail deposits with interbank funding that has a residual maturity of more than 12-months increases a bank's funding stability by moving the ASF factor from the 90% - 95% bucket to the 100% bucket, thereby decreasing the roll-over risk of the bank's funding, i.e., increasing its NSFR *ceteris paribus*. However, a less optimal aspect is that this represents a more expensive funding source. Conversely, substituting with wholesale – other than small business customers – or central bank funding with a residual maturity of less than 12-months is cheaper than funding liabilities with a maturity of 12-months or longer but reduces the NSFR, bringing it closer to the 100% threshold imposed by regulation.

Item	ASF factor
Capital instruments Liabilities with 12-months residual maturity or more	100%
Deposits provided by retail and small business customers with residual maturity up to 12-months	90% - 95%
Funding provided by non-financial corporate customers and sovereign entities with residual maturity up to 12-months Funding provided by central banks and financial institutions with residual maturity between 6- and 12-months, not included in the other buckets	50%

**Table 3 - Summary of funding sources and corresponding ASF factors**

Source Basel Committee on Banking Supervision. 2014. "Basel III: The Net Stable Funding Ratio." Basel.

The comparative analysis of institutions' NSFR follows a similar approach to that of the LCR.

The corresponding box plot illustrating this comparison can be found in Appendix 5.

## **4.5. Pecking order of strategic balance sheet adjustments**

Building on the adjustment strategies previously discussed, this section establishes a pecking order for balance sheet adjustments. The pecking order reflects the sequence of the financial sector's potential responses to the issuance of the Digital Euro, taking into account own excess reserves, collateral, liquidity (LCR and NSFR) availability and profitability.

Subsequently, a benchmark analysis will be conducted to assess the likelihood of different types of financial institutions exhausting the pecking order and experiencing impacts on funding structures in the context of the issuance of the Digital Euro. This benchmark will specifically consider institutions' internal resource availability and liquidity positions.

### **4.5.1. Pecking order: a definition**

In response to the outlined trade-off between liquidity risk and profitability, ECB researchers developed a constrained balance sheet optimisation model that simulates institutions' optimal responses to different levels of overnight household deposit outflows, which might occur with the issuance of the Digital Euro (Adalid et al. 2022, 25; Lambert et al. 2024, 7; Meller and Soons 2023, 17). The approach operates under the assumption that institutions decide to maintain their lending volume and loan interest rates, framing this as a short-term assessment of their response.

By capturing the trade-off between liquidity risk and profitability, the objective function focuses on a minimization problem of funding costs, constrained by institutions' own excess reserves, overall banking sector excess reserves, collateral, minimum liquidity requirements and specific institutions' liquidity risk preferences<sup>15</sup>. Considering this framework, the

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<sup>15</sup> To reflect heterogenous liquidity preferences, it is considered that each individual institution holds a voluntary buffer above the regulatory standards, which constitute at least the historical median yearly change to individual institutions' liquidity ratios observed since 2016 (Meller and Soons 2023, 12).

suggested pecking order of adjustment channels to accommodate increasing levels of retail demand deposit outflows is as follows:

1. Own excess reserves: Assuming institutions are willing to partially withdraw their voluntary reserves buffers, they will make use of own resources as a first adjustment strategy (Adalid et al. 2022, 27-28; Lambert et al. 2024, 11);
2. Secured short-term (ST) and medium-term (MT) market funding: Once institutions have depleted their excess reserves or are no longer willing to reduce them further, along with their balance sheet size, they will resort to the cheapest funding options: secured ST and MT market funding. This funding will primarily rely on unencumbered HQLA held in excess of their assumed preferred voluntary liquidity buffers (Adalid et al. 2022, 26-28; Lambert et al. 2024, 11; Meller and Soons 2023, 22-23);
3. Unsecured ST and MT market funding: Eventually, institutions will face HQLA collateral constraints or reach their preferred voluntary LCR buffers, leading them to rely on unsecured ST and MT market funding. Although secured funding may be more appealing to institutions for profitability reasons, unsecured ST and MT market funding is expected to be the primary adjustment strategy among all adjustment strategies employed, due to both collateral and LCR constraints (Adalid et al. 2022, 26-28; Lambert et al. 2024, 11; Meller and Soons 2023, 22-23);
4. Unsecured LT market funding: In cases of unusually high levels of deposit outflows, institutions might also need to sustain their NSFR voluntary buffers by balancing ST and MT market funding with LT market funding (Meller and Soons 2023, 22-23);
5. Eligible non-HQLA secured central bank funding: In scenarios where market reserves shrink and market funding prices escalate, institutions may be obliged to resort to central bank funding. If they do not face NSFR constraints, they opt for MROs, a 7-day maturity credit line (Adalid et al. 2022, 27; European Central Bank 2024b; Lambert et al. 2024, 11-13; Meller and

Soons 2023, 18-19). If institutions face NSFR constraints, they are compelled to engage in TLTROs, a credit line with up to 4-years maturity, falling into the ASF bucket of 100% (Adalid et al. 2022, 27; European Central Bank 2024b; Lambert et al. 2024, 11-13; Meller and Soons 2023, 18-19).

#### **4.5.2. Assessing institutions' position within the pecking order**

Building on the theoretical framework outlined in the previous subsection, the following benchmark analysis will evaluate the likelihood of different types of institutions exhausting the pecking order and experiencing impacts on their funding structures with the issuance of the Digital Euro.

The exercise will consider four criteria: (i) reliance on demand retail deposits, which measures their exposure to the impact of the Digital Euro; (ii) the availability of own excess reserves relative to demand deposits, reflecting individual autonomy in managing deposit outflows; (iii) availability of HQLA relative to retail demand deposits, indicating capacity to pledge HQLA as collateral to raise secured borrowing; (iv) LCR and NSFR, which infer short-term and structural liquidity resilience, respectively.

Savings and cooperative banks are the most likely to be significantly affected by the Digital Euro. Heavily reliant on retail demand deposits (median values of 56.9% and 51.6%, respectively), these institutions are particularly vulnerable to structural disintermediation. Their median excess reserves to demand deposits are critically low (0.017), offering almost no autonomous capacity to intermediate a CBDC, forcing them to explore alternative adjustment strategies. Despite comfortable LCR levels (180.8% and 180.3%), they face potential HQLA collateral constraints to cover deposit outflows (0.245 and 0.188). Additionally, their NSFR (125.2% and 120.7%) indicates limited flexibility to replace retail deposits with alternative funding without breaching NSFR regulatory or risk appetite thresholds. Given these

challenges, they are more likely to resort to LT central bank funding, collateralized by non-HQLA assets, to manage liquidity pressures.

Commercial banks occupy an intermediate position. With a median reliance on demand deposits of 45.3% and excess reserves covering 20.6% of these, they have some capacity to manage withdrawals. Their HQLA-to-demand deposit ratio (0.683) and liquidity metrics (LCR at 205.5% and NSFR at 149.3%) position them favorably to engage in ST secured wholesale borrowing if needed to intermediate the Digital Euro. Consequently, commercial banks are less likely to exhaust the pecking order compared to savings and cooperative banks.

At the opposite end of the spectrum, non-banking credit and mortgage institutions exhibit minimal reliance on retail demand deposits (median values of 2.4% and 0.66%, respectively), making them less exposed to the Digital Euro's potential disruptions. While non-banking credit institutions are better prepared to manage deposit outflows independently – with excess reserves covering at least 41.9% of demand deposits – mortgage institutions are less equipped (0.99%). Nevertheless, both demonstrate minimum HQLA-to-demand deposits ratios, at 0.48 and 0.58, respectively. Their liquidity levels are challenging to assess due to the limited sample size and high data dispersion. Despite this, these institutions are less likely to be significantly affected, given their low reliance on retail demand deposits. Any need to raise borrowing would likely have a marginal impact on their funding structures and liquidity positions.

For investment banks and private banking institutions, the limited number of observations in the sample (4 and 7, respectively) and the high data dispersion across key variables make it challenging to draw conclusions about the potential impact of the Digital Euro on their funding structures and liquidity ratios. This includes assessing their susceptibility to structural disintermediation, measured by demand deposit reliance.

In summary, the varying liquidity profiles and funding structures across different types of financial institutions determine their position within the pecking order and their ability to adapt to the introduction of the Digital Euro. While some groups are well-positioned to manage these changes, others face significant challenges that may require greater reliance on central bank funding.

## 5. Conclusions

The present project aims to explore the implications of the issuance of the Digital Euro, a retail non-interest-bearing CBDC, for financial stability in the Euro Area, with a specific focus on the balance sheets of financial institutions. As a premise for the research, it is assumed that there are no holding limits on the adoption and usage of the Digital Euro. To this end, the study examines the three fundamental components of institutions' balance sheets: (i) funding structure, (ii) capital structure, and (iii) asset structure. The discussion considers the associated risks for each of these components – (i) liquidity risk for funding structure, (ii) capital adequacy for capital structure, and (iii) credit risk for asset structure – accompanied by a brief discussion of their implications for institutions' profitability.

To begin, sections 1 and 2 elaborate on the definition of the Digital Euro and the key advantages of its issuance, with particular emphasis on the enhancement of the current Euro Area payment system, which is highly reliant on non-European payment providers, and the safeguard of the Euro currency as public money in the digital era. Section 3 introduces the topic of financial stability, focusing on the impact of the Digital Euro on financial stability, particularly on institutions' balance sheets through the disintermediation of deposits.

Based on the analysis of institutions' funding structures and liquidity positions (in section 4), savings and cooperative are the most likely to experience significant impacts on their funding structure with the launch of the Digital Euro. They rely heavily on retail demand deposits and dispose of relatively low levels of internal funds. Additionally, if they need to raise funding, their liquidity positions may be jeopardized. In that scenario, these are the types of banks most likely to require central bank funding, which while less damaging for their liquidity, is the most expensive funding option.

On the other side of the spectrum are non-banking credit and mortgage institutions, which have minimal reliance on retail demand deposits. However, if they need to raise funding, it is complex to evaluate the likelihood of borrowing from central banks, as their liquidity buffers are challenging to evaluate due to the small number of observations and high dispersion. The same limitation applies to investment banks and private banking institutions. While a comparative analysis allows to hypothesize about potential impacts on the funding structure of savings, cooperative and commercial banks, the same is not feasible to investment banks and private banking institutions. This highlights the limitations encountered in data collection, particularly for these types of financial institutions.

The following segment explores the effect of the Digital Euro issuance through the endogenous lens of money creation. Capital adequacy emerges as a critical constraint, acting as both a regulator of banks' risk appetite through required buffers and a direct influence on credit and liquidity risks. This section concludes that the Digital Euro could theoretically exert a dual pressure on the Capital Adequacy Ratio and analyses in parallel European banks' current capital position (which stands at about 2.5 to 5 pp above the required), even considering recent macroeconomic challenges. Despite confirming banks' short-term capital resilience, the proposed strategies – prioritized by ease of implementation and historical precedence – offer a roadmap to strengthen banks' risk-adjusted capital ratios, addressing medium- to long-term impacts on the balance sheet of banks. In terms of impact on profitability, the Digital Euro significantly introduces initial costs for banks but also creates opportunities for new revenue streams, such as fee-based services, enabling banks to optimize capital efficiency and offset early challenges.

The model examined in the last section highlights the crucial function of deposit funding in upholding financial stability, particularly during periods of economic stagnation or contraction. A larger proportion of deposit funding enables banks to withstand external economic shocks

more effectively, which in turn leads to a reduction in non-performing loans (NPLs) and an improvement in the management of credit risk. The findings of the analysis indicate that the stabilizing impact of deposit funding is most evident during economic contractions, a time when systemic credit risks are heightened. Conversely, its relative significance is diminished during periods of economic expansion. This dynamic emphasizes the critical interdependence between the structural characteristics of financial funding, macroeconomic conditions and the risk of credit default in guaranteeing the stability of the financial system.

The implementation of the Digital Euro may potentially disrupt this equilibrium, with the possibility of triggering significant deposit outflows on a large scale. Such a shift could necessitate that banks rely on alternative funding sources that are less stable, thereby intensifying credit risk and systemic fragility, particularly during periods of economic turbulence. To mitigate these risks, the design of the Digital Euro must prioritize measures that minimize disruptions to funding stability. Features such as holding limits, tiered interest rates, or restrictions on its use as a store of value could serve to mitigate deposit migration and thereby preserve the stabilizing role of traditional deposit funding.

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## Appendix

<b>Specialisation</b>	<b>No. obs.</b>	<b>Assets share</b>
Savings bank	197	38.71
Cooperative bank	308	30.70
Commercial bank	42	18.24
Real estate & mortgage finance institution	10	8.20
Investment bank	4	2.88
Finance company & Other non-banking credit institution	4	0.78
Private banking, Investment & trust corporation	7	0.49
<b>Total</b>	<b>572</b>	<b>100</b>

*Appendix 1 - Distribution of institutions by specialization: number of observations and asset share*

*Source: Calculations based on 2023 data from Orbis BankFocus.*

*Note: Asset share (%) represents the share of each institution category's assets relative to the total assets of the institution sector.*

		<b>Mean</b>	<b>SD</b>	<b>Min.</b>	<b>P5</b>	<b>P25</b>	<b>P50</b>	<b>P75</b>	<b>P95</b>	<b>Max.</b>
<b>Total</b>	Demand deposit funding	50.885	16.106	0.028	18.606	43.869	53.494	61.290	72.293	94.433
	Other retail deposit funding	31.721	13.844	0.032	11.269	24.734	30.103	36.119	59.471	98.369
	Interbank liabilities	14.615	10.924	0	1.946	7.695	12.746	18.961	35.073	83.387
	Wholesale funding except interbanking	2.779	7.535	0	0.000	0.243	0.842	1.843	13.264	83.758
	Short-term wholesale funding	14.882	11.116	0	1.961	7.755	12.915	19.152	35.336	83.387
	Long-term wholesale funding	2.512	7.135	0	0	0.203	0.814	1.700	11.900	83.758
	Excess reserves to demand deposits	0.772	15.389	0	0.0003	0.011	0.018	0.033	0.366	367.287
	HQLA to demand deposits	5.651	99.112	0.063	0.105	0.175	0.228	0.291	1.237	2344.398
	LCR	214.499	109.207	119.2	130.26	157	183.4	222.855	441.54	987
	NSFR	127.798	18.478	105.46	112.24	118.205	123.053	130.26	162.168	257
<b>Commercial bank</b>	Demand deposit funding	45.142	25.259	1.181	4.507	25.389	45.270	64.159	86.360	94.433
	Other retail deposit funding	30.076	19.259	0.032	5.001	14.250	29.465	40.943	66.057	80.724
	Interbank liabilities	15.934	20.209	0	0.007	0.683	9.561	23.478	50.595	83.387
	Wholesale funding except interbanking	8.848	13.811	0	0.001	0.642	3.270	10.212	40.781	54.723
	Short-term wholesale funding	17.376	21.009	0	0.029	1.622	10.991	24.003	54.995	83.387
	Long-term wholesale funding	7.407	11.876	0	0	0.275	2.523	10.064	39.005	52.455
	Excess reserves to demand deposits	0.348	0.442	0	0	0.040	0.206	0.539	1.404	1.929
	HQLA to demand deposits	3.726	15.421	0.125	0.282	0.475	0.683	1.144	8.164	100.428
	LCR	273.627	156.776	124.1	147.4	170	205.48	335	512	855.14
	NSFR	159.487	38.669	110.11	113.829	129.022	149.254	186.308	227.35	257
<b>Cooperative bank</b>	Demand deposit funding	50.287	13.453	5.431	26.658	42.636	51.561	58.633	73.578	83.664
	Other retail deposit funding	32.688	11.935	0.196	13.338	27.139	31.813	38.725	57.783	77.328
	Interbank liabilities	15.306	9.900	0	2.563	8.621	14.246	20.446	35.073	65.642
	Wholesale funding except interbanking	1.718	4.806	0	0	0.139	0.639	1.385	5.492	50.618
	Short-term wholesale funding	15.489	9.959	0	2.563	8.660	14.430	20.922	35.073	65.642
	Long-term wholesale funding	1.535	4.669	0	0	0.078	0.610	1.327	4.132	50.618
	Excess reserves to demand deposits	0.040	0.136	0	0	0.006	0.017	0.029	0.114	2.157
	HQLA to demand deposits	0.252	0.421	0.063	0.085	0.143	0.188	0.244	0.433	5.086
	LCR	200.915	81.509	119.2	120	150.5	180.025	222.3	387	635.78

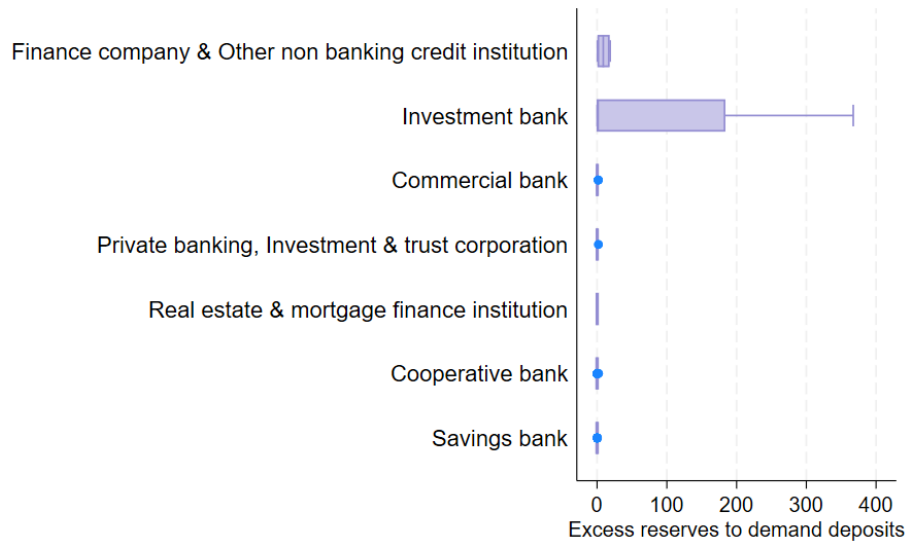
	NSFR	122.492	9.656	106.855	111.545	116.815	120.71	124.901	140.442	167.46
<b>Finance company &amp; Other non-banking credit institution</b>	Demand deposit funding	5.321	7.645	0.086	0.086	0.143	2.433	10.500	16.333	16.333
	Other retail deposit funding	52.225	42.328	14.681	14.681	16.307	47.926	88.144	98.369	98.369
	Interbank liabilities	38.599	41.652	0.363	0.363	3.056	35.808	74.142	82.416	82.416
	Wholesale funding except interbanking	3.855	5.237	0	0	0.591	1.943	7.118	11.533	11.533
	Short-term wholesale funding	38.599	41.652	0.363	0.363	3.056	35.808	74.142	82.416	82.416
	Long-term wholesale funding	3.855	5.237	0	0	0.591	1.943	7.118	11.533	11.533
	Excess reserves to demand deposits	9.232	10.066	0.419	0.419	0.536	8.865	17.928	18.778	18.778
	HQLA to demand deposits	82.402	146.978	0.484	0.484	1.507	13.425	163.298	302.274	302.274
	LCR	538.980	372.869	188.93	188.93	233.965	489.995	843.995	987	987
	NSFR	125.953	16.136	112.92	112.92	114.755	121.03	137.15	148.83	148.83
<b>Investment bank</b>	Demand deposit funding	35.400	29.820	0.042	0.042	16.826	34.278	53.975	73.004	73.004
	Other retail deposit funding	36.432	29.158	7.239	7.239	17.630	30.900	55.234	76.688	76.688
	Interbank liabilities	15.976	11.270	1.730	1.730	8.040	16.646	23.913	28.884	28.884
	Wholesale funding except interbanking	12.191	9.066	0.815	0.815	5.150	13.205	19.233	21.54	21.540
	Short-term wholesale funding	20.751	13.929	1.730	1.730	10.336	25	31.167	31.276	31.276
	Long-term wholesale funding	7.417	9.968	0	0	0.408	4.063	14.425	21.54	21.540
	Excess reserves to demand deposits	92.079	183.472	0.133	0.133	0.135	0.448	184.023	367.287	367.287
	HQLA to demand deposits	586.617	1171.854	0.417	0.417	0.427	0.826	1172.806	2344.398	2344.398
	LCR	311.268	119.449	144.61	144.61	231.855	337.73	390.68	425	425
	NSFR	153.883	5.266	146.3	146.3	150.69	155.38	157.075	158.47	158.47
<b>Private banking, Investment &amp; trust corporation</b>	Demand deposit funding	57.498	29.839	7.274	7.274	45.219	56.051	92.669	94.102	94.102
	Other retail deposit funding	35.468	27.402	3.588	3.588	4.283	34.839	45.873	83.951	83.951
	Interbank liabilities	5.966	2.402	2.311	2.311	2.649	7.062	7.702	7.809	7.809
	Wholesale funding except interbanking	1.068	0.670	0	0	0.399	1.302	1.697	1.714	1.714
	Short-term wholesale funding	5.966	2.402	2.311	2.311	2.649	7.062	7.702	7.809	7.809
	Long-term wholesale funding	1.068	0.670	0	0	0.399	1.302	1.697	1.714	1.714
	Excess reserves to demand deposits	0.361	0.693	0	0	0.009	0.122	0.331	1.908	1.908
	HQLA to demand deposits	0.676	0.750	0.233	0.233	0.272	0.459	0.584	2.347	2.347
	LCR	343.734	208.914	184.94	184.94	185	283.53	441.54	767.13	767.13

	NSFR	157.786	48.251	111.394	111.394	127.003	132.85	217.642	234	234
<b>Real estate &amp; mortgage finance institution</b>	Demand deposit funding	2.092	2.939	0.0282	0.028	0.275	0.659	2.777	7.764	7.764
	Other retail deposit funding	68.452	32.679	10.0084	10.008	54.392	81.467	92.050	95.318	95.318
	Interbank liabilities	10.562	11.806	3.5215	3.522	4.387	6.958	10.204	43.363	43.363
	Wholesale funding except interbanking	18.894	33.157	0.5482	0.548	0.660	1.329	12.106	83.758	83.758
	Short-term wholesale funding	10.562	11.806	3.5215	3.522	4.387	6.958	10.204	43.363	43.363
	Long-term wholesale funding	18.894	33.157	0.5482	0.548	0.660	1.329	12.106	83.758	83.758
	Excess reserves to demand deposits	0.158	0.181	0.0099	0.010	0.011	0.058	0.282	0.524	0.524
	HQLA to demand deposits	26.676	48.941	0.5793	0.579	3.348	9.927	16.156	161.266	161.266
	LCR	380.618	263.421	149.8	149.8	187.31	275.405	470	921	921
	NSFR	124.837	10.280	109.5	109.5	117.44	125.345	133.14	140.03	140.03
<b>Savings bank</b>	Demand deposit funding	56.524	9.312	23.724	40.826	51.336	56.940	63.248	69.964	82.0537
	Other retail deposit funding	28.051	7.155	2.751	17.156	23.687	27.453	31.930	39.232	57.516
	Interbank liabilities	13.251	7.440	0.535	3.310	8.584	12.090	16.784	26.550	47.537
	Wholesale funding except interbanking	2.175	3.453	0	0.005	0.385	0.932	2.058	11.900	18.832
	Short-term wholesale funding	13.337	7.476	0.535	3.310	8.611	12.296	16.855	26.550	47.537
	Long-term wholesale funding	2.089	3.332	0	0.001	0.381	0.930	2.040	10.591	18.832
	Excess reserves to demand deposits	0.028	0.054	0	0.009	0.013	0.017	0.022	0.084	0.600
	HQLA to demand deposits	0.258	0.107	0.115	0.170	0.217	0.245	0.272	0.366	1.458
	LCR	201.554	82.314	126.34	141.88	162.66	180.8	209.48	352.23	839.7
	NSFR	127.932	12.224	105.46	114.57	121.47	125.19	131.61	157.911	205.19

**Appendix 2 - Summary statistics of institution funding and liquidity by financial sector specialisation**

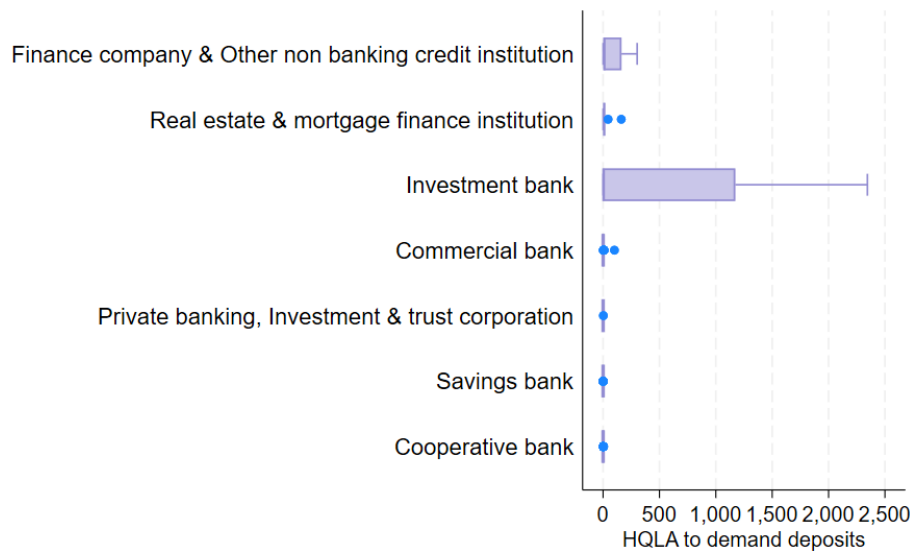
Source: Calculations based on 2023 data from Orbis BankFocus.

Note: All variables are expressed as percentages, except for 'Excess reserves to demand deposits' and 'HQLA to demand deposits', which represent the proportion of own excess reserves and HQLA relative to retail demand deposit, respectively.



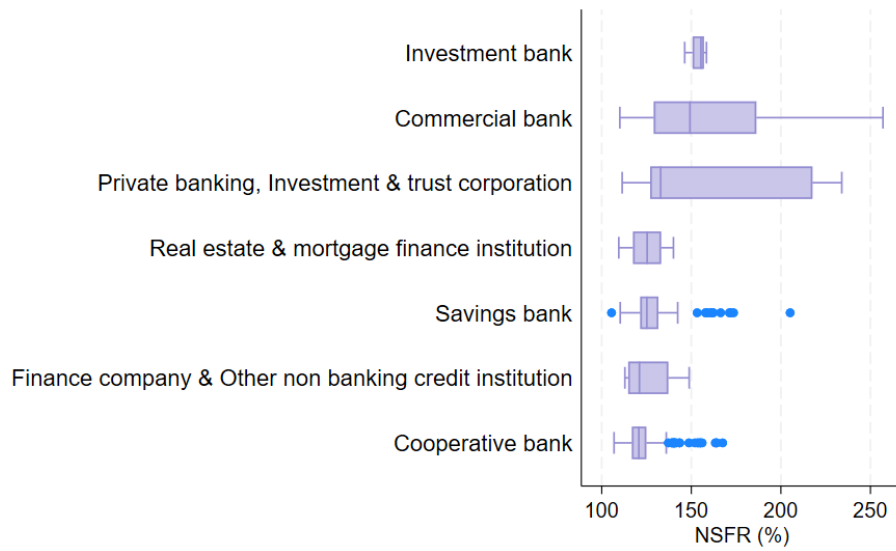
*Appendix 3 - Excess reserves to retail demand deposits by financial sector specialisation*

*Source: Own computations based on 2023 data provided by Orbis BankFocus.*



*Appendix 4 - HQLA to retail demand deposits by financial sector specialisation*

*Source: Own computations based on 2023 data provided by Orbis BankFocus.*



***Appendix 5 - NSFR by financial sector specialisation***

*Source: Own computations based on 2023 data provided by Orbis BankFocus.*