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ENABLE DIGITAL INNOVATION IN THE FINANCIAL SECTOR; PRESERVE FINANCIAL STABILITY

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This is a translated version of the original German-language chapter "Digitale Innovationen im Finanzsektor ermöglichen, Finanzstabilität sichern", which is the sole authoritative text. Please cite the original German-language chapter if any reference is made to this text.

KEY MESSAGES

↘ The digital transformation in the financial sector promises opportunities such as lower costs for financial services due to process innovation and more competition as well as new financial products.

↘ Introducing regulatory sandboxes and facilitating the exchange of financial data between big techs, fintechs and banks can foster innovation without creating new systemic risks.

↘ The digital euro promises improvements in the European payment market and protection against geopolitical risks.

EXECUTIVE SUMMARY

The digital transformation is reaching the financial sector, but digital innovations are most likely to come from new players. Specialised digital financial service providers ('**fintechs**') are entering the financial market, and large technology companies ('**big techs**') are expanding their activities. They are competing with established financial institutions in the payment market and – increasingly, but at a very low level – in the credit market. The European Central Bank (ECB) also responded to this change and wants to anchor public money in a digital and increasingly cashless economy. It intends to offer a digital central bank currency to the general public with the **digital euro.**

The digital transformation in the financial sector offers several opportunities. For example, **households and firms** are likely to **benefit** from **lower costs of financial intermediation**. These costs fell in Germany during the 2010s, however this was against the backdrop of a prolonged low interest rate environment. The German financial sector has been rather slow to embrace digitalisation. In future, process innovation such as 'digital scoring', i.e. using digital financial data for credit risk analysis, and more intense competition from entrants could help further reduce costs. Digitalisation has also resulted in new **financial services that are more convenient.**

However, new players entering the market can also create **financial stability risks** and pose new challenges for financial regulation. Differences in regulation between banks, fintechs and big techs provide incentives to shift businesses to less regulated areas. In the EU, however, this problem appears manageable because the activities of banks or payment service providers that are particularly relevant to financial stability require a licence. Gaps could arise if European regulations are applied differently by national supervisors or when regulating big techs with significant financial activities. In addition, the digitalisation can threaten the stability of commercial banks, for example, at interconnections with less regulated financial service providers or if banks take higher risks due to declining profits.

The main challenge for policymakers is to enable digital innovation in the financial sector to realise efficiency and quality improvements, while preserving financial stability. Options to achieve these goals include '**regulatory sandboxes**' that create spaces for experimentation and '**open banking**' regulations that contribute to level playing field between banks, fintechs and big techs regarding data access. The **digital euro** should primarily help reduce **fragmentation and costs in the European payment market** as well as dependence on non-European payment service providers. It can also protect monetary policy against extreme but unlikely risks like the displacement of the official currency.

I. INTRODUCTION

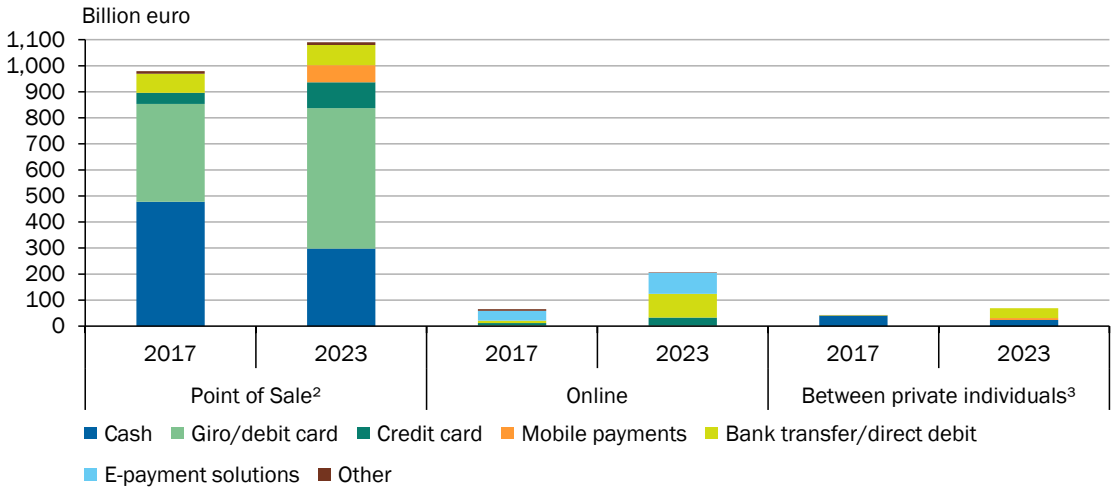
213. Digitalisation offers new financial services and changes business models in the financial sector. Significant **shifts towards digital products** are already visible, for example, in the **payment market** with a marked shift from cash to digital payments. ↘ CHART 53 The volume of **online payments**, which are typically made using credit cards, bank transfers and e-payment solutions, more than **tripled** between 2017 and 2023. In shops, consumers more frequently pay with debit and credit cards or mobile payment apps and **less frequently with cash**. Even for payments between individuals, cash has lost ground to digital solutions.

214. Against this backdrop, this year's Productivity Report analyses cost efficiency ↘ ITEMS 242 FF. and digitalisation ↘ ITEMS 248 FF. in the German financial sector. In particular, it highlights the **opportunities and risks of digital innovation** for different financial institutions and agents: digital innovation promises **new products** – e.g. mobile payment solutions or peer-to-peer (P2P) lending – to users of financial services like payments, savings products and loans. ↘ GLOSSARY They **improve convenience** in the sense of greater flexibility and availability (e.g. through app- or web-based interaction). ↘ ITEMS 259 FF. In addition, there is better **financial inclusion** customer groups who – often due to a lack of traditional collateral – had only limited access to certain financial services. ↘ ITEMS 266 FF. Digitalisation offer financial institutions **potential cost reductions**, for example via automated business processes or credit scoring with alternative data sources such as the 'digital footprint'. ↘ ITEMS 256 FF.

↘ CHART 53

Payment volume in Germany[1]

By means of payment and situation



1 – The payment volume includes irregular payments by private households. Regularly recurring payments such as rent payments are excluded. Expenditure on education and health is also not included. 2 – Point of sale (POS) refers to a physical point of sale. 3 – Including charitable purposes.

Sources: Deutsche Bundesbank, Federal Statistical Office, own calculations

215. In general, digital innovation can originate from both established incumbents and new entrants. However, **established institutions** like commercial banks often have only weak incentives for digital innovation. This is due to complex legacy IT systems and the cannibalisation of profitable product lines, for example. The degree of digitalisation in the German financial sector is currently in the lower midfield compared to the rest of Europe. ↘ ITEM 248 **New players** are therefore especially suitable for digital innovation in the financial sector. On the one hand, they include **fintech companies** entering the financial market. ↘ ITEMS 220 FF. On the other hand, **big tech companies** ↘ GLOSSARY are increasingly expanding their businesses and offering a wide range of financial services. ↘ ITEMS 224 FF. Last but not least, **central banks** aim at making public money available to the general public in digital form with **initiatives like the digital euro**, thereby establishing themselves in the digital payment market. ↘ ITEMS 228 FF.

216. The entry of new players creates challenges for financial regulation. Differences in regulation between banks, fintechs and big techs can open up **opportunities for arbitrage** such that business could be shifted to less regulated areas. ↘ ITEM 288 **More intense competition** from entrants can stimulate innovation and increase market shares of more productive financial institutions. At the same time, the literature on bank competition points to possible **negative effects on financial stability**. Smaller profits could incentivise banks to take more risks and slow down the build-up of bank equity. ↘ ITEMS 297 FF.

217. The key challenge for policy makers is to **enable digital innovation in the financial sector** to realise efficiency and quality improvements, while **preserving financial stability** and avoiding systemic risks. In the area of fintechs, **regulatory sandboxes** can be useful to create room for testing new products and business models. ↘ ITEM 310 Regarding big techs, the goal is to **avoid fragmented regulation** and to better account for the interdependencies between the group's financial and non-financial businesses. ↘ ITEM 313 Finally, **open banking regulations** can help create a level playing field by mitigating the competitive disadvantages faced by new fintech firms in accessing financial data. ↘ ITEM 312

218. Although the **digital euro** does not address a classic market failure, it promises several **improvements** and **fosters the digital transformation**. One example is the **payment market**, where it can offer households a cost-effective alternative for digital payments and helps overcome coordination problems in the development of an uniform, autonomous European payment infrastructure. ↘ ITEMS 275 FF. Furthermore, the digital euro could protect the euro area against extreme, albeit unlikely, events ('tail risks') such as the displacement of the official currency by a private cryptocurrency. In view of its envisaged **design with low holding limits** and non-interest-bearing balances, the **risk of disintermediation** is likely to be **very low**. ↘ ITEM 307 Households are unlikely to replace bank deposits with the digital euro on a large scale, causing banks to lose one of their most important sources of finance.

II. DIGITAL TRANSFORMATION: NEW PLAYERS ARE SHAKING UP THE FINANCIAL MARKET

219. New digital financial service providers are increasingly changing the financial market. One of these is **fintechs** (financial technology companies), mainly young companies that provide innovative digital financial services. ↘ ITEMS 220 FF. Fintechs sometimes operate as cooperation partners for traditional financial institutions, offering technology-based solutions. Other fintechs compete with traditional institutions and offer their own services directly to private customers. In addition, **big techs**, large technology companies, are increasingly appearing on the financial market. Up to now, they have been active particularly in payment transactions. ↘ ITEMS 224 FF. Big techs benefit from competitive advantages such as technological expertise in data collection and processing, a large customer base from their core business and considerable financial clout. Finally, **central banks** are emerging as new players with plans for central bank digital currencies. The ECB is in the advanced planning stage for a digital euro, which will be an alternative to sight deposits ↘ GLOSSARY at commercial banks and can be used for transactions. ↘ ITEM 228 All these developments are increasing competition in the financial market and thus the pressure on established financial institutions.

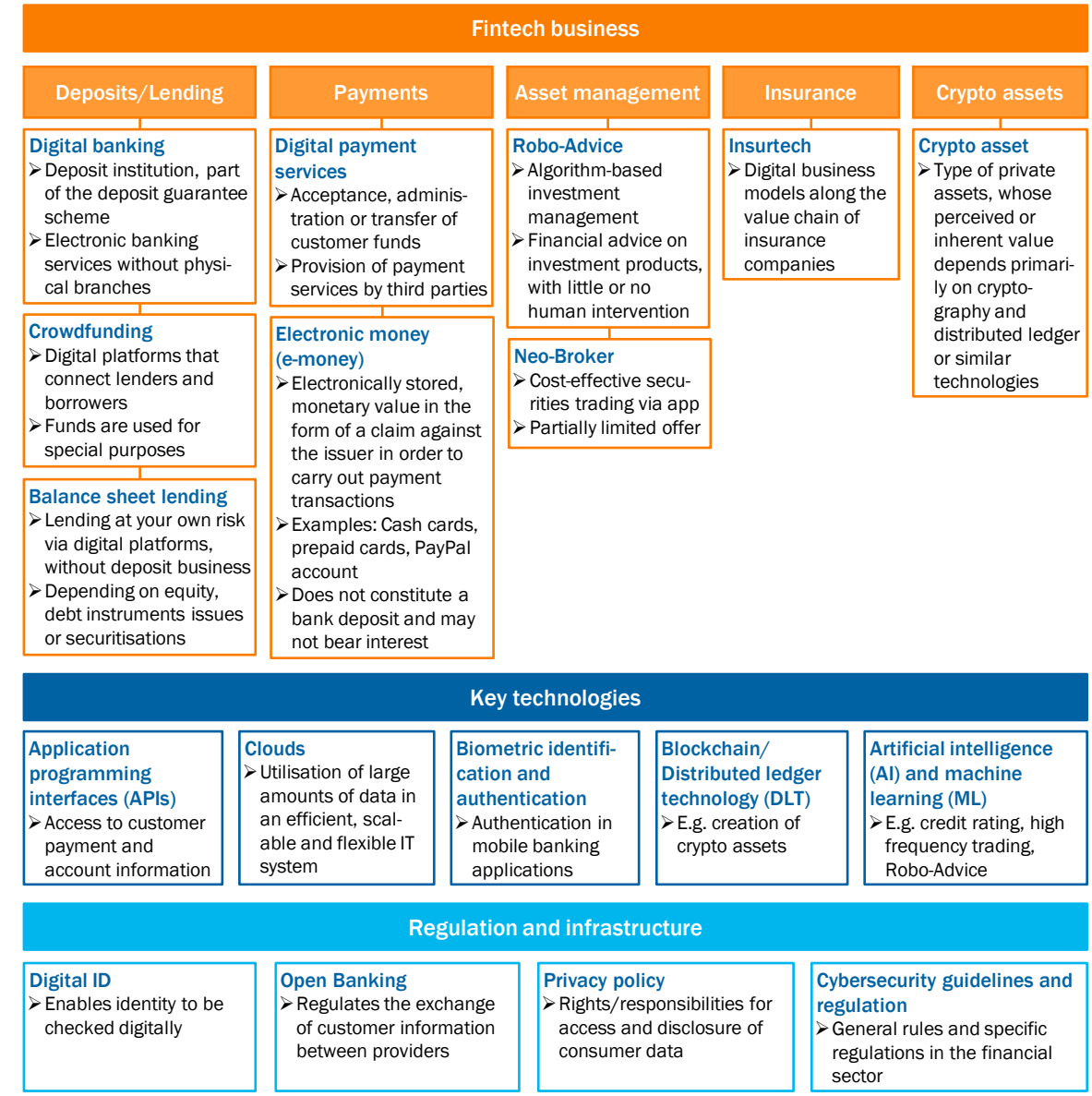
1. Fintechs – sometimes friend, sometimes foe of incumbents

220. Fintechs are active in various segments in the financial sector such as lending, payments, asset management, insurance and crypto assets. ↘ CHART 54 In terms of credit volume, **fintechs** play a **very minor role internationally** in **lending** to households and firms; they are almost non-existent in Germany to date. ↘ CHART 55 LEFT The situation is similar for crowdfunding, ↘ GLOSSARY which is growing but currently plays a very small role in the overall economy. ↘ CHART 55 RIGHT One exception used to be China where fintech loans accounted for around 1.5 % of the total credit volume. Since 2017, however, lending by fintechs has fallen drastically – or shifted more towards the big tech sector – following a series of insolvencies. ↘ CHART 56 LEFT In Europe, fintech lending in the United Kingdom developed comparatively dynamically, which may have been partly due to the involvement of a state development bank (Cornelli et al., 2023a).

221. Many fintechs **cooperate** with traditional financial institutions, such as banks and insurance companies, and offer **digital solutions for their business processes** (Brandl and Hornuf, 2020). For example, they can help to automate processes, process large amounts of data or improve investment decisions or advice with the help of software. Cooperation between traditional institutions and fintechs can vary in intensity, for example in the form of collaborations, outsourcing or takeovers (EBA et al., 2022).

222. Other fintechs **compete** with existing financial institutions and offer their services **directly to customers**. These include fintechs offering mobile banking via current accounts and credit cards, payment service providers for digital transactions, BNPL ('buy now, pay later') ↘ ITEM 260 or online brokers. Fintechs compete with established players particularly in the fields of digital lending (mortgages,

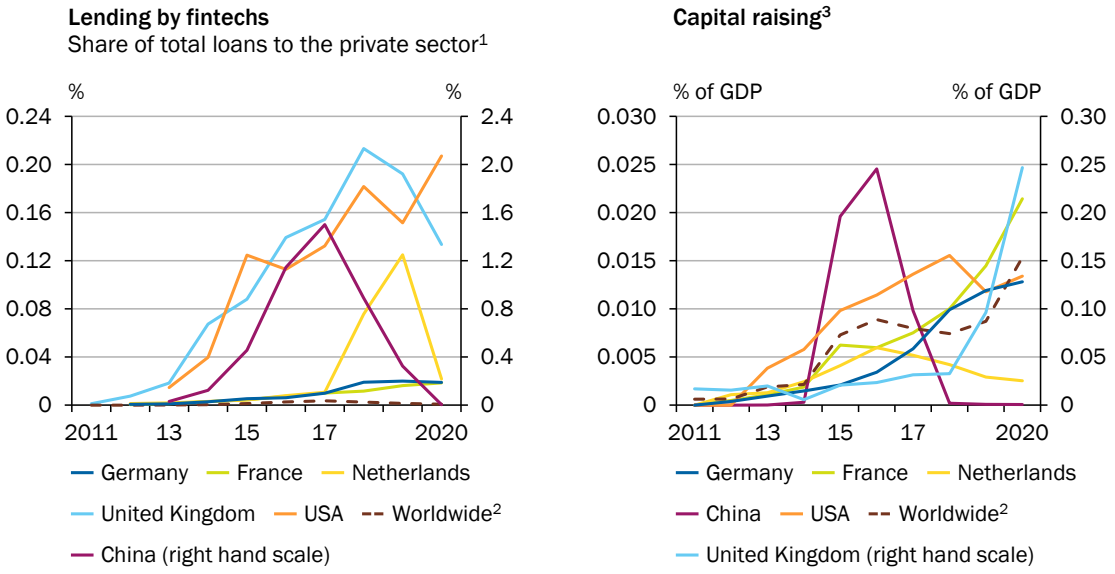
↘ CHART 54
The fintech world at a glance



Source: own illustration based on Ehrentraud et al. (2020a)

↘ CHART 55

Lending and capital raising by fintechs



1 – Excluding companies in the financial sector. 2 – Comprises 96 countries worldwide according to a compilation by Cornelli et al. (2020). 3 – Includes investment-, donation- and reward-based crowdfunding.

Sources: BIS, Cambridge Center for Alternative Finance, World Bank, own calculations

consumer loans), P2P lending, payment transactions and portfolio management. By contrast, they have so far hardly been active in serving corporate customers.

223. Fintechs use **digital technologies** or are themselves involved in their development. ↘ CHART 54 In this context, distributed ledger technology (DLT), blockchains and the 'tokenisation' of assets are particularly relevant for the financial sector. ↘ BOX 13 One example of this is the crypto asset Bitcoin. Using such technological innovations requires the corresponding expertise, which the established financial institutions have not yet built up to the same extent.

↘ BOX 13

Background: New digital technologies in the financial sector

The digital transformation in the financial sector is driven by technological innovations. One important example is **distributed ledger technologies (DLTs)**, which can be used to **manage transaction data in a decentralised and synchronised manner** (Davidson et al., 2016; Walport, 2016). This technology is based on a network of nodes that work together to maintain a common, immutable ledger of all transactions, which makes manipulation much more difficult (Garay et al., 2015; Casino et al., 2019). DLTs are regarded as particularly transparent, as all transactions are traceable for all participants in the network (BSI, 2019). With a sufficient number of independent participants, the decentralised structure makes these systems robust against cyber attacks and makes financial fraud more difficult (Maull et al., 2017). In the case of public ledgers, uploading data to the network and access to all ledger transactions is accessible to the broad public. The user group can be restricted in the case of private ledgers. DLTs reduce dependence on third parties (e.g. central counterparties in securities trading) when

processing transactions.

Blockchain is a **technology**, generally a DLT, on which transaction data is recorded. New transactions are added as blocks to an existing chain of transactions. It is difficult to manipulate a blockchain, as this would require simultaneously compromising a majority of the network participants (Garay et al., 2015). This strengthens confidence in the technology. Blockchains are used, for example, in cryptocurrencies such as Bitcoin and Ethereum (Nakamoto, 2008).

In financial markets, **tokenisation** describes the digital representation of real assets in a blockchain. The aim here, for example, is to facilitate trading, particularly in assets that are traditionally difficult to access or illiquid, as in the case of partial ownership of property or works of art.

Some blockchain technologies offer innovative functions such as **smart contracts** – programmes that are executed automatically under previously defined conditions. For example, a German bank tested a smart derivative contract in which a derivative in the form of an interest rate swap was simulated under real market conditions and then settled fully automatically using live market data (Deutsche Bundesbank, 2024a). As such contracts are difficult to manipulate retrospectively, they should reduce the costs of incomplete contracts, for example due to a lack of commitment. Due to the limited scope for human intervention and simultaneously greater accuracy and higher transaction speed, smart contracts promise to increase efficiency (Kaulartz and Heckmann, 2016). However, the validation of codes, messages and data sets can increase initial costs (Townsend, 2020). It is still difficult to conclusively assess the security of such contracts empirically due to a lack of legal and technical standards and limited options for testing these contracts (Kirstein, 2020; Zou et al., 2021).

2. Big techs – are tech companies taking over the financial sector?

224. Large technology groups, known as big techs, are becoming increasingly active in the financial sector. Based on their main business areas – e.g. consumer electronics, search engines, online marketplaces and social media – big techs were initially mainly involved in **payment transactions**. They are now also expanding their activities to include **credit cards and lending to private individuals** (Frost et al., 2019). ↘ TABLE 15 Up to now, they have been less active in serving corporate customers. One exception is Amazon, which provides loans to its sales partners. Overall, lending by big techs is growing but is still quite limited. ↘ CHART 56 LEFT

225. Big techs are strong competitors for established financial institutions, but also for fintechs, for several reasons. Big techs have a very **large, sometimes global customer base** that allows them to gather large amounts of **data**. This enables companies to improve and expand their products, which further increases the customer base and the amount of available data (Doerr et al., 2023a). With their platform-based business models, big techs benefit from **network effects** and increasing marginal returns from data use, as well as **economies of scope** (GCEE Annual Report 2021 item 456). Network effects arise from the fact that the benefit of the service for the individual increases, the more other users use the service (e.g. a financial transaction app), or the more providers are active on the platform. By contrast, economies of scope arise from linking different data sources. Scalable

↘ TABLE 15

Big techs at a glance

By importance in online payment transactions

	Apple	Alphabet	Amazon	Alibaba	Mercado Libre	Meta
Location	USA	USA	USA	China	Argentina	USA
Core business	Electric hardware	Search machine	Online Marketplace	Online Marketplace	E-Commerce	Social Media
Turnover[1] 2023	$ 383 bn	$ 307 bn	$575 bn	$ 126 bn	$ 14.5 bn	$ 135 bn
Profit[1] 2023	$ 97 bn	$ 74 bn	$ 30 bn	$10bn	$ 1.8 bn	$ 39 bn
Payment service	Apple Pay, Apple Cash	Google Pay	Amazon Pay	AliPay	Mercado Pago	Meta Pay, Whatsapp Pay
Worldwide number of websites using the payment service	725,923	256,955	121,002	96,261	56,680	56,493
of which in Germany	31,968	13,249	12,446	2,065	1,222	512
Lending and other selected financial products	Apple Card, savings account[2]		Credit cards, BNPL[3], Amazon Lending	Shares in MyBank	Mercado Credito	

1 – Worldwide. 2 – Both in cooperation with Goldman Sachs. 3 – "Buy now, pay later" (BNPL) refers to low-threshold financing models that enable consumers to pay for purchases at a later date.

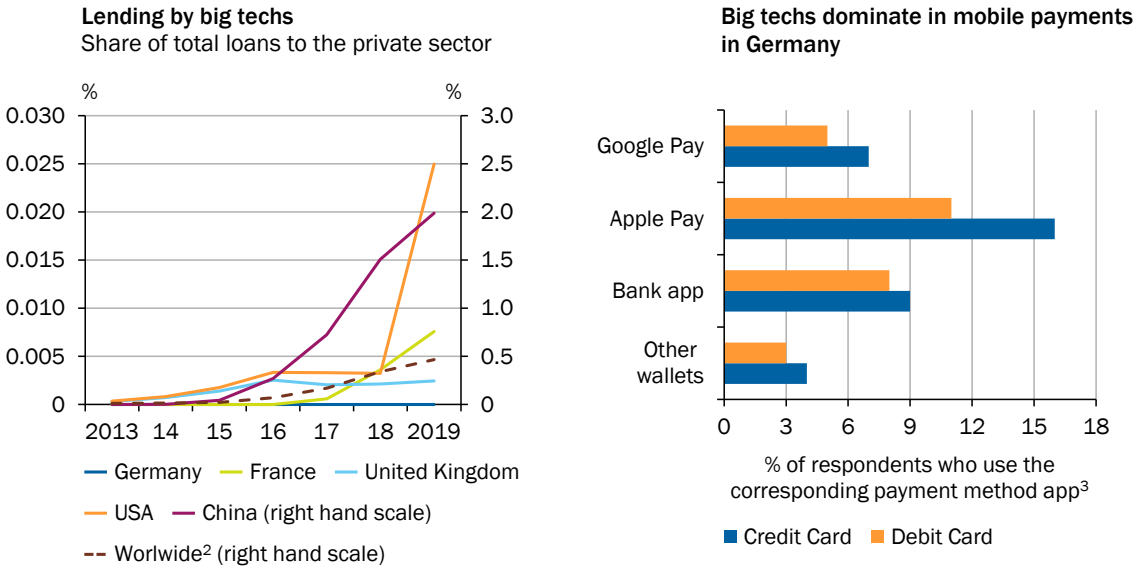
Sources: annual reports of the companies, SimilarTech, own presentation

products, such as apps for payment transactions, can be added quickly and with a wide reach on this platform.

226. Financial services are especially profitable for big techs if they are **complementary to their existing business models** and collecting (financial) data can improve their business models. This explains the focus on payment transactions, which involve a lot of personal data on consumption and income. Big techs operate at **low cost** because of their **high level of digitalisation** and the digital technologies they already have available; they can therefore offer financial services profitably. Big techs can use their market power in areas outside the financial market to gain a foothold in the financial market (Doerr et al., 2023a). For example, Apple and Google are among the most important players in mobile payments due to their dominance in the field of smartphone software. ↘ CHART 56 RIGHT It is more convenient for consumers to integrate their credit and debit cards directly into their smartphones via the latter's systems than via an app from their own bank.

227. Big techs also have a major competitive advantage in the field of **data analysis**. This is based on the large volume of data collected and the data-processing expertise acquired from their core business. By analysing large amounts of data, the needs of consumers can be better predicted and **financial products and services can be tailored to their needs** (Carstens, 2019). **Information** about user behaviour helps in the **pricing of loans** or the calculation of insurance rates. ↘ ITEM 257 For example, data from social networks allows conclusions to be drawn about the insured person's employment situation and therefore their willingness to take risks.

↘ CHART 56
Big techs in the financial sector



1 – Excluding companies in the financial sector. 2 – Comprises 96 countries worldwide according to a compilation by Cornelli et al. (2020). 3 – Basis: Respondents who own at least one debit card (n = 5,531) or credit card (n = 2,942). Multiple answers possible. Question: Do you have one or more cards stored in a payment app for mobile payments?

Sources: BIS, Cornelli et al. (2023a), Deutsche Bundesbank (2024d), own calculations

3. Central banks – a new competitor with a digital currency?

Central bank digital currency

228. A **central bank digital currency** (CBDC) is a digital form of central bank money that, like cash, has the status of legal tender. A retail CBDC (rCBDC) can be used by the general public to pay for goods or services. A wholesale CBDC (wCBDC), on the other hand, can only be used by financial institutions in the interbank market to settle financial transactions with central bank money (Panetta, 2022). The **aims** of introducing a CBDC frequently cited by central banks are greater **financial inclusion**, ↘ ITEM 266 more **resilience and competition** in the payment market, better **transparency** of money flows, and a digital currency that allows **programmable**, autonomous and automated flows of services (Atlantic Council, 2024). ↘ BOX 14 CBDC could also act as a 'backstop' for private payment systems to avoid the risk of payment infrastructure failure in a crisis (Wüst et al., 2020).

↘ BOX 14

Background: International discussion on central bank digital currencies

134 countries and currency zones around the world are currently **working on a central bank digital currency** (Atlantic Council, 2024). ↘ CHART 57 While some central banks are still researching and developing the technology, others are already testing its operation. Only three countries have already introduced rCBDCs across the board: the Bahamas, Jamaica and Nigeria. Eight countries are pursuing only wCBDCs.

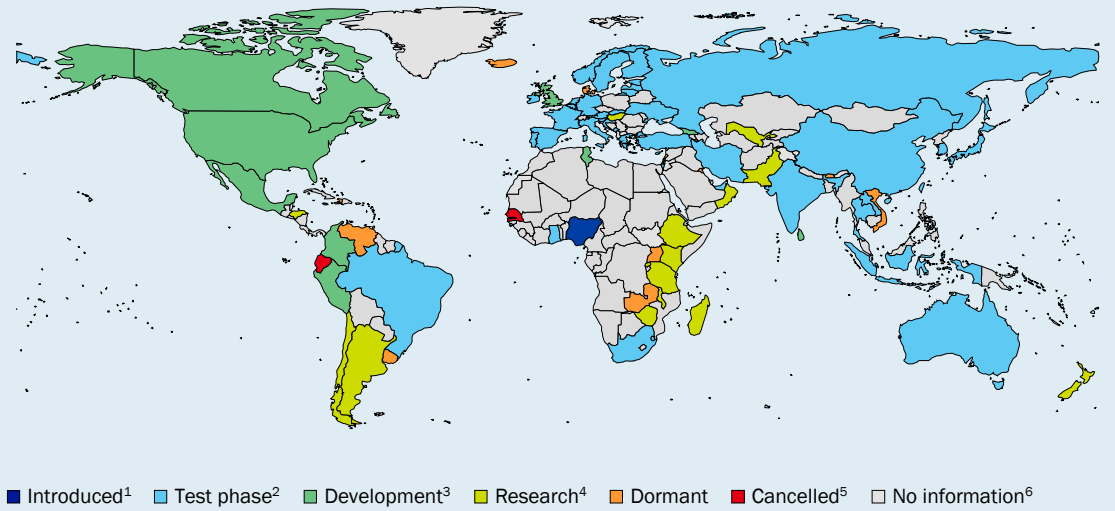
The **US** Federal Reserve has **not yet decided** whether to **introduce** its own **rCBDC**, but has no plans to do so in the near future (Powell, 2024). In an experimental phase, a hypothetical digital currency was developed and the technical requirements for a transaction-processing system were analysed (Werkema and Allen, 2022).

The **Bank of England** is moving **ahead with the development of a digital British pound**. It is currently considering introducing a holding limit and not paying interest. The digital pound would be available in both the retail and wholesale sectors. Once the current design phase has been completed, a decision will be made on whether to introduce it (Bank of England and HM Treasury, 2024).

The Swiss National Bank does not yet see any need to introduce an rCBDC. However, a pilot project has been launched to issue a tokenised wCBDC to financial institutions (Jordan, 2024). This involves the settlement of tokenised asset transactions with central bank money, e.g. trading in tokenised bonds.

↘ CHART 57

Retail central bank digital currencies worldwide

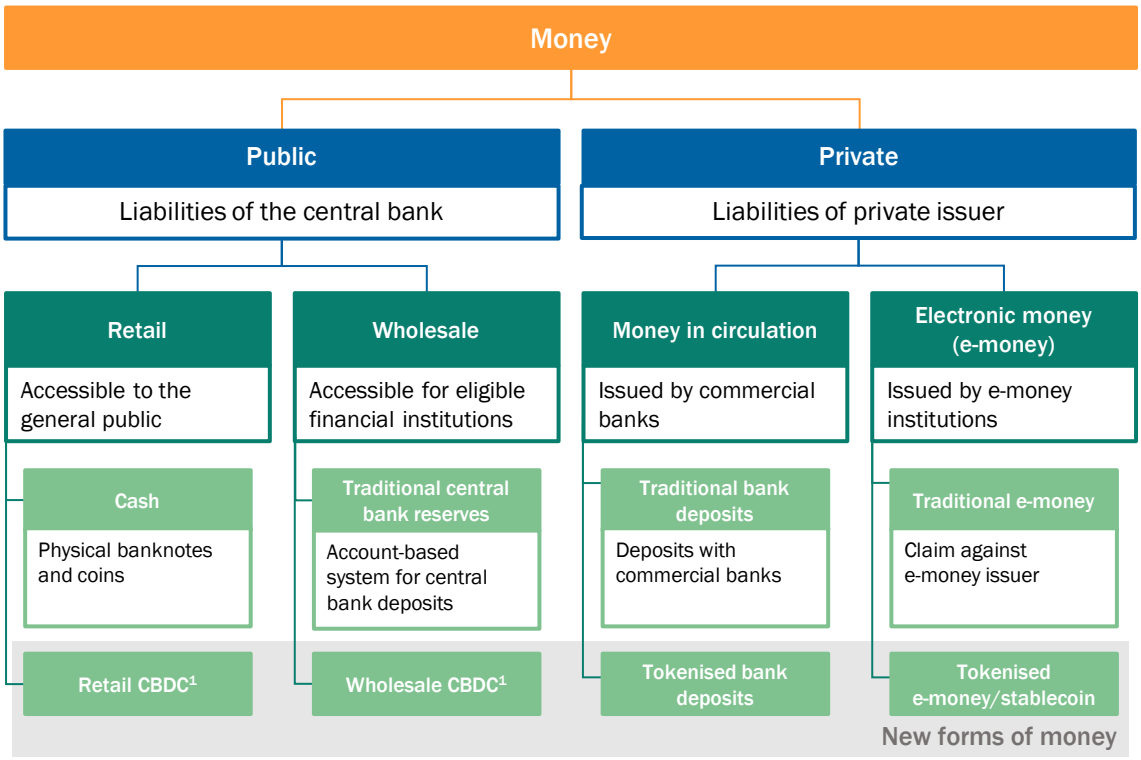


1 – A central bank digital currency was issued for widespread use in the retail sector. 2 – Small-scale testing of a central bank digital currency in the real world with a limited number of participants. 3 – Technical setup and early testing of a central bank digital currency in controlled environments. 4 – Investigating the use cases, impact and feasibility of a central bank digital currency. 5 – Paused/cancelled. 6 – No official research on central bank digital currencies.

Sources: Atlantic Council, EuroGeographics for the administrative boundaries

229. **Modern monetary systems** have **a two-tier structure** and consist of **public central bank money** and **private bank money**. ↘ CHART 58 Central bank money comprises cash and central bank reserves held by commercial banks; it is issued directly by the central bank. It is the only legal tender. Private bank money

↘ CHART 58
Different forms of private and public money



1 – Central Bank Digital Currency.

Sources: based on Deutsche Bank (2023) and Deutsche Bundesbank (2023c), own presentation
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consists of the deposits of households and companies at private commercial banks. Unlike central bank money, private bank money is a liability of private banks and as such is subject to insolvency risk. This risk is limited by banking supervision and regulation, as well as deposit guarantee schemes and is extremely low for small bank deposits. Another form of private money is **e-money**, an electronically stored monetary value that is used as a means of payment. Prepaid credit cards or PayPal balances are examples of e-money (Deutsche Bank, 2023).

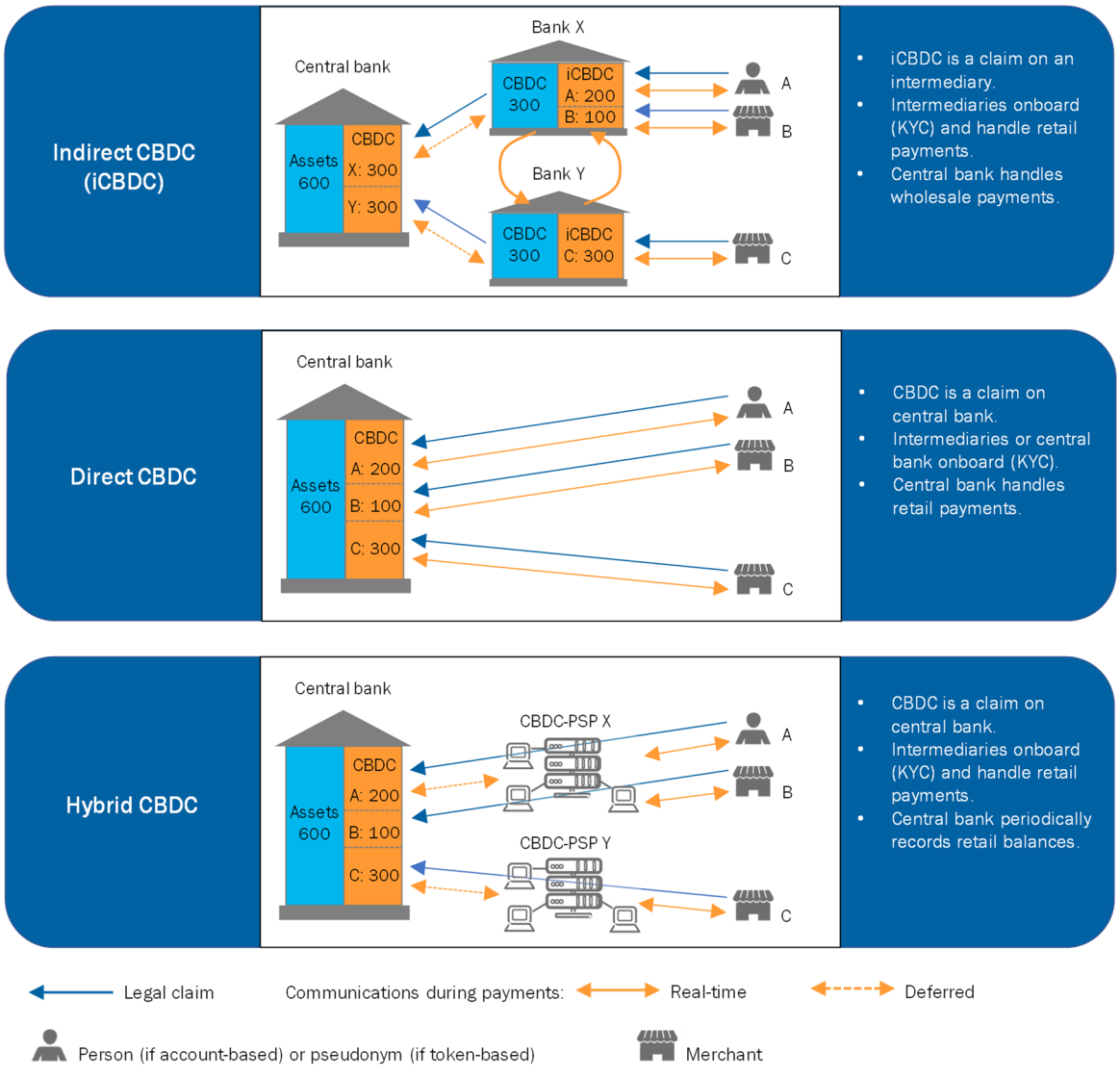
230. **Central bank money** is subject **only to inflation risk**, i.e. the risk that it might lose purchasing power. However, households and companies can **currently only hold central bank money in the form of cash**, which is not suitable for transactions in the digital space. This is why its importance has declined significantly in recent years compared to private bank money, which is used to process card payments. ↘ ITEM 213 A central bank digital currency would offer users access to central bank money in a form that meets the payment needs of a digital economy.

231. A broad **definition of wholesale CBDC includes digital central bank reserves** held by financial institutions which have existed for a long time. In the euro area, for example, banks use TARGET to process payments on the interbank market with central bank money. In the current discussion about central bank digital currencies, the focus is on a **narrower definition**, according to which a

wCBDC has certain technological characteristics, such as **tokenisation** (BIS, 2023) or the **use of DLT** (Cirasino et al., 2021).

232. The **architecture of a central bank digital currency** is determined by several **design elements**. Firstly, it needs to be clarified which institutions will manage the CBDC accounts. Wholesale digital central bank money is held in **accounts directly at the central bank**. Here, account holders have a **direct claim** on the central bank. In the retail sector, such a model would require the central bank to process all transactions itself. As this would be technically very complex, an **indirect model** is conceivable instead, in which users have a claim on an intermediary, e.g. a bank (Auer and Böhme, 2020). The intermediary is obliged to fully collateralise any outstanding CBDC liability to the customer with central bank money. ↘ CHART 59 In this case, the bank is responsible for the KYC ('know your customer') onboarding to combat money laundering, terrorism

↘ CHART 59
Overview of possible architectures for a central bank digital currency[1]



1 – CBDC: Central Bank Digital Currency, KYC: Know your customer, PSP: Payment service provider.

Source: Auer and Böhme (2020)
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financing and other crimes. The **hybrid model** enables payments to be processed by intermediaries, but is based on direct financial assets vis-à-vis the central bank (Auer and Böhme, 2020).

233. Secondly, when introducing a CBDC, the question arises as to whether the **infrastructure** is based on a traditional, **centrally controlled database or** on **decentralised DLT**. ↘ BOX 13 The latter could be used to process transactions in real time with a wider range of participants, potentially also including non-financial corporations. Furthermore, transactions can be programmed to be processed automatically on the basis of predefined conditions, so-called 'smart contracts' (Panetta, 2022).

234. Thirdly, the **type of access to CBDC** is central to the question of how best to protect user privacy. In a conventional **account-based** system, a payment is made by debiting the payer's account and crediting the payee's account (Grothoff and Moser, 2021). Here, the identities of the account holders are directly linked to the transaction carried out. In a **token-based** system, a token representing a monetary value is transferred when a payment is made. The identities do not have to be recorded; it is only verified that the token is authentic.

235. A central bank digital currency also has **many other features**. It can be designed for use in cross-border payments. In addition, in the case of an rCBDC the central bank could **restrict access to certain groups**, such as the local population or small businesses. **Holding limits** can also be introduced to limit the withdrawal of bank deposits for the purpose of holding digital central bank money (disintermediation). ↘ ITEM 303 Central banks must also decide whether CBDC balances should bear interest. An interest rate would strengthen the role of CBDC as a monetary anchor, but it could also increase disintermediation risks (Infante et al., 2023).

236. A CBDC also offers the option of **programming money**. This refers to the possibility of incorporating predefined rules and conditions into the digital currency itself (IWGDTP, 2024). The currency could then be used for specific purposes. Money could be issued that can only be used for cultural offerings, as was discussed after the COVID-19 pandemic. One advantage could be automatic compliance with regulatory requirements, e.g. by incorporating regulations to limit transaction volumes or tax obligations into the CBDC architecture (IWGDTP, 2024).

The digital euro

237. The **ECB is looking into** both an **rCBDC** and a **wCBDC**. The **digital euro** project relates to the **retail sector** and is intended to **complement cash**. In the wholesale field, the focus is on the further development of the TARGET system for processing interbank payments and the application of new technologies. ↘ ITEM 283

238. In **October 2021**, the ECB **launched** a **two-year investigation phase** into the possible functional design of a digital euro in the retail sector. Its aim is to

secure the role of central bank money in an increasingly digital economy and to maintain confidence in the euro as a currency (ECB, 2022). In **November 2023**, the ECB launched a **two-year preparatory phase** to select providers that could develop the infrastructure for a digital euro (Deutsche Bundesbank, 2023a). In June 2023, the European Commission published legislative proposals on the digital euro, which are currently the subject of negotiations between the European Parliament and the Council. The development and introduction of a digital euro could begin in 2025.

239. The **exact design of the digital euro is still unclear** and will depend on the legislative process. However, some **design elements** ↘ ITEM 232 **are already emerging**. The digital euro should be made available to all private individuals, companies and public entities that reside or are temporarily or permanently established in a member state of the euro area. Users will not have an account directly with the ECB. **Intermediaries** such as banks **would be responsible for distributing the digital euro**. The ECB has not yet decided whether the digital euro will be an account-based or token-based. The focus is on digital money as a means of payment and not as a store of purchasing power. Therefore, **no interest** will be paid **on outstanding balances** and there will be a **holding limit**, which is likely to be between €500 and €3,000 for private individuals (Balz, 2024) and €0 for business users. A so-called **waterfall functionality** will enable payments to be made regardless of the amount held. To do this, a user's digital euro account must be linked to their bank account. Missing amounts would be automatically debited from the bank account, and excess amounts would be credited to the bank account and exchanged for bank money. The digital euro would also have an **offline function** enabling payments without an internet connection. In the case of offline payments, personal transaction details will only be known to the payer and the payee in order to offer the highest level of privacy. The digital euro will not be **programmable**, so that its use cannot be restricted (ECB, 2024a).

III. OPPORTUNITIES: DIGITAL INNOVATION IN THE FINANCIAL SECTOR

1. Status quo: costs, digitalisation, and competition in the financial sector

240. The digital transformation can potentially **reduce** the **costs of financial services** for users such as households and companies. These costs primarily reflect the **efficiency** of and the **competition** between financial intermediaries. Digitalisation promises improvements in both areas: on the one hand, providers can digitise their services and thus provide them more efficiently, for example via internet banking instead of branches; on the other hand, new entrants increase competition, thereby limiting market power of incumbents and lowering prices.

241. The analysis of the cost of financial intermediation offers a **nuanced picture** of the German financial sector. In the 2010s, the **unit cost of financial intermediation decreased by around a quarter**. ↘ ITEM 244 It is likely that the prolonged low interest-rate environment, which reduced banks' net interest income, contributed to this decline. ↘ ITEM 245 In addition, growth in banks' personnel and operating expenses slowed and bank branches were closed on a massive scale. However, the **degree of digitalisation in the financial sector** in Germany is comparatively **low**, ↘ ITEMS 248 F. partly because incumbents are confronted with specific obstacles to innovation and the use of digital technologies. ↘ ITEMS 251 FF. New players such as **fintechs and big techs** are thus more likely to **accelerate the digitalisation in the financial sector** and thus reduce costs for users in the long term. Despite their initially low market shares ↘ CHARTS 55 AND 56, they are likely to **intensify competition**. However, this second effect will not be very large because the German banking market is characterized by comparatively small profit and interest margins. ↘ ITEMS 253 F.

How much do users pay for financial services in Germany?

242. To assess the costs of financial services in Germany, the GCEE analyses the **unit cost of financial intermediation** in the period from 1991 to 2022 following Philippon (2015) and Bazot (2018). ↘ BOX 15 The unit cost is the annual cost incurred by the users of a basket of financial services worth one euro. They reflect both **cost efficiency** and, thus, productivity, as well as the **market power** of financial intermediaries. A **lower unit cost** promises significant **welfare gains**. A model calibrated for the United States suggests that halving unit cost from two to one cent per US dollar increases consumer welfare by 8.7 % of consumption (Philippon, 2017).

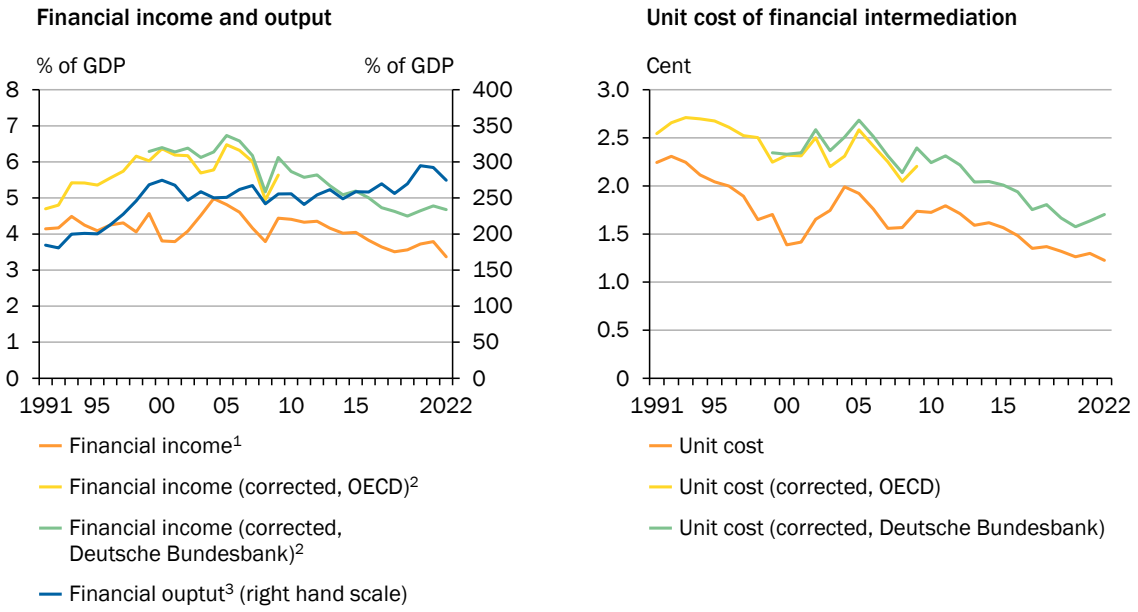
243. Previous studies for the United States (Philippon, 2015, 2017) show that the **unit cost of financial intermediation** was **comparatively stable over a long period** of more than 130 years and amounted to around 1.5 to 2 cents per US dollar. Technological advances and new business models did not permanently

lower this cost for a long time. Bazot (2018) estimates similar figures of around 1.5 to 2.5 cents per euro of financial services for Germany, France and the United Kingdom (1950–2007). Only in France, this cost has declined from 2.5 to 1.5 cents since the 1990s. In Germany, it was stable and only declined slightly towards the end of the time horizon. Bazot (2024) analyses unit costs in 15 developed economies over a later period (1970–2014) and documents unit cost convergence between countries. The estimates suggest that especially financial deregulation – e.g. the **international openness of capital markets** and **removing interest rate controls** – contributed to the decrease in unit costs.

244. In academic studies, the unit cost is calculated as the annual cost, which primarily consists of fees and spreads and, at an aggregate level, corresponds to the **income of the financial sector** (financial income), **relative to the intermediated assets** (financial output). ↘ BOX 15 In Germany, financial income fluctuated between 4 % and 5 % of the GDP during the 1990s and 2000s and has declined significantly since 2010. ↘ CHART 60 LEFT An alternative and somewhat broader measure (corrected income) was slightly higher and has declined by more than one percentage point of GDP since 2010. Intermediated assets increased from around 185 % to around 275 % of GDP during the same period. The **unit cost of financial intermediation**, based on corrected income, was **relatively stable between 1997 and 2008** at just under 2.5 cents per euro ↘ CHART 60 RIGHT, similar to the findings of Bazot (2018). However, the unit cost **declined by around 0.5 cents per euro since 2010**.

↘ CHART 60

Unit cost of financial intermediation in Germany has fallen since 2010



1 – Gross value added (GVA) of the economic sector K „Financial and insurance activities“ (WZ 2008). 2 – The corrected income of the financial sector is the sum of the operating income of banks, the GVA of insurance companies, reinsurance companies and pension funds (excluding social security funds) and the GVA of auxiliary financial services. Operating income is calculated separately using data from the OECD and the Deutsche Bundesbank. 3 – Financial output is the sum of credit to the non-financial private sector (private credit), the money supply (M3), stock market capitalisation and the stock of government bonds. The latter is weighted with a factor of 1/10 as suggested by Bazot (2018.

Sources: BIS, Deutsche Bundesbank, Federal Statistical Office, OECD, World Bank, own calculations

↘ BOX 15

SVR analysis: The unit cost of financial intermediation in Germany

The efficiency of financial intermediation activities such as lending, asset management and payment services can be measured based on the unit cost of financial intermediation. The latter are the **costs** incurred **by the users of financial intermediation**, in particular, households and firms. The observation period of previous studies which estimate this cost ends before (Philippon, 2015; Bazot, 2018) or shortly after the global financial crisis (Philippon, 2017; Bazot, 2024). Since then, the regulatory environment has changed significantly, and the low interest rate environment may have driven induced banks to improve cost efficiency (Avignone et al., 2022). This **analysis updates the cost estimates for Germany** (1991–2022) based on the methodology of Philippon (2015, 2017) and Bazot (2018, 2024).

The unit cost of financial intermediation is defined as the annual **income of the financial sector relation to the volume of intermediated assets** (financial output):

$$Unit\ cost = \frac{Financial\ income}{Financial\ output}.$$

Financial income is measured by the gross value added of sector 'provision of financial and insurance services' (Section K in to the 2008 edition of the Classification of Economic Activities). In the national accounts, the gross value added of this sector is defined as the sum of fees and the aggregate interest rate spreads on loans and deposits relative to a reference minus intermediate consumption (Financial Services Indirectly Measured; see Eichmann, 2005).

However, **dividends, capital gains and income from securities and derivatives** of banks are not included in gross value added. Such income tends to become more significant given the more capital market-orientated business models and more comprehensive risk management of banks, which require the use of derivatives. Following an approach by Bazot (2018), we correct the income measure by replacing the gross value added of the industry 'provision of financial services', which is part of the financial sector, by the operating income of banks. The latter is calculated using data from the OECD (available 1991–2009) and the Bundesbank (since 1999). ↘ CHART 60 This **corrected income** equals the sum of **banks' operating income** and the **gross value added of the other industries** in the financial sector.

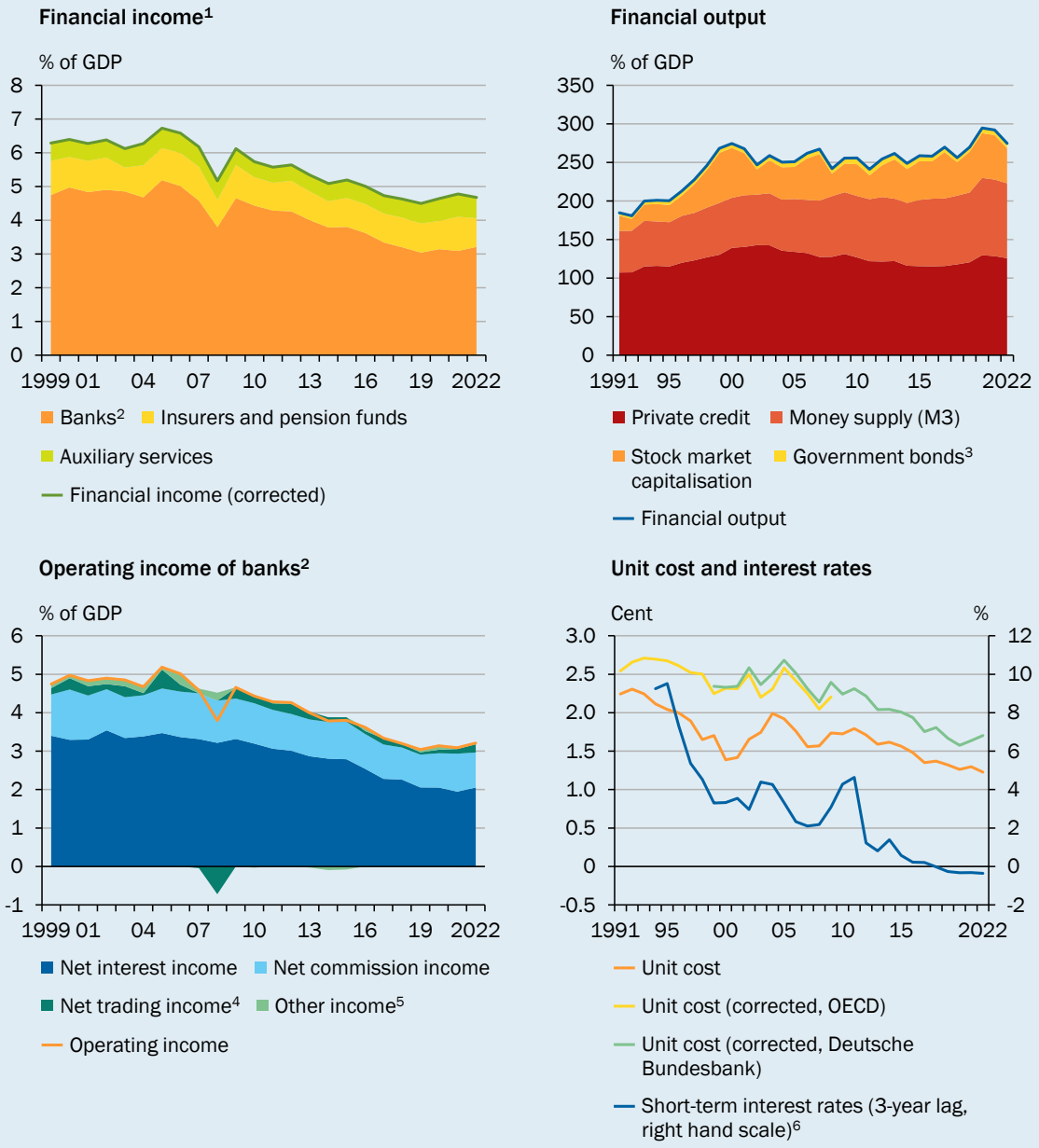
As in Bazot (2018), it is assumed that the **financial output** is proportional to **intermediated assets**. The latter include **loans to the non-financial private sector** ('private credit'), the **stock market capitalisation** and **volume of government bonds** as measures of the credit volume and asset management, as well as the **money supply (M3)** as a measure of payment services. However, the scope of the intermediation services associated with these assets (e.g. the screening of borrowers or issuers) may differ. As issuing government bonds, a relatively standardised asset, requires fewer services, they are weighted with a factor of 1/10 (Bazot, 2018):

$$Financial\ ouptut = Private\ credit + Money\ supply$$
$$+Stock\ market\ capitalisation\ + 0.1 \times Government\ bonds$$

Private credit accounted for **more than a third of intermediation services** and increased from 107 % to 126 % of GDP during the observation period. Cash and cash equivalents, covered by the **money supply M3**, almost **doubled**, from 53 % to 97 % of GDP. The **stock market capitalisation** more than doubled relative to GDP, exhibiting **strong fluctuations**. ↘ CHART 61 TOP RIGHT

↘ CHART 61

Cost of financial intermediation in Germany



1 – Financial income (corrected) ist the sum of the operating income of banks (net banking income), the GVA of insurance and reinsurance companies and pension funds (excluding social security funds) and the GVA of auxiliary financial services; net banking income is calculated using data from the Deutsche Bundesbank. 2 – Banks as defined in the OECD Banking Statistics: MFIs (Monetary Financial Institutions) excluding branches of foreign banks, mortgage banks, building and loan associations and banks with special, development and other central support tasks. 3 – Intermediation services for government bonds equal to 1/10 of the volume. 4 – Net result of the trading portfolio. 5 – Balance of other operating income and expenses. 6 – Annual average 3-month interbank interest rate for Germany, based on Bazot (2024) with a lag of three years.

Sources: BIS, Deutsche Bundesbank, Federal Statistical Office, OECD, World Bank, own calculations

245. The **decline in the unit cost** during the 2010s reflects the falling income of the German financial sector relative to GDP. The latter is due to the **decreasing operating income of banks**, which accounts for around 70 % to 80 % of

(corrected) financial income and fell from 4.4 % to 3.2 % of GDP between 2010 and 2022. ↘ CHART 61 TOP LEFT This decline can be explained by the **lower net interest income**, ↘ CHART 61 BOTTOM LEFT which fell from 3.2 % to 2.1 % of GDP against the backdrop of a **prolonged low-interest environment**. After all, nominal interest rates close to zero limit the banks' price setting power in the deposit market such that the interest rate spread on deposits disappears (Drechsler et al., 2017). This may change again when interest rates rise. Although banks might compensate their lower net interest income with higher net commission income, the latter, in fact, fell from 1.1 % to 0.9 % of GDP.

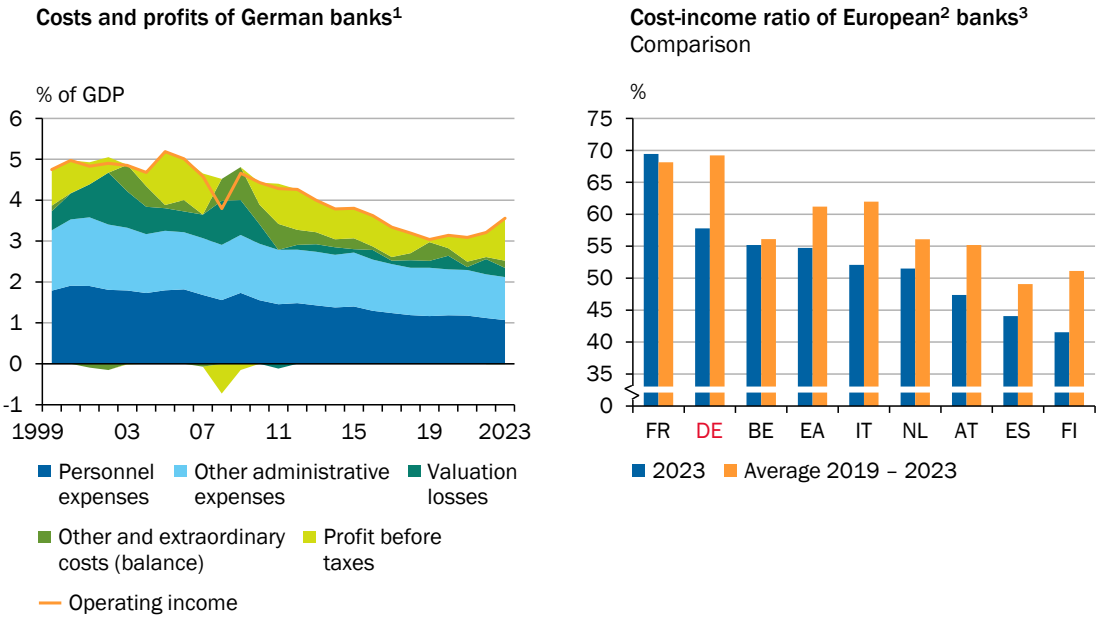
The descriptive evidence points to a close, **positive correlation between the unit cost** and **short-term interest rates**. ↘ CHART 61 BOTTOM RIGHT Interest rate changes affect the unit cost only gradually because of fixed-term interest rates. This correlation is consistent with the empirical findings of Bazot (2024), who estimates a **positive effect of short-term interest rates on unit costs** in a sample of 15 countries (1970–2014). One can use his estimates to roughly assess the impact of low interest rates: the decline in 3-month interbank interest rates by 4.64 percentage points between 2007 and 2019 implies that the unit cost (corrected calculation using data from the Deutsche Bundesbank) fell – with a time lag – by up to 0.23 percentage points between 2010 and 2022. ↘ CHART 61 BOTTOM RIGHT This corresponds to up to 43 % of the observed cost reduction of 0.54 percentage points.

246. Smaller revenues can shrink profits or induce banks to increase productivity. The latter is supported by the fact that the **personnel expenditure** and other **administrative expenses fell relative to GDP** between 2010 and 2022 (from 1.6 % to 1.1 % and from 1.4 % to 1.1 % respectively). ↘ CHART 62 LEFT There was also significant structural change in the banking sector, such as a massive closure of branches. ↘ ITEM 250 Pre-tax **profits were very volatile**, decreasing to a low level relative to GDP; they returned to higher levels only in 2021 and 2022.

A frequently used measure of the cost efficiency of banks is the **cost-income ratio**, which compares operating costs (personnel and non-personnel expenses) to operating income. One can interpret this measure as the costs that banks incur to earn one euro of income. It is volatile and strongly depends on the level of interest rates, which is why multi-year averages are more meaningful. The cost-income ratio of **German banks is high relative to their European peers**, indicating low cost efficiency. ↘ CHART 62 RIGHT In 2023, it decreased significantly because of the interest rate hike and the resulting improvement in bank earnings (Deutsche Bundesbank, 2024b).

↘ CHART 62

Cost efficiency of German banks has improved, but remains below European peers



1 – Banks according to the definition in the OECD Banking Statistics: MFIs (Monetary Financial Institutions) excluding branches of foreign banks, mortgage banks, building societies and banks with special, promotional and other centralised support functions. 2 – FR-France, DE-Germany, BE-Belgium, EA-euro area, IT-Italy, NL-Netherlands, AT-Austria, ES-Spain, FI-Finland. 3 – Domestic banks and banking groups.

Sources: Deutsche Bundesbank, ECB, Federal Statistical Office, own calculations

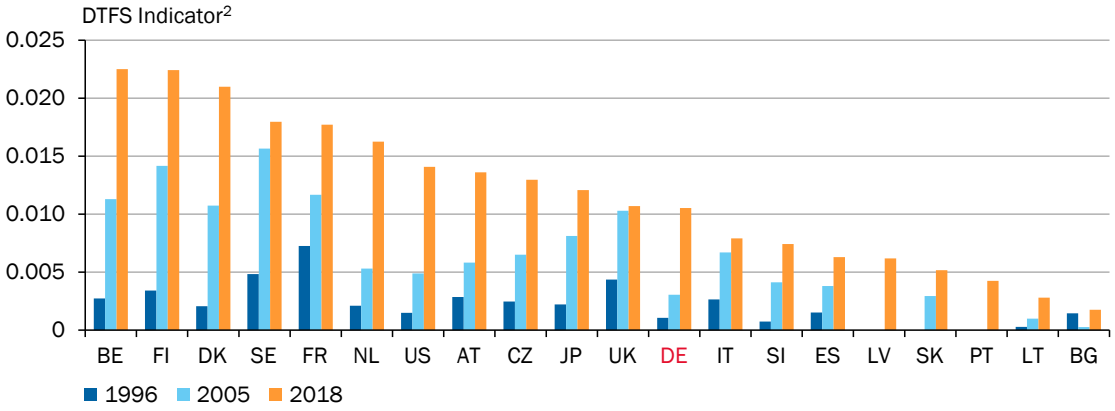
247. The analysis does not directly inform about how **fintechs and big techs contributed to the lower unit cost of financial intermediation**. However, a strong quantitative **effect seems implausible** because the market share of these new digital financial service providers was insignificant in Germany during the 2010s. ↘ CHARTS 55 AND 56 The role of the low-interest environment was likely much more important, leading to lower profits of banks or forcing them reduce their expenses. In future, fintechs and big techs may be able to reduce unit costs by **providing financial services more cost-effectively**, for example via more digitalised business processes, ↘ ITEMS 256 FF. and by **increasing competition**.

Digitalisation of the financial sector

248. The degree of digitalisation of the financial sector can be quantified based on their **investment in information and communication technologies** and the consumption of intermediate **digital services**. An indicator that encompasses both aspects (Bontadini et al., 2024) shows that digitalisation of the financial sector of all OECD countries surveyed rose sharply between 1996 and 2018, with Germany moving from the bottom third to the lower midfield. ↘ CHART 63 The empirical results of Bontadini et al. (2024) suggest that **digitalisation of the financial sector has a positive impact on productivity growth** in downstream sectors: a 10 % increase in the digitalisation indicator is accompanied by a 0.1 percentage point higher growth rate in labour productivity. The productivity gains are likely to be primarily due to a more efficient allocation of loans. They are

↘ CHART 63

Use of digital technologies in the financial sector increased sharply over time[1]



1 – BE-Belgium, FI-Finland, DK-Denmark, SE-Sweden, FR-France, NL-Netherlands, US-USA, AT-Austria, CZ-Czechia, JP-Japan, UK-United Kingdom, DE-Germany, IT-Italy, SI-Slovenia, ES-Spain, LV-Latvia, SK-Slovakia, PT-Portugal, LT-Lithuania, BG-Bulgaria. 2 – The DTFS indicator (Digital Technologies in the Financial Sector) is defined as the sum of investment in ICT and intermediate consumption of digital services at constant prices, scaled in terms of hours worked in the financial sector. Excluding Romania due to significant volatility in the dynamics of prices for value added in the IT and other information services. These data are used by Bontadini et al. (2024) as deflators for the indicator.

Source: Bontadini et al. (2024)

especially pronounced in sectors with a high proportion of intangible assets, where the valuation of collateral is more difficult.

249. On the demand side, the **prevalence of digital financial services** such as **online banking** or **online payments** provides an indication of the extent to which the financial sector is digitalised. Surveys of households show that 57 % of Germans recently used online banking, and online payments accounted for 24 % of the transaction volume. This is **low by European standards**. ↘ CHART 64 LEFT Of the countries analysed, the use of online banking was lower only in Italy.

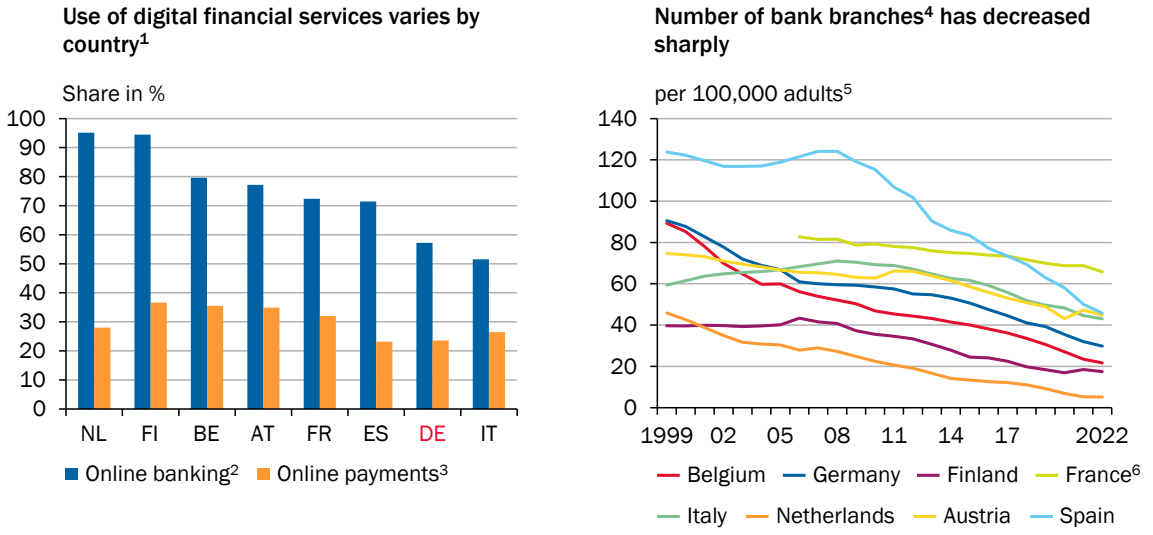
250. At the same time, financial services are being offered less and less in non-digital form. This is illustrated by the **closure of many bank branches** over the past 25 years. ↘ CHART 64 RIGHT In **Germany**, the number **has fallen** by **more than two thirds**: there were 58,546 branches at the end of 1999 – and 17,851 at the end of 2022. Relative to the population, the number of bank branches in Germany is now in the lower midfield, well below that of other major euro-area economies. This decline is due not only to ongoing digitalisation and automation, but also to **consolidation**. Between 1999 and 2022, the number of credit institutions in Germany halved from 3,168 to 1,458, primarily due to the consolidation of savings and cooperative banks (Deutsche Bundesbank, 2000, 2023b).

251. There are several **obstacles** to **digitalisation** in the banking sector. One constraint on innovation is the **cannibalisation** of banks' **existing activities**: a new product line can reduce demand for currently profitable produces. This makes **innovation less profitable for a bank** than for a new player without existing activities, weakening the incentive to innovate (Stulz, 2019). In principle, such an incentive exists in any multi-product firm, but it applies particularly to banks, as they typically offer a bundle of different financial services ↘ ITEM 300

↘ CHART 64

Digital financial services

Trends in selected European countries



1 – NL-Netherlands, FI-Finland, BE-Belgium, AT-Austria, FR-France, ES-Span, DE-Germany, IT-Italy. 2 – Number of people, who have used the internet for online banking, data from 2023. 3 – Share of online payments relative to total (non-recurring) payments, data for 2022. 4 – Number of branches of credit institutions as at 31 December. 5 – Population aged 20 and over, in each case as at 1 January of the following year. 6 – Time series break, therefore only shown from 2006 onwards.

Sources: ECB, Eurostat, own calculations

252. Another obstacle are **legacy IT systems of large banks**. Due to takeovers and mergers, these systems are often **highly complex**. For example, some banks in Germany had up to 45 different IT systems (Stulz, 2019). The IT infrastructure of many banks is still based on the COBOL programming language, which was developed in the 1960s and is **mastered by fewer and fewer IT staff** (Protiviti, 2018). The complexity of legacy IT systems creates high adjustment costs and makes integrating new technologies and products into existing system difficult.

German banking market: low concentration, low profitability

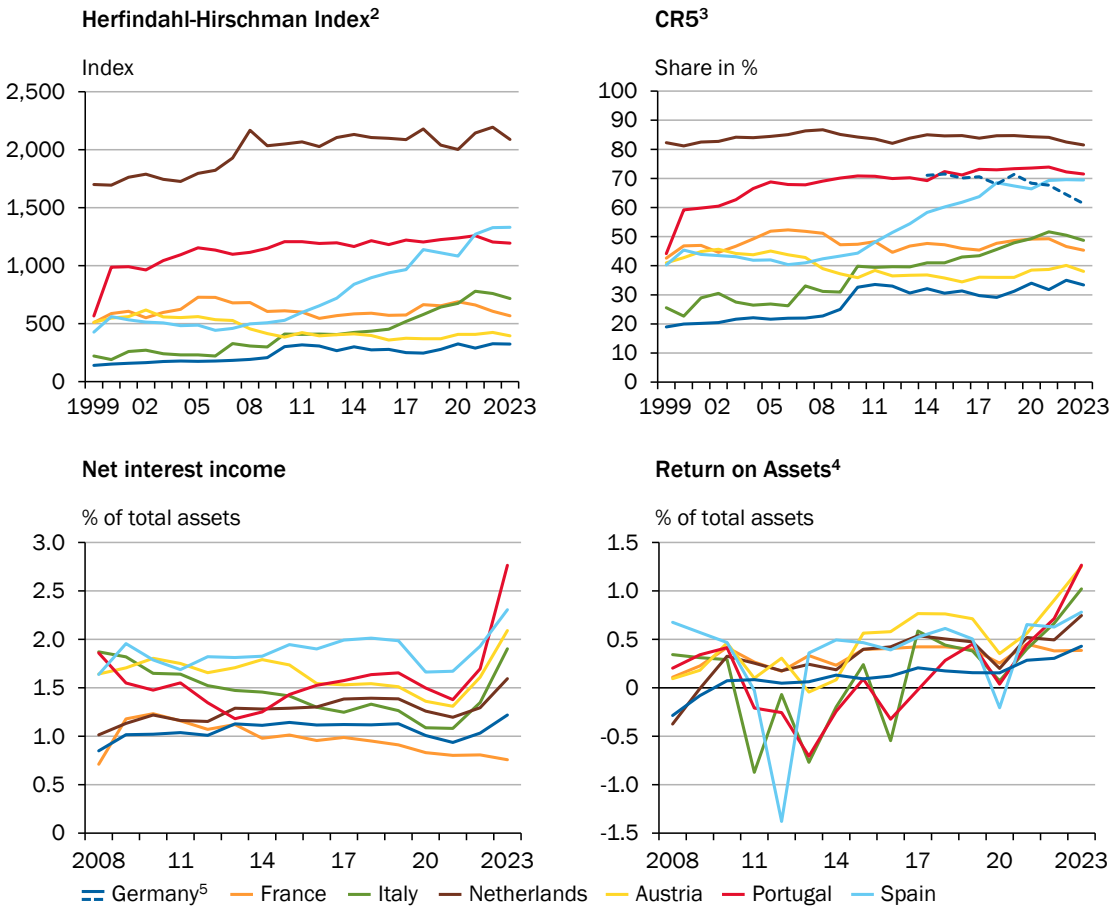
253. The digital transformation can also lower the cost of using financial services as entrants can reduce the **market power of incumbents**. The extent of this effect depends on the **banks competition**, which can be characterised based on market concentration and indicators like the Herfindahl-Hirschman Index (HHI) or the CR5 concentration rate. ↘ CHART 65 TOP The low values of the HHI and the CR5 concentration rate in Germany can be explained by the fact that, when considering the market as a whole, the almost **1,050 savings banks and cooperative banks** (Deutsche Bundesbank, 2024c), which account for 75 % of all German credit institutions, are counted individually. ↘ CHART 65 TOP

Due to their regional focus, they compete with each other only in a limited way. One may instead consider the **entire savings bank and cooperative bank sectors as one bank**. In this case, the measured **market concentration** is **much higher**. ↘ CHART 65 TOP RIGHT DASHED LINE Since the geographical separation of

savings and cooperative banks is not perfect, this represents an upper limit of market concentration. Alternatively, concentration can be measured within regional banking markets. Evidence from Koetter (2013) and Cycon and Schaffranka (2019) suggests a higher market concentration compared to the overall market.

254. The **profitability of German banks is low by European standards**. They have a low return on assets and net interest income. ↘ CHART 65 BOTTOM The reasons for this include the **large number of banks**, the complex **three-pillar model** – with commercial banks, public-sector banks such as savings banks, and cooperative banks (GCEE Annual Report 2020 items 384 ff.) – and **low cost efficiency** measured in terms of the cost-income ratio. ↘ CHART 62 RIGHT Furthermore, the mandate of savings banks and cooperative banks is often not maximising

↘ CHART 65
Market concentration and profitability of European banks[1]



1 – Domestic banks and subsidiaries and branches of foreign banks. 2 – Measure of the concentration of banking business (in relation to total assets). It is calculated by adding the squared market shares of all credit institutions in a country's banking sector multiplied by 10,000. 3 – CR: Concentration Ratio. Share of the five largest banks relative to aggregated total assets of all banks in a country. 4 – Return on assets: Annual profit or loss relative to total assets. 5 – The dashed line in the chart at the top right shows the share of the five largest banks in terms of total assets of all banks in Germany, using the aggregated annual financial statements of the Bundesverband der Deutschen Volksbanken und Raiffeisenbanken (BVR) and the Deutscher Sparkassen- und Giroverband (DSGV). This means that the savings banks and cooperative banks are each treated as one bank.

Sources: BVR, Commerzbank, Deutsche Bank, DSGV, ECB, KfW, own calculations

profits, but the welfare of their members or the region in which they operate (IMF, 2022). In 2023, the earnings of German banks improved significantly due to the interest-rate hikes, and net interest income reached a 25-year high (Deutsche Bundesbank, 2024b).

2. Digital innovation by new players: Fintechs and big techs

255. Digital financial service providers essentially have three innovative aspects compared to incumbents. Firstly, fintechs and big techs can provide many services at a lower cost, as they can **automate** their **business processes** more (process innovation) and make better use of machine learning and big data. Secondly, they offer **new products** (product innovation), such as 'buy now, pay later', ↘ ITEM 260 a digital payment option, and 'payment for order flow' for broker services, or they improve the quality of existing products, such as payments via mobile phones. This increases **convenience** for customers. Thirdly, digital financial service providers enable groups that are under-served by established banks to access financial services (**financial inclusion**).

Process innovation

256. A key advantage of digital financial service providers is an improved process of customer interaction that offers **greater flexibility and speed**. This results from increased automation, standardisation and centralisation of business processes (Berg et al., 2022). Centralised processes facilitate the division of labour, as it is easier for loan officers at headquarters, for example, to specialise in certain borrower groups or risk types than those in branch offices. An analysis of the US mortgage market suggests that fintechs are therefore less constrained by capacity limitations and can respond better to changing market conditions (Fuster et al., 2019). They adjust credit supply **more flexibly to fluctuations in demand** than banks. If the number of loan applications doubles, the processing time of fintechs rises by 7.5 days from an average of 42.6 days, while that of traditional providers rises by 13.5 days. In general, fintechs have around **20 % shorter processing times for loan applications** (Fuster et al., 2019).

257. **Digital scoring** can be used to screen and monitor borrowers, particularly in case of consumer loans. Their creditworthiness is assessed analysing **large amounts of digital data** using **machine learning** methods. One example is the evaluation of the 'digital footprint', which includes information such as the digital device used, its operating system and the exact time of the enquiry. This information allows for conclusions about a credit applicant's income and reliability. Evidence from an e-commerce retailer in Germany (Berg et al., 2020) implies that the **'digital footprint' is slightly more informative** about credit defaults than an **external rating by a credit bureau** (e.g. Schufa). The analysed firm could significantly reduce defaults by using such information. A similar study on big tech lending in Argentina (Frost et al., 2019) also points to an informational

advantage compared to a credit bureau. Digital scoring allows **realising cost advantages** with **similar or better information content** about credit risk.

258. Unlike credit bureaus, **banks can use** a lot of **other information** when screening and monitoring borrowers (Berg et al., 2020). Due to the often **long-standing lending relationships** and the fact that borrowers typically have **deposits with the bank**, they have access to private information about the borrowers (Puri et al., 2017; Parlour et al., 2022). In addition, **only big techs, not fintechs**, have large amounts of data from other business areas. Fintechs can only exploit their advantage in data analysis if bank customers give them access to their data (Babina et al., 2024). This depends crucially on data privacy regulations. ↘ BACKGROUND INFO 8

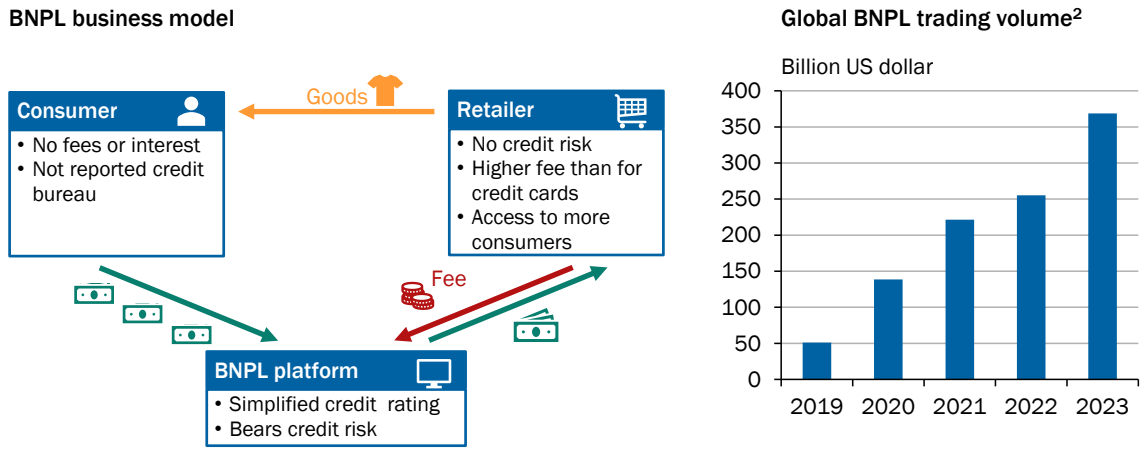
Product innovation

259. An app- or web-based customer relationship is key to the business model of fintechs and big techs. Customers who place less value on personal advice benefit from greater **flexibility and availability** and more **convenience**, for example with payment services or consumer loans. One concern could be that **customers** might take on **excessive debt** because of the easy and convenient access to credit, or that digital providers might grant loans to people who cannot afford them. However, the existing evidence on loan default rates of fintech and bank borrowers is inconclusive (Fuster et al., 2019; Di Maggio and Yao, 2021).

260. One financial product that has recently attracted a lot of attention is **'Buy now, pay later'** (**BNPL**). It offers **interest-free payment for product purchases**, primarily in **e-commerce**. The BNPL platform checks creditworthiness and immediately pays the retailer the full purchase price. The retailer bears no credit risk and gains access to a larger customer base, but in return pays fees to the platform that exceed credit card fees (Berg et al., 2024b). ↘ CHART 66 LEFT Unlike traditional

↘ CHART 66

"Buy now, pay later" (BNPL)[1] is growing strongly worldwide



1 – "Buy now, pay later" refers to low-threshold financing models that enable consumers to pay for purchases at a later date. 2 – Global trading volume of selected BNPL platforms.

Sources: Cornelli et al. (2023b), own presentation

consumer credit, BNPL loans are extended based on less information – typically income and recent payment history – and **screening is quick and convenient**. BNPL is common among young customers with low income and education levels and in countries with a less efficient banking sector (Cornelli et al., 2023b).

261. The global volume of **purchases financed via BNPL rose more than sevenfold between 2019 and 2023**. ↘ CHART 66 RIGHT A randomised control trial at a Germany e-commerce retailer implies that **sales rise by around 20 % if BNPL** is **offered** (Berg et al., 2024a). BNPL can have a **redistributive effect** whenever it is primarily used by customers with low income and liquidity constraints as suggested by evidence from the US (Cornelli et al., 2023b) and – with some limitations – Germany (Berg et al., 2024a). After all, the costs are borne by retailers or passed on to all consumers via higher product prices.

262. **BNPL loans** can also **involve risks** for consumers. They are easily accessible, especially for households without sufficient financial resources. As long as the loan is repaid on time, BNPL are usually free of charge. However, loan contracts can often not be cancelled, and late payments cause high fees. Borrowers may easily lose track of outstanding payments if they borrow from different BNPL platforms. Di Maggio et al. (2022) and Bian et al. (2023) document for the US that access to BNPL increases **consumption spending of households**, and deHaan et al. (2024) show that this additional spending is associated with an **increased risk of over-indebtedness**. Until now, German consumer credit law has not applied to BNPL loans, which can legally be granted without a credit risk analysis. However, the **revised European Consumer Credit Directive** came into force in November 2023 (European Parliament and Council of the European Union, 2023). It will subject BNPL platforms to **much stricter rules in future**, for example with regard to advertising, credit risk analysis or revocability rules. Implementation in national law is planned by summer 2025 (Rohleder, 2024).

263. Another new business area is **financing via digital platforms** (e.g. crowdfunding, P2P lending or marketplace lending). ↘ GLOSSARY fintechs or big techs merely provide the platform that connects investors and borrowers, **but do not act as financial intermediaries**. This form of financing can offer an **alternative** to consumer loans, for example, if banks are cautious. Originally, this model was aimed at retail investors, but the funding now comes mainly from institutional investors (Balyuk and Davydenko, 2024; Berg et al., 2024a). Evidence from Germany shows that primarily high-risk borrowers take out consumer loans via P2P platforms (de Roure et al., 2022).

264. **Neo-brokers** offer securities trading on **favourable terms** via online portals and trading apps. This makes trading in securities with small amounts more affordable. Especially young people gain access to the stock market (Kritikos et al., 2022). Neo-brokers offer favourable conditions as they have low costs due to their purely digital business model and often only provide a limited range of investment products and trading venues (Frölich and Lembach, 2021). As a rule, neo-brokers forward securities transactions directly to trading centres or market makers, which generate a margin between the bid-ask spread and partly reimburse this to

the neo-brokers. However, this 'payment for order flow' mechanism will be banned in the EU from 2026 (Council of the European Union, 2024).

265. Another innovation is the **tokenisation of assets**, whereby the latter are converted into digital tokens on a blockchain. ↘ BOX 13 The latter can be transferred directly without a central counterparty, which reduces transaction costs and makes some illiquid assets tradable in the first place. This technology can be used in **payment transactions** with tokenised means of payment (e.g. CBDC, e-money or stablecoins). However, this has rarely been used in industrialised countries, in contrast to emerging and developing countries, where high inflation, low trust in the government and an inefficient financial system render such alternative payment solutions attractive (Bogaard et al., 2024).

Financial inclusion

266. Digital financial service providers can improve financial inclusion by offering financial services to **customer groups** that are **under-served** by **incumbents**. In this context, financial inclusion does not mean that loans are granted to people who cannot afford them, but that households and small businesses gain access to financial services that they previously did not have, for example because of high costs or asymmetric information that requires collateral. Especially big techs, which have a wide reach, can serve such groups profitably. Examples from China show that **big techs facilitate access to credit** for small firms that are considered less creditworthy by banks due to a lack of collateral or reputation. On the one hand, big techs are **less reliant on traditional collateral** than banks. They can alternatively enforce loan repayment by excluding defaulting debtors from their ecosystem (e.g. retailers can no longer sell via the e-commerce platform), which strengthens the incentive for punctual loan repayment (Doerr et al., 2023b). On the other hand, big techs can use **data from other services** (e.g. sales on the e-commerce platform) to assess credit risk. ↘ ITEM 257

267. In general, financial inclusion is **much more relevant in emerging and developing economies**, where financial markets are less developed. However, fintechs can also improve access to financial services for some customer groups in advanced economies. Empirical studies on Germany (de Roure et al., 2022; Nam, 2023) suggest that fintechs grant loans to customers who are riskier and less profitable for banks (e.g. with low collateral).

268. However, digitalisation may entail countervailing effects on financial inclusion. Empirical evidence from the US (Jiang et al., 2022) suggests that especially younger consumers benefit from new digital services, while **some poorer and older groups** are **excluded**. The decline in the number of bank branches associated with digitalisation and changes in pricing strategies make it more difficult for them to access banking services. Solutions must also be found for children.

Market entry of fintechs and big techs

269. In which **markets fintechs and big techs enter** and the market shares they achieve crucially depends on **competition** and **financial regulation**. Cornelli

et al. (2023a) analyse fintech and big tech lending in 79 countries for the period from 2013 to 2018. The loan volumes of fintechs and big techs are larger in countries with high per-capita income and high profit margins of banks. **Stricter bank regulation** is associated with **less lending by fintechs** (Cornelli et al., 2023a) and **big techs** (Frost et al., 2019), as well as less investment in fintechs (Barba Navaretti et al., 2018). This may be due to the fact that such countries often also regulate alternative forms of finance more strictly. Whenever regulation primarily restricts banks, but not fintechs and big techs, **regulatory arbitrage** opportunities can open up, which **fosters growth of alternative providers**, as illustrated by the rise of mortgage lending by fintechs in the United States (Buchak et al., 2018). ↘ ITEM 288

270. For **fintechs**, the lack of **access to payment and financial data** can be a disadvantage compared to big techs and traditional banks. **Open banking regulations**, ↘ BACKGROUND INFO 8 which give consumers more control over their banking data and allow them to share it with other providers, can reduce this disadvantage. One example is the California Consumer Privacy Act, which gives users control over their personal data such as financial information or online activities. This reform led to an **increase in mortgage applications among fintechs compared to banks**, as fintechs were able to make more targeted offers to potential borrowers thanks to data access (Doerr et al., 2023b). The **quality of screening by fntechs** improved as well (e.g. more individualised risk premia).

↘ BACKGROUND INFO 8

Background: Open banking

The concept of 'open banking' aims at creating an open banking system. In particular, the aim is to allow third-party providers to **access personal financial data, if consumers agree**. Consumers should benefit from competitive offers for loans and other financial services, and such regulations should promote competition and innovation in the financial sector. In the European Union, open banking policies are often discussed for payment services. The second Payment Services Directive (PSD2), which was introduced in 2018, obliges banks to offer third-party providers access to account and transaction data so that they can offer customised payment services. The third Payment Services Directive (PSD3), which aims at improving the interoperability of payment systems and the resulting transaction data, is currently being discussed.

3. The economic rationale for a digital euro

271. The digital euro aims at providing the general public with access to public (i.e. central bank) money in digital form. Given declining importance of cash, ↘ CHART 53 the aim is to **secure** the **role of public money** in an **increasingly digital economy**. The digital euro promises **innovations** above all in **payment services**, for example through a pan-European payment system, more intensive competition and better data protection.

Monetary policy and the declining importance of cash

272. One rationale for a central bank digital currency which is often emphasised is that it serves as a **'monetary anchor' in a digital economy** (e.g. Panetta, 2021). The aim is to ensure that **public money** remains **visible and available** to all economic agents, even if cash becomes significantly less important (Brunnermeier and Landau, 2023). In particular, **deposits at commercial banks** can still be **converted into public money**. This exchange option is a key reason for consumers' trust in commercial banks – in addition to the quality of prudential regulation, supervision and deposit insurance. Brunnermeier and Landau (2023) point out that in recent history the general public has never had only access to private bank money, but not to public money.

273. Effective **monetary policy does not require the existence of cash**. The latter already accounts for only a small proportion of the money supply M3 – less than a tenth in the euro area (ECB, 2024b). According to modern monetary theory, on which the monetary policy strategies of most central banks is based, it is sufficient for the **central bank to control short-term interest rates** in order to influence the price level and the inflation rate (Broemel et al., 2023). This is possible even in a 'cashless limit' – a theoretical construct in which the public hardly use no cash any more (Woodford, 1998).

274. However, the effectiveness of monetary policy might be limited in the future if **private cryptocurrencies** ↘ BOX 16, which compete with the central bank currency, become more popular. One example is **Facebook's Libra proposal** in 2019 that ultimately failed (GCEE Annual Report 2019 box 11). Should such a currency be successfully established and at least partly drive out public money, a country's **monetary sovereignty** would be jeopardised. The same could be true for central bank digital currencies of other countries. If prices and contracts are denominated in an alternative currency (Ahnert et al., 2022), it becomes difficult for the central bank to influence the price level.

↘ BOX 16

Background: Cryptocurrencies

Cryptocurrencies are **digital currencies** that secure transactions using **cryptographic coding**, a kind of digital vault. They often function on blockchain technology. ↘ BOX 13 The best-known cryptocurrency is Bitcoin, which was launched in 2009. Cryptocurrencies allow for transactions between two parties without involving a central authority such as a bank or public institution.

Bitcoin has **exhibited high volatility** (Baur and Dimpfl, 2021). For instance, its value in 2017 rose from just over 1,000 US dollars initially to almost 20,000 dollars in December, before again falling by more than 73 % to 3,100 dollars at the end of 2018 (Investing.com, 2024). Many investors do not use Bitcoin for regular transactions because the level of acceptance is low. Instead, they buy Bitcoin expecting future price gains (Baur et al., 2018). Hence, **cryptocurrencies** are used **as speculative investments** rather than as means of payment or as a store of value.

In addition, cryptocurrencies are often associated with **illegal activities** because the high degree of anonymity facilitates money laundering, tax evasion and even financing terrorism. In the past, Bitcoin was the favoured means of payment on darknet marketplaces such as Silk

Road (Foley et al., 2019).

Stablecoins are a special form of a cryptocurrency. They are linked to **reference value** like gold or a traditional currency. Unlike other cryptocurrencies, stablecoins aim at maintaining a stable value and are therefore suitable for regular transactions. Stablecoins now account for more than 80 % of the trading volume on major crypto exchanges (Baughman et al., 2022).

Improving payment services

275. The digital euro can help make payment transactions in Europe more cost-effective, especially for cross-border transactions. Since the Single Euro Payment Area (SEPA) was introduced in 2002, bank transfers between SEPA countries can be carried out in the same way as domestically (Cipollone, 2024), but **there is no standardised European infrastructure for cross-border card payments**. Some countries have their own national systems like Germany with Girocard, while others rely on international card providers such as Visa and Mastercard. The private-sector **European Payments Initiative** ↘ BACKGROUND INFO 9 aims at overcoming this fragmentation, but progress has been very slow so far, which suggests **coordination problems**. The ECB could thus set a **technological standard** with the digital euro, which ensures cross-border compatibility and might form a cornerstone for a pan-European payment system.

↘ BACKGROUND INFO 9

Background: European Payments Initiative

The European Payments Initiative (EPI) was launched in 2020 by 16 European banks (ECB, 2020) to develop a **standardised European payment system for consumers and merchants**. After the EPI only made slow progress and some founding members withdrew from the initiative (Atzler et al., 2022), the digital wallet 'Wero', which would be offered in 2024, was announced, Initially, it should be available for payments between individuals, later also for online payments and for payments at the point of sale (Tagesschau, 2023). Plans to also develop a European payment card were abandoned (Atzler et al., 2022).

276. The payment market is a **two-sided market**. Consumers and merchants benefit if many others use the same infrastructure: the benefit of a payment method thus depends on the size of the user group on the other side of the market (Bogaard et al., 2024). Given such increasing economies of scale, it is not surprising that the **payment market** is **highly concentrated** and exhibits an **oligopolistic structure**. Market power could be one reason why payment service providers earn **above-average returns**. Their annual total return on assets (2000–2022) averaged 4.3 % in the US and 2.3 % in the euro area, compared with returns of 0.9 % and 0.2 % for commercial banks respectively (Berg et al., 2024b).

277. The oligopolistic market structure allows payment service providers to charge **high transaction fees**. In general, consumers react more elastically to price differentials between different payment methods than merchants such that trans-

action fees are mostly paid by the merchants (Bogaard et al., 2024). However, depending on market conditions, they can pass these costs on to consumers via higher prices. In Germany, the **revenues of payment service providers** correspond to **around 0.7 % of GDP**, compared to 1 % and 1.3 % in the euro area and the US respectively (Germann et al., 2019). After all, the comparatively inexpensive Girocard ↘ CHART 68 and cash are still quite popular in Germany.

Nevertheless, **transaction fees** continue to be **high** in Germany, **especially in the digital space**, where the cheapest means of payment are not available. ↘ BOX 17 This particularly affects small merchants with little bargaining power vis-à-vis payment service providers which pay high fees. Therefore, the **digital euro** could offer a **cost-effective alternative to credit cards and e-payment solution** and **strengthen competition** in the payment market. Evidence of Berg et al. (2024b) suggests that investors anticipate a weaker position of US payment service providers in the European market once the digital euro is introduced. Repeatedly, their share prices fell following announcements about the digital euro, and their market capitalisation thus decreased by 127 billion US dollars or 10.3 % in total.

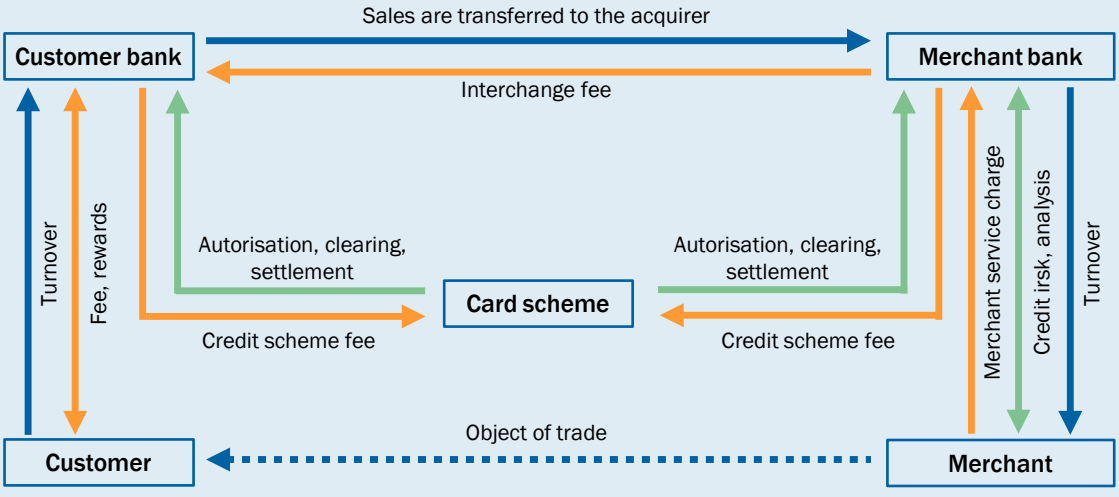
↘ BOX 17

Background: Transaction costs in the German payment market

Card payments typically involve **four parties** ↘ CHART 67. If a **customer** pays at the point of sale (POS) or online with a credit, giro or debit card, the **merchant** sends a credit query to its **merchant bank**, the acquirer. The latter forwards the transaction details via the card network (e.g. Visa or Mastercard) to the **customer bank**, the issuer. The latter authorises the transaction by transmitting a signal to the terminal (Katz, 2001; Veljan, 2020).

↘ CHART 67

Fee structure for credit and debit card payments
in the „four-party-system“



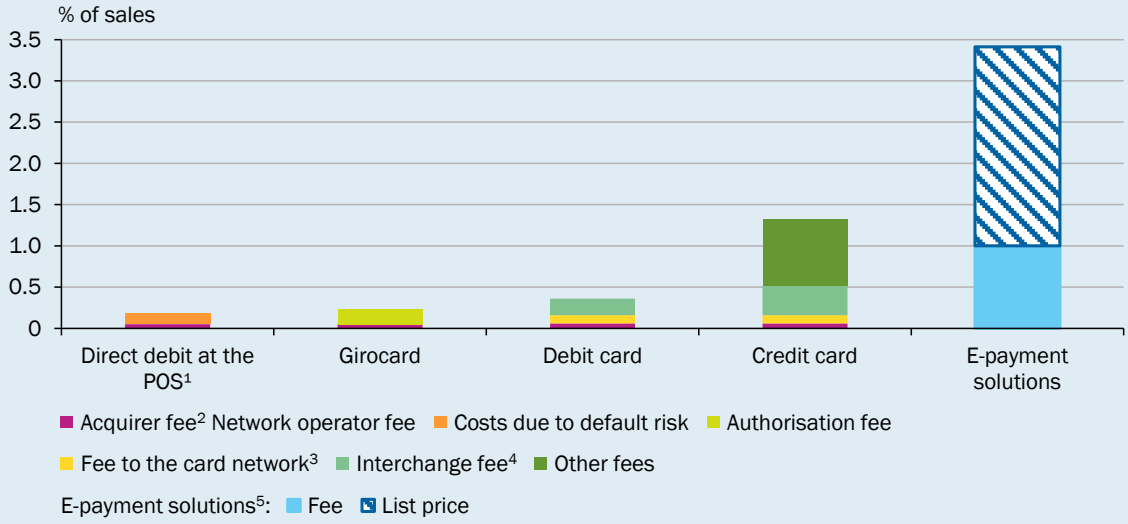
Source: own presentation
© Sachverständigenrat | 24-270-01

Several charges are incurred during the payment process. The acquirer pays the issuer an **interchange fee** for processing the transaction. In the European Union, this fee for credit cards

(debit cards) is capped at 0.3 % (0.2 %) of the payment value (European Commission, 2016). This also applies to any fees charged by banks to providers of mobile payment solutions (e.g. Apple Pay or Google Pay). Since business cards and international credit cards are exempt from this regulation, the average interchange fee for credit card payments in Germany is 0.36 % (Cabinakova et al., 2019; Rüter, 2020). Both banks involved (acquirer and issuer) pay a **scheme fee** to the card network, which amounts to around 0.1 % of the payment value in Germany (Cabinakova et al., 2019). Finally, the acquirer charges the merchant a **merchant service charge**. This includes interchange fees, scheme fees and an **acquirer fee** of 0.06 % on average (Cabinakova et al., 2019; ECB, 2019). Together with other charges, credit card payments in Germany cost an average of 1.33 % of the payment value (Cabinakova et al., 2019). For debit cards, these costs amount to around 0.36 %.

↘ CHART 68

Transaction fees of different means of payment in Germany



1 – Point of Sale (POS): Place where goods and services are purchased and paid for. 2 – Assumption: the acquirer fee for debit cards equals the acquirer fee for credit cards. 3 – Assumption: the fee to the card network for debit cards equals the fee to the card network for credit cards. 4 – For debit cards the European maximum value in Europe (see European Commission, 2016) is assumed, for credit cards the empirical average value. 5 – Paypal is used as an example for e-payment solutions. The list price represents the upper limit of the fees. Berg et al. (2024a) refer to a negotiated fee of 1 % for an online furniture retailer.

Sources: Berg et al. (2024a), Cabinakova et al. (2019), European Commission (2016), PayPal, own calculations

In Germany, anther debt card exists: the **Girocard**. It can only be used for transactions at the point of sale, not online. As with payments in the four-party system, the authorisation fee – the counterpart to the interchange fee – to the issuing credit institution is capped at a maximum of 0.2 % of the payment value. Since no card network is involved in the transaction, this fee does not apply. The costs for the network operators amount to around 0.05 % (Cabinakova et al., 2019). Overall, the average costs of 0.24 % of the payment amount are significantly lower than in the four-party system.

At the POS, one can also pay using **SEPA direct debit**, whereby no authorisation or interchange costs are incurred, but there is a risk that the payment will not be valid. Taking the default risk and network operator fees of 0.05 % into account, the average transaction costs are 0.18 % (Cabinakova et al., 2019).

In e-commerce, payments are also offered by **SEPA bank transfer**, which entails a risk of default but virtually no transaction costs, or via a **payment service provider** (PSP) such as PayPal or Klarna. The latter handle the entire payment process and offer payments by direct debit,

bank transfer, credit and debit card or via a credit balance at the PSP. For example, PayPal's list price consists of a fixed fee of €0.39 per transaction and a variable fee of 2.99 % of the payment value (PayPal, 2024). However, negotiated fees can be significantly lower as illustrated by the example of an online furniture store (Berg et al., 2024a).

278. It remains questionable whether **imperfect competition in the payment market** is a sufficient condition for introducing of the digital euro. On the one hand, the oligopoly is to some extent technological because of the two-sided market. On the other hand, measures against imperfect competition are an **original task of competition policy**, especially when market power is abused. For example, the European Commission has already limited the interchange fees for card payments (European Commission, 2016). Nevertheless, the dominant market position of the US card providers has changed very little.

Privacy protection

279. The German public has a **strong desire for anonymity** when making payments. According to a survey by the Deutsche Bundesbank (2024d), 63 % of respondents consider anonymity of cash payments an advantage, and **70 % of respondents said that they do not trust big techs to handle payment data responsibly**. This suggests that privacy protection in new digital payment systems is very important and that part of the public still prefers cash due to a lack of trust. However, cash cannot be used in the digital space.

280. The digital euro aims at meeting particularly **high standards of privacy protection**. Private providers do currently not satisfy these requirements. Large tech companies, in particular, collect a lot of data in payment transactions and have an incentive to use in other business areas such as e-commerce. In contrast, an independent **central bank such as the ECB** is **well positioned** to protect **the privacy of digital payments**. On the one hand, there is no genuine interest in commercialising payment data. On the other, it can embed fundamental principles of privacy protection – such as integrity, confidentiality or the limited use and storage of data – in the design of the digital central bank currency. For example, they may use **technologies which restrict data collection** and thus credibly ensure a high degree of anonymity of transactions (Murphy et al., 2024). However, a central bank digital currency will not and does not aim at creating complete anonymity. After all, transaction data have to be analysed to a limited extent such that users do not circumvent regulations against money laundering and terrorism financing.

Strategic autonomy

281. Functioning payment systems are of great importance for a country's strategic autonomy, since secure, generally accepted and fast payments are essential for all economic activity. In the EU, cross-border card payments are currently not possible without the involvement of international, i.e. non-European, payment service providers (Papsdorf and Themejian, 2024). A **digital euro** could **boost inde-**

pendence from foreign payment service providers and thus contribute to Europe's strategic autonomy (Brunnermeier and Landau, 2023). In extreme cases, a lack of autonomy can lead to a country losing access to a jointly used payment system, for example if financial sanctions are imposed.

Prospects for wholesale CBDC

282. **Concepts for interoperable networks** of **commercial bank and central bank liabilities** are being developed worldwide, both by the financial industry (RLN, 2022) and by central banks (Carstens, 2023; NYIC, 2023). The aim of such 'unified ledgers' is to improve national and international payment transactions and to enable the use of various tokenised forms of money issued by private actors or the central bank on a common platform (Deutsche Bundesbank, 2023c). The Bank for International Settlements (BIS) is already working with various central banks on wCBDC projects as part of the **BIS Innovation Hub**. This involves, for example, a common platform for cross-border wholesale payments based on DLT, which enable instant settlement. The platform could be used by multiple central banks and commercial banks. This should reduce inefficiencies in cross-border payment transactions such as high costs, low speed and a lack of transparency, as well as operational complexity (BIS, 2024).

283. **The ECB**, together with several national central banks, has conducted **initial experiments on the interaction between the ECB's TARGET services** which process wholesale payments for financial institutions **and market DLT platforms** (ECB, 2024c). With its 'Trigger Solution', the Deutsche Bundesbank provides a technical bridge between eligible market DLT platforms and the Eurosystem's TARGET services. Financial transactions can be settled directly in central bank money using existing accounts of financial institutions. Blockchain-based digital bonds have already been issued, with the 'trigger solution' handling the settlement (Deutsche Bundesbank, 2024a). These transactions are made possible by the German Electronic Securities Act (eWpG) passed in 2021. The combination of DLTs and the tokenisation of assets with digital money is expected to generate considerable efficiency gains in the financial industry (Deutsche Bundesbank, 2023c).

IV. RISKS TO FINANCIAL STABILITY, NEW CHALLENGES FOR REGULATION

284. A stable financial system is key for the smooth functioning of the real economy. The **insolvency of a single bank** can quickly escalate **into a systemic banking crisis** due to the many interconnections, for example via interbank loans. Such systemic crises cause **high costs** that are only partially internalised or not at all. Laeven and Valencia (2020) compare 151 global banking crises from 1970 to 2017. In advanced economies, a systemic banking crisis led to a cumulative loss of income of roughly 35 % of GDP over a median of four years compared to the trend. According to their calculations, the direct fiscal costs of stabilising the financial system, e.g. for recapitalising distressed banks, amount to a median of 3.3 % of GDP, even when taking into account the repayment of support payments.

285. The **disruption** caused by **digitalisation** could **undermine financial stability** if (i) systemic risks arise in the (in some ways) less regulated area of fintechs or big techs, or if (ii) established commercial banks are weakened abruptly, resulting in the loss of important businesses within a short period of time or an even faster outflow of customer deposits in the event of a crisis. In addition, declining bank margins could weaken the capitalisation of commercial banks in the future and increase incentives to take high risks, leading to higher bank insolvency risk.

1. Regulation of the financial services of big techs and fintechs

286. **Banks pose various systemic risks**, originating, for example, from maturity transformation, that is, banks refinance long-term loans with short-term deposits. If many deposits are withdrawn, the bank cannot satisfy all withdrawals at the same time. Banks can face a liquidity shortage, and even a bank run can occur. Furthermore, different banks are often exposed to the same market risks, so that credit defaults rates increase simultaneously if economic conditions deteriorate. Due to the large risks of banking crises, **commercial banks** are **strictly regulated and supervised**. The aim of banking regulation is to limit these risks and prevent contagion.

As long as **fintechs and big techs pursue an activity** that requires a banking licence, they are generally **subject** to the **same regulation** as banks. ↘ ITEM 287 Although a licence is required for some activities, such as the processing of payments, the company is not necessarily subject to prudential regulation at group level and is therefore not subject to the corresponding risk management or minimum capital requirements. ↘ ITEM 293

Regulatory requirements depend on the business model

287. In Germany, certain **banking and financial services** require a **licence** from the Federal Financial Supervisory Authority (**BaFin**). A distinction is made here between banking business, investment services, financial services, payment services and e-money business. A **banking licence** is required for **banking business** that involves a **combined deposit and lending business**. It is issued jointly by BaFin and the ECB. Holding a banking licence means that company is subject to **comprehensive prudential regulation** such as minimum capital and liquidity requirements and **supervision**. However, no banking licence is generally required for granting loans without deposits, although approval from BaFin is required in most cases. Comparable prudential requirements like those for banks do not apply.

A **licence from BaFin** is also required for **investment services**, such as investment brokerage and advice or the operation of trading systems, for the provision of **financial services** such as leasing or factoring, and for the custody of crypto assets. **Payment service providers** must obtain a licence from BaFin and register as a payment institution. This also applies to e-money institutions such as Amazon Payments Europe. Providers of digital wallets such as Apple Pay do not require a licence as they do not provide their own payment services; rather, they act as technical intermediaries between payment services and consumers (Bosch Chen et al., 2023). **Supervision of insurers** is **shared between BaFin** and the **state authorities**. BaFin mainly supervises private insurers and grants them a business licence.

288. In principle, these regulations, which vary according to the business model, open up the possibility of **financial services** being shifted **from strictly regulated entities**, such as banks, **to less regulated entities (regulatory arbitrage**), creating risks to financial stability. This issue extends beyond the shifting of businesses to fintechs and big techs; it also encompasses a broader shift to the non-banking sector in general, which is growing in Germany and Europe (Bouveret et al., 2024). The stricter regulation imposed on banks after the financial crisis has likely driven a shift to the less regulated segments of the financial sector (Gebauer and Mazelis, 2023). In the United States, this has been evident in mortgage financing. Non-banks entities, especially fintechs operating without a banking licence, increased their market shares especially in areas where traditional banks were subject to higher regulatory capital requirements (Buchak et al., 2018). In the US, the Financial Stability Oversight Council has called for a revision of the regulatory requirements for mortgage providers (FSOC, 2024).

However, it should be noted that it is only **possible** to **grant mortgages without a banking licence in the US** because fintechs and other non-banks can securitise them using **guarantees** from government-sponsored entities (GCEE Annual Report 2023 items 215 ff.). They therefore do not need deposits for refinancing. Since no comparable securitisation market exists in Europe, the risk from this specific form of regulatory arbitrage is low.

289. Within the EU, all institutions that are permitted to provide the above-mentioned services in a member state may, **in principle, offer their services throughout the entire internal market** through **'passporting'**. For this purpose, it is only necessary to notify the home supervisory authority of the cross-border activity.

Appropriate fintech Regulation can enable Innovation

290. **Online banks** or so-called **'neo-banks' do not differ fundamentally from traditional banks** in terms of their business model. They take on similar credit, market or liquidity risks and offer a range of products and services. They require the same banking licences and are monitored by the same supervisory authority. However, operational risks or cyber risks can be more pronounced for neo-banks than for commercial banks (Ehrentraud et al., 2020b). They do not operate any branches and must carry out customer onboarding purely digitally. Together with rapid growth, these processes can make it more difficult to prevent money laundering or terrorism financing and make them more susceptible to fraud.

291. **'Regulatory sandboxes'** have been introduced in several countries and offer **fintechs** and **banks** an opportunity to **establish** themselves or to **test innovations**. Sandboxes allow testing innovations quickly and cost-effectively before they are launched on the market (He et al., 2017). In turn, **supervisors** can gain **insights about innovations and new business models** in the context of such programmes. Such sandboxes do not yet exist in the EU.

In **Australia**, new banks can apply for a restricted **banking licence** (as a 'restricted authorised deposit-taking institution'). The restricted licence limits the amount of deposits that these banks can accept. At the same time, they are subject to simplified regulatory requirements so that they can expand their resources and capacities (APRA, 2021). In the **United Kingdom**, both incumbents and entrants have an opportunity to **test new products with consumers within a regulatory sandbox**. They are advised by the supervisory authority to ensure that they fulfil all regulatory requirements. Cornelli et al. (2024) show that participating in this programme significantly increases the likelihood for fintechs to raise capital. The survival rate and patenting increase as well. The authors attribute this to reduced asymmetric information vis-à-vis potential investors and lower regulatory costs.

Is the regulation of big techs lagging behind?

292. In Europe, **big techs have only played a relevant role in payments so far.** Nevertheless, they are expected to **gain importance** in the financial sector very **quickly**. Regulators must thus compare the benefits that big techs bring and the potential risks they pose to the financial system (Ehrentraud and Crisanto, 2021).

293. The **current regulatory approach is to regulate certain financial services** (activity-based regulation), but not the entity as such, with the exception of banks and insurers. Big techs generally offer their financial services via separate regulated entities. For example, payment services are provided by subsidiaries

that are authorised in the EU as e-money or payment institutions (Crisanto et al., 2021).

294. However, there are several **interdependencies between the financial and core business** of big tech companies. This not only involves internal contagion and reputational risks, but also financial stability risks. The latter arise primarily due to the dependence of the financial sector on big tech services such as data storage and analysis, especially in the event of cyber incidents or operational failures. In addition, **partnerships between big techs and established players**, such as banks, can lead to **unclear responsibilities** and therefore **higher risks**. For example, if big techs only provide customer-facing services such as loan brokering, but do not bear any credit risk, the incentive to carefully check the credit standing of borrowers is weaker (Ehrentraud and Crisanto, 2021). Finally, the regulatory architecture is fragmented along sectoral and national boundaries (James and Quaglia, 2024).

295. Therefore, the question arises as to whether **entity-based regulation**, similar to the prudential regulation of banks or insurance companies, is necessary for **big techs** or whether the existing **regulation of certain services is sufficient**. To date, the approach followed has been 'same activity, same risk, same regulatory requirements'. Big techs are additionally subject to industry-specific regulations – e.g. the Digital Markets Act (DMA) and the Digital Services Act (DSA) in the EU. These regulations aim at protecting competition and consumers, but do not address potential financial stability risks, which may thus be inadequately covered by current regulations. There is no specific regulation of the activities of big techs in the field of financial services.

2. Digital transformation and the stability of banks

296. New risks to financial stability can arise from the **interaction between digital financial service providers and established commercial banks**, increasing the likelihood of bank insolvencies. The latter can quickly escalate into a systemic crisis, resulting in high costs. ↘ ITEM 284 In general, one should distinguish between three types of risks. Firstly, direct **connections between banks and fintechs and big techs**, including, for example, the **financing of digital financial service providers by banks**. They typically create credit risks in bank balance sheets. Further risks for commercial banks arise when buying securitisations, for example of mortgages issued by fintechs or big techs, or when they sell credit default swaps ↘ GLOSSARY with a digital financial service provider as the reference debtor.

297. Secondly, **competition from fintechs and big techs** is likely to **reduce the profit margins of commercial banks**, creating financial stability risks in two ways. On the one hand, lower profits **make it more difficult** to **build up bank equity**, which is mainly accumulated through **retained earnings** (Cohen, 2013). Low equity weakens the ability of banks to absorb losses.

On the other hand, lower profits can influence **risk-taking by banks**, which has been extensively discussed in the literature. ↘ BOX 18 Despite yet limited empirical evidence on how **competition from fintechs and big techs** affects risk taking, first empirical results suggests that **banks are taking higher risks**. Jia (2024) shows that competition from P2P lending platforms in the United States increases risk taking of commercial banks. This effect is particularly strong among banks with low earnings. A similar effect is found in a study of 57 countries (Elekdag et al., 2024). The effect is weaker for banks with high equity and liquidity ratios and in relatively concentrated markets. Overall, these results indicate that the **increasing competition from fintechs leads to more risk taking, particularly among weaker banks**, creating harmful incentives within the financial system.

298. The **German banking market** is relatively fragmented, although the intensity of competition is probably lower than would be expected due to some institutional features. **German banks are less profitable than their counterparts in many European countries**. ↘ ITEMS 253 F. The literature emphasises a U-shaped relationship between competition and bank risk taking. ↘ BOX 18 Furthermore, there is empirical evidence which suggests that especially banks with low earnings take higher risks due to competition from fintechs. Taken together, **stability risks** are **plausible** if bank margins fall. However, **fintechs and big techs have been almost non-existent in the German credit and deposit market to date**. ↘ CHARTS 55 AND 56 They are currently unlikely to exert much pressure on bank margins. Measures that reduce competitive pressure and limit stability risks, such as more restrictive licensing, are therefore not appropriate. Constant monitoring of bank risk taking and profitability by the supervisor should currently be sufficient.

299. Thirdly, **digitalisation** can **increase the risk of liquidity shortages** especially due to a faster outflow of customer deposits. Historically, the latter have been an important and largely stable source of financing for banks. Typically, deposits do not react very strongly to interest rate changes, and banks can refinance themselves with deposits below the market interest rate (Drechsler et al., 2021). However, how stable deposits are also depends on the digital services a bank offers. According to a study on the digitalisation of banks in the United States, digital offerings such as mobile apps or brokerage services facilitate switching from bank deposits to higher-yielding investments without having to change banks (Koont et al., 2024). As a result, interest rate hikes may lead to larger outflows of demands deposits at digital compared to non-digital banks, thereby increasing liquidity risks.

↘ BOX 18

Background: Competition and bank risk taking

Banks take risks when extending loans or investing in securities. Because of asymmetric information – banks' assets (e.g. loan portfolios) are usually opaque and outsiders can hardly assess their risk profile – **incentives are key**. Competition in the deposit market influences these incentives and thus risk taking, primarily via margins. When **interest margins are small, banks**

tend to take higher risks, which may even have a negative expected value. In case of success, their owners retain a high return, while in case of failure (insolvency) they only lose the already low interest margin and are protected by limited liability. This is achieved by investing in **high-risk and high-return securities** (Hellmann et al., 2000; Allen and Gale, 2001; Repullo, 2004) or by a **weakly diversified loan portfolio** (Hakenes and Schnabel, 2011). Empirical studies suggest that the deregulation of the US banking market in the 1980s reduced bank profitability and contributed increased risk taking (Keeley, 1990), and that systemic banking crises are less frequently in more concentrated banking markets (Beck et al., 2006).

However, there are counteracting mechanisms whereby intense competition reduces risks in the banking sector. This can **reduce credit interest rates for firms**, which improves their debt sustainability. Furthermore, low interest rates on loans are likely to weaken the incentive for firms to invest in risky projects (Boyd and De Nicoló, 2005). Both reduce credit risks of banks. In addition, more competition could **reduce** the **'too-big-to-fail' risk**. In concentrated markets, banks are often relatively large and therefore likely to take greater risks if they expect to be bailed out by the government because of their systemic importance (Berger et al., 2017). The more recent literature therefore emphasises a **U-shaped relationship between competition and stability risks** (Martinez-Miera and Repullo, 2010). In highly concentrated markets, increased competition reduces insolvency risk, but increases it in markets that are already competitive.

3. A risk for banks' intermediation model?

300. Banks often offer a **bundle of complementary financial services** such as loans, deposits and payment transactions. This allows them to perform key economic functions. One example of this is **maturity transformation**. Banks refinance long-term loans predominantly with short-term deposits. This reconciles households' desire for **permanent access to their savings** and firms' need for **stable, long-term financing** and increases welfare compared to alternative financial arrangements (Diamond and Dybvig, 1983). Without maturity transformation, households would have to invest their savings for longer terms, or firms would have to finance investments for shorter terms. Although maturity transformation does not necessarily have to be carried out by a commercial bank, it requires an institution that is **simultaneously active in a short-term debt-capital market** and a **long-term credit market**. Specialised providers that focus only on loans or transaction accounts do not offer this service. Since maturity transformation involves considerable liquidity and interest-rate risks, it should always take place in a **regulated and supervised area**.

301. Another complementarity exists between payment services and screening of borrowers. Banks can use **data on customer deposits and transactions** for credit risk analysis, thereby **improving their internal ratings**. Parlour et al. (2022) show in a theoretical model that competition from fintechs in the payment market has an impact on the credit market via such 'information spillovers' within a bank. If the bank receives less information from payments, the credit conditions for some debtors may deteriorate.

302. In contrast to banks, **new players** such as fintechs and big techs, as well as asset-management and private equity companies, **often specialise in individual services**. Examples include payment transactions, lending and asset manage-

ment. If the new players were to drive banks out of important market segments, this would jeopardise the traditional intermediation model (**disintermediation**). In many respects, such a development would imply a gradual **transition to market financing**, which has long played a central role in other advanced economies, particularly in the United States. For Germany and in the EU, this would first of all require deepening equity and bond markets and **further developing the European Capital Markets Union** (GCEE Annual Report 2023 items 268 ff.).

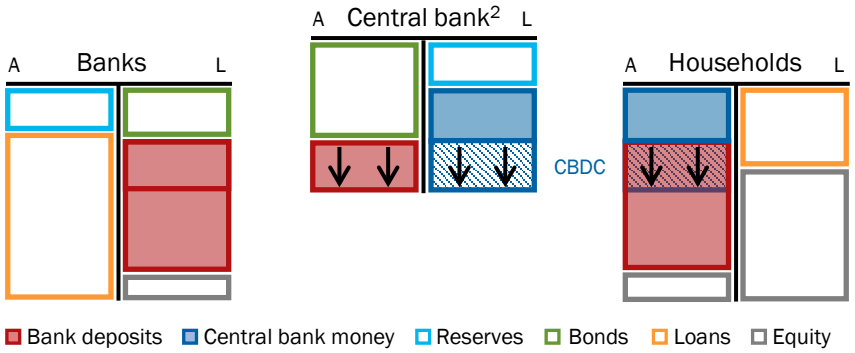
4. Disintermediation risks due to the digital euro

303. A central bank digital currency offers households a **secure, liquid asset** that can be used for **digital transactions**. It has many of the attributes of demand deposits at commercial banks, but is safer because it is a liability of the central bank. Households could therefore **substitute** their **bank deposits with a digital central bank currency**. In this case, commercial banks would lose a large proportion of their customer deposits. This makes it difficult for banks to refinance loans, which would negatively affect lending and investment. A contraction of credit supply would be a major problem in Germany where many firms are dependent on bank loans, while market finance is underdeveloped (GCEE Annual Report 2023 items 210 f.).

304. Simulation studies point to **high substitution rates**. According to Whited et al. (2023), whose model is calibrated for the United States, an **expansion of the central bank digital currency by one US dollar** would lead **to around 80 cents lower bank deposits**. Banks can partially compensate for this via other sources of financing such as wholesale funding (e.g. from money market funds, pension funds, other financial intermediaries). Nevertheless, lending decreases by an average of 20 cents in the study. Smaller banks restrict their lending three times more than large banks, as wholesale funding is particularly expensive for them. Bidder et al. (2024) use a model calibrated to the euro area and distinguish between slow disintermediation in normal times and **rapid disintermediation during a crisis**. Central bank digital money offers a secure and – compared to cash – convenient alternative that bank customers could quickly switch to during a crisis. This can increase the likelihood of a bank run, which weakens financial stability and lowers welfare.

305. The importance of such disintermediation risks crucially depends on the institutional framework. For example, the **central bank can compensate banks for the loss of customer deposits**. In this way, a central bank digital currency extends the central bank's balance sheet and changes the composition of (aggregate) bank liabilities, but the credit volume remains the same. ↘ CHART 69 A compensation **ensures the refinancing of bank loans** and prevents negative effects on investment. According to Brunnermeier and Niepelt (2019), a **central bank digital currency** can be **neutral** such that the resource allocation remains unaffected. The conditions for this neutrality result include, in particular, a strong commitment by the central bank to compensate banks for lost deposits. One challenge is that the central bank **usually grants loans to commercial banks**

↘ CHART 69
Neutrality of a digital central bank currency
Stylised balance sheets[1]



1 – Only financial assets (A: assets, L: liabilities). 2 – Central bank money in the form of cash and CBDC (Central Bank Digital Currency).

Source: own illustration based on Brunnermeier and Niepelt (2019)
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against collateral. If banks do not have sufficient collateral in case of large liquidity outflows, the central bank would have to relax collateral requirements, for example, to ensure that the central bank digital currency remains neutral.

306. Furthermore, the **design of the central bank digital currency** is key for the magnitude of substitution effects. Firstly, **holding limits** can significantly restrict substitution. These limits define a maximum volume of central bank digital money that a user can hold. For the digital euro, holding limits of **between €500 and €3,000 for individuals** and €0 for firms are being discussed (Balz, 2024). Simulations by Bidder et al. (2024) show that such holding limits allow realising the benefits of a digital euro, without exacerbating the risk of a bank run. However, **holding limits must remain credible even in a crisis** and they must not be weakened under the pressure to offer bank depositors greater access to a secure and convenient alternative. That would accelerate a bank run. Technical and legal conditions (e.g. the need for legislative changes) that make it impossible to raise holding limits quickly may add to such credibility. Secondly, the **digital euro** is to be **interest-free**, which would make it unattractive as a store of value. This should also limit the substitution of bank deposits, as simulation results suggest (Whited et al., 2023).

307. The GCEE has estimated the take-up of the digital euro in Germany based on the assumption of low holding limits. ↘ BOX 19 This estimate suggests that **Germans** could **hold €98 billion worth of digital euros**, only a portion of which would substitute bank deposits. This is the equivalent of only 2 to 3 % of the total overnight household deposits at German banks of over €1.7 trillion. Note that only around 17 % of German banks' funding comes from overnight deposits (ECB, 2024d). However, this only applies to the banking sector as a whole. For some individual banks which are much more dependent on household deposits, the effect could be significantly higher.

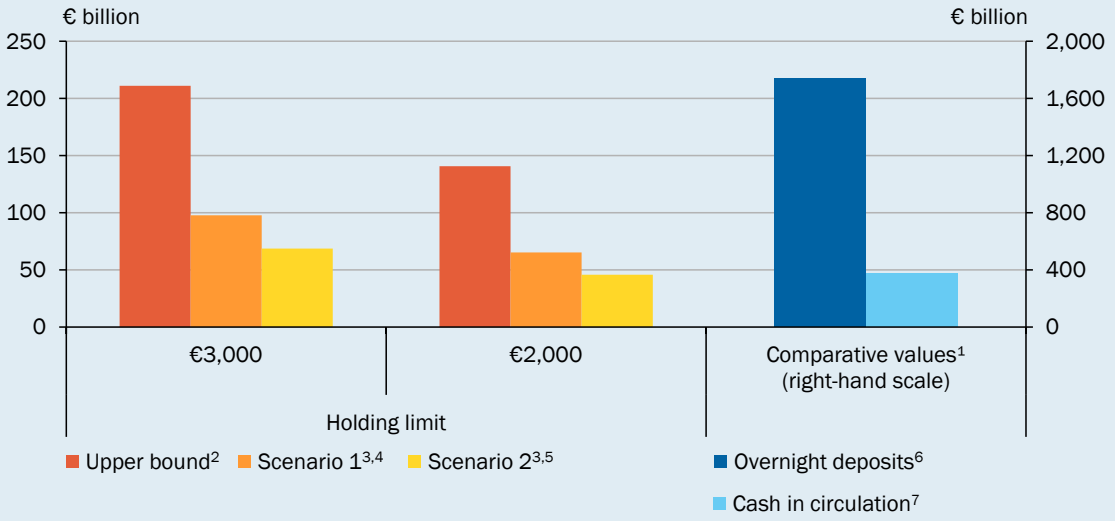
↘ BOX 19

SVR analysis: Estimating the take-up of the digital euro in Germany

The take-up of the digital euro can **be roughly estimated** based on different **scenarios.** ↘ CHART 70 Since only individuals are allowed to hold a positive balance of the digital euro up to a limit, one can calculate an upper bound. If all adults in Germany use the holding limit in full and if that this limit is either €3,000 or €2,000, the take-up would be €211 billion and €141 billion respectively. However, not all Germans will use the digital euro. In a survey of over 2,000 people on their attitudes towards the digital euro (Deutsche Bundesbank, 2024e), 15 % stated that they would definitely use it and a further 35 % would probably do so. The digital euro would probably not or definitely not be used by 24 % and 25 % of respondents respectively. Taking this information into account, different scenarios can be calculated. Private individuals in Germany could **hold between €65 and €98 billion** (€46 to €69 billion) if the **holding limit is €3,000** (€2,000). This corresponds to between a third and just under half of the upper bound. Taking other factors into account – such as the distribution of financial assets, sight deposits and consumer spending, which would also influence the use of the digital euro – the take-up is likely to be even lower.

↘ CHART 70

Possible take-up of the digital euro in Germany



1 – Status: 31. December 2023. 2 – Assumption: all people aged 18 and more fully exploit the holding limit (population on 31. December 2023: 70.4 million people). 3 – Representative survey of German households by the Deutsche Bundesbank: „Could you generally imagine using the digital euro?" („definitely" 15 %, „probably" 35 %, „probably not" 24 %, „definitely not"/n. a. 26 %). 4 – Assumptions: People who definitely want to use the digital euro exploit the full holding limit, those who „probably" or „probably not" want to use it exploit 2/3 or 1/3 of the holding limit respectively, those who „definitely not" want to use it (or n. a.) do not use the digital euro. 5 – Assumptions: People who definitely want to use the digital euro exploit the full holding limit, those who „probably" want to use it exploit 1/2 of the holding limit, those who „probably don't" or „definitely don't" want to use it (or n. a.) do not use the digital euro. 6 – From private households in the euro area at German banks (Monetary Financial Institutions). 7 – German contribution.

Sources: Deutsche Bundesbank (2024e), ECB, Federal Statistical Office, own calculations

In household portfolios, the digital euro is likely to **replace demand deposits and cash**, which are close substitutes as liquid assets earning little or no interest. Households' overnight deposits with German banks and the German contribution to cash in circulation totalled around €1.74 trillion and €371 billion respectively at the end of 2023. If, for example, cash and sight deposits

were to be substituted by the digital euro to a similar extent, overnight deposits could fall by a total of 2 to 3 % and cash in circulation by 9 to 13 % at a holding limit of €3,000.

V. POLICY IMPLICATIONS

308. Digital innovation in the financial sector offers many opportunities like new products, more efficient processes and more intense competition that benefit consumers. At the same time, the market entry of new digital financial service providers may create risks for financial stability and consumer protection. Economic policy should therefore be guided by three principles: **enable digital innovation** in the financial sector, **avoid systemic risks to preserve financial stability**, and **protect consumers** in the digital space. The challenge lies in appropriately regulating the risks arising from the business activities of new market participants without unnecessarily hampering innovation. This may be achieved with regulatory simplifications in areas where they promote innovation and affect institutions that are not systemically relevant.

309. The risk of **regulatory arbitrage** between fintechs and commercial banks in Germany and the EU currently appears quite low. ↘ ITEM 288 Conducting a banking business requires a licence such that a fintech company is subject to prudential regulation and supervision whenever it performs lending and deposit activities. In some peripheral areas, there is a need for some adjustments, however. To prevent new risks related to EU passporting, for instance, **applying common regulations uniformly within the EU** is essential. Strengthening and reforming the European Securities and Markets Authority (ESMA) and the European Insurance and Occupational Pensions Authority (EIOPA) can contribute to this (FGCEE, 2024).

310. For fintechs, **targeted, time-limited 'regulatory sandboxes'** can help set up and test new products and business models. In Germany, such sandboxes do not yet exist in the financial sector, but examples from abroad suggest that they can promote the development of the fintech sector. ↘ ITEM 291 Unlike established institutions, young companies have little expertise in dealing with regulation. Specifically, simplifications would primarily comprise **prudential regulations and reporting obligations** and be designed as a **temporary programme**. On the one hand, this programme could target **small fintech start-ups** that pose hardly any systemic risks. Once a company has reached a certain size or the programme expires, it would be subject to the same regulations as comparable financial service providers. International role models are the restricted banking licence in Australia or the regulatory sandbox in the United Kingdom, in which companies can test new products with customers. Moreover, established players could try out innovations in a simplified regulatory environment. This is already happening as part of the ECB experiments on wCBDC, ↘ ITEM 283 which represent a form of regulatory sandbox for trialling new products and technologies. Such

experiments could form the basis of a permanent programme. It would make sense to establish sandboxes at the European level, as financial regulation is largely determined by European law. ↘ ITEM 291

Such a programme should not only **include** regulatory simplifications, but should also establish **close exchange between the supervisory authority and participating firms**. This would allow the supervisor to quickly learn about new business models and products and keep pace with the sometimes disruptive developments in the fintech sector. At the same time, regulatory sandboxes must not be perceived by market participants as a seal of approval for the participating companies or business ideas. This will require precise communication of the supervisory authority. Otherwise, it could make it more difficult for companies that do not participate in such programmes to enter the market.

Simplifications are not appropriate whenever they affect the **individual protection** of customers (e.g. deposit guarantee schemes, correct payment processing) and the **anti-money laundering and combating the financing of terrorisms**. Here, the same standards must apply to all market participants. However, it may be useful if the authorities in charge support fintechs companies as part of a sandbox programme (e.g. advice, employee training).

311. Regarding the regulation of commercial banks, it is important that the digital transformation does not lead to an abrupt weakening of banks that might jeopardise financial stability. The first step is for the supervisory authorities to **systematically monitor the interconnections** between regulated banks and less regulated financial service providers along the value chain (EBA et al., 2022), as well as **risk taking and the liquidity position** of banks. Moreover, **completing the banking union** (GCEE Annual Report 2018 items 471 ff.) with effective resolution mechanisms at the European level can limit the risk of an uncontrolled market exit or a costly bank bailout.

Market finance is likely to become more important as specialised providers such as fintechs and big techs enter the market. ↘ ITEM 302 In order to strengthen market finance in Germany, which has traditionally been dominated by bank finance, progress on the **European Capital Markets Union** is essential (GCEE Annual Report 2023 items 268 ff.).

312. **Open banking regulations** ↘ BACKGROUND INFO 8 oblige banks to grant third-party providers access to customer data at the request of consumers. This could reduce a **competitive disadvantage for new fintech companies**. Although the latter can analyse data efficiently, they lack data access, unlike banks and big techs. Open banking may therefore boost demand for fintech services and improve the quality of their products. ↘ ITEM 270 However, forcing banks to share financial data with third parties may weaken their incentive to collect private information about borrowers because they bear the costs but have to share the data. Thus, such regulations should always be limited to data about consumers and not include data about firms because financing the latter typically requires information-intensive screening and monitoring by banks.

So far, the discussion on the EU Payment Services Directives (PSD 2 and 3) has focused on banks offering alternative payment service providers interfaces to customer data, which simplifies market access and reduces the market power of banks. In addition, one may consider **including big techs with significant financial activities in open banking regulations**, i.e. obliging them to pass on data at their customers' request. This approach would ensure that data access would not be one-sided at the expense of banks and could help establish a **level playing field for all providers** – banks, fintechs and big techs.

313. The **regulation and supervision of big techs with significant financial activities** has focused on individual business activities, but not on the group as a legal entity. ↘ ITEM 293 This approach is insufficient given the challenges and risks posed by big techs. ↘ ITEM 294 Systematically, three regulatory approaches are conceivable: **restrictions** that prohibit big techs from engaging in financial activities altogether; **separation**, so that the financial activities have to be a separate legal entity subject to the same prudential regulation and supervision as comparable financial institutions; or **inclusion** such that the entire big tech group – financial and non-financial business – is subject to financial supervision (Ehrentraud et al., 2022). Each of these approaches suffers from obvious weaknesses. Restrictions can be ruled out not at least for legal reasons; complete separation is unrealistic due to the interdependencies within a big tech group (e.g. data transfer); complete inclusion could mean that non-financial businesses such as e-commerce or internet search engines would also be subject to regulatory capital and liquidity requirements. A **combination of separation and inclusion**, as proposed by the Bank for International Settlements therefore appears promising (Ehrentraud et al., 2022). All financial transactions would be bundled in a separate holding company that is subject to prudential requirements for liquidity and solvency. In addition, the group as a whole would be subject to governance rules designed to ensure appropriate business conduct.

314. The GCEE acknowledges the **potential benefits of the digital euro** even though there is **no compelling reason** for its introduction. Several **concerns** that have been articulated in the public debate (e.g. disintermediation) have **already** been **largely addressed** with the envisaged design, e.g. low holding limits and non-interest-bearing balances. ↘ ITEM 239

The GCEE sees that the digital euro would bring **improvements in the payment market**, whose oligopolistic structure leads to high transaction costs. The digital euro can strengthen competition, offer a **cost-effective alternative** and contribute to the development of an autonomous, pan-European payment infrastructure. Furthermore, a central bank digital currency may offer **advantages beyond retail payments** in the future, e.g. technological innovations for wholesale payments or the use of smart contracts. It therefore appears sensible for the ECB to continue this initiative. As a central bank, the **ECB** seems **particularly trustworthy**. Unlike private providers, the ECB has no genuine interest in collecting large-scale use data and commercialising them. Finally, the digital euro can offer **protection against tail risks** – extreme but highly unlikely events. For example, by positioning itself in the digital payment market, the ECB can reduce the risk that a digital parallel currency or central bank digital currencies from

other countries drives out the official currency, which would massively weaken the effectiveness of monetary policy. The digital euro thus contributes to Europe's strategic autonomy in the area of payment systems.

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