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ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ
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(περιλαμβάνεται ως ξεχωριστή (δεύτερη) σελίδα στο σώμα της διπλωματικής εργασίας)

«Δηλώνω υπεύθυνα ότι η διπλωματική εργασία για τη λήψη του μεταπτυχιακού τίτλου σπουδών, του Πανεπιστημίου Πειραιώς, στη Διοίκηση Επιχειρήσεων : MBA» με τίτλο

«*Digital Banking and Financial Technology*»
έχει συγγραφεί από εμένα αποκλειστικά και στο σύνολό της. Δεν έχει υποβληθεί ούτε έχει εγκριθεί στο πλαίσιο κάποιου άλλου μεταπτυχιακού προγράμματος ή προπτυχιακού τίτλου σπουδών, στην Ελλάδα ή στο εξωτερικό, ούτε είναι εργασία ή τμήμα εργασίας ακαδημαϊκού ή επαγγελματικού χαρακτήρα.

Δηλώνω επίσης υπεύθυνα ότι οι πηγές στις οποίες ανέτρεξα για την εκπόνηση της συγκεκριμένης εργασίας, αναφέρονται στο σύνολό τους, κάνοντας πλήρη αναφορά στους συγγραφείς, τον εκδοτικό οίκο ή το περιοδικό, συμπεριλαμβανομένων και των πηγών που ενδεχομένως χρησιμοποιήθηκαν από το διαδίκτυο. Παράβαση της ανωτέρω ακαδημαϊκής μου ευθύνης αποτελεί ουσιώδη λόγο για την ανάκληση του πτυχίου μου».

Υπογραφή Μεταπτυχιακού Φοιτητή/ τριας.....

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Dedicated to my family

Abstract

The banking industry continues to prioritize digital transformation for a number of reasons. The key benefit is that it can help banks increase their operational efficiency and effectiveness. By streamlining processes and automating operations, financial institutions can enhance their ability to be future-ready and improve customer and member experiences. In addition, digital banking transformation can help banks and credit unions compete more effectively in an ever-evolving financial ecosystem. In recent years, the banking industry has faced increased competition from fintech companies and other non-traditional competitors, such as large internet companies. By using digital technology and processes, financial institutions can improve their service offerings and delivery methods. Finally, the transition to digital banking helps financial institutions reduce costs and boost profitability. Banking institutions can reduce their reliance on human labor and operating costs by automating operations and adopting current technologies, including automation. This helps maintain healthy profit margins, reallocate human and financial resources, and remain competitive in a tough market. The purpose of this paper was to examine the phenomenon of digitalization of banks, the use of new technologies by financial institutions and related frameworks, and new trends in the digital banking industry.

Key Words: Digital Banking, Digital Transformation, Cost-Efficiency, Financial Technology, Digital System, CBDC (Central Bank Digital Currencies)

Thanks

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Table of contents

Abstract.....	4
Table of contents	6
Table of Images	8
Introduction	10
References	12
Chapter 1: Digital Banking	13
1.1. Short history of banking	13
1.2. Digital Banking	13
1.3. New Trends	14
1.4. Advantages of Digital Banking	15
1.5. Disadvantages	17
1.6. The digitalisation of banks in the face of the pandemic	18
References	24
Chapter 2: Digital transformation of the banking system in Europe	26
2.1. Digital transformation (DT)	26
2.2. The cost-benefit regulation on the traditional banking operations....	28
2.2.1. Capital Requirements and Cost Efficiency.....	29
2.2.2. Liquidity Requirement and Cost Efficiency	30
2.2.3. Interest Rate and Cost Efficiency	30
2.2.4. Quality of Funding and Cost Efficiency	31
2.2.5. Security Market Regulation and Cost Efficiency	31
2.2.6. Bank size and Cost Efficiency	31
2.2.7. Macroeconomic Environment and Cost Efficiency	32
References	34
Chapter 3: FinTech companies	37
3.1. Financial technology	37
3.2. The industry's development	39
3.3. The FinTech business ecosystem	41
3.4. The importance of financial technology companies	44
3.4.1. Financial Inclusion	44
3.4.2. Cost-Effective Option.....	46

3.4.3. Fintech is Safe and Secure.....	47
References	49
Chapter 4: Reform of the European banking system	51
4.1. The characteristics of the existing framework	51
4.2. Crisis management for EU banks	59
4.3. Developments in Greece	63
4.4. Policies in Greece.....	68
References	70
Chapter 5: Central Bank Digital Currencies	73
5.1. Definition.....	73
5.2. Types of CBDCs	77
5.3. Cryptocurrency Vs CBDC	78
5.4. Benefits.....	79
5.5. Disadvantages	82
References	85
Conclusions	91

Table of Images

Image 1	Traditional business models in the payment services sector (https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA(2021)689460)	17
Image 2	Examples of new business models in the payments arena (https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA(2021)689460)	17
Image 3	Potential benefits of the BaaS model (https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA(2021)689460)	19
Image 4	Fintech ecosystem (https://www.gatewayhouse.in/big-fintech-is-here/)	.....39
Image 5	Percentage of adults with a bank or mobile depository account worldwide (https://plaid.com/resources/fintech/financial-inclusion/)	.....43
Image 6	Overview of main causes of the EU financial crisis https://www.eca.europa.eu/lists/ecadocuments/rw20_05/rw_financial_crisis_prevention_en.pdf	.....49
Image 7	Internal MREL for an expanded scope of non-resolution entities	.....50
Image 8	European institutions for financial supervision and resolution in a Banking Union	.....51
Image 9	table of vulnerabilities https://www.bankingsupervision.europa.eu/ecb/pub/ra/html/ssm.ra2021~edbbea1f8f.en.html	.....55
Image 10	Four phases of crisis management for EU banks https://www.eca.europa.eu/lists/ecadocuments/rw20_05/rw_financial_crisis_prevention_en.pdf	.....57
Image 11	Evolution of the stock of gross nonperforming loans and the corresponding non-performing loans ratio for Greek banks https://economy-finance.ec.europa.eu/system/files/2022-11/ip191_en.pdf	.....60
Image 12	Bank credit and deposit trends https://economy-finance.ec.europa.eu/system/files/2022-11/ip191_en.pdf	.....64
Image 13	Bank credit and deposit trends https://economy-finance.ec.europa.eu/system/files/2022-11/ip191_en.pdf	.....64
Image 14	Possible Future: The introduction of CBDC could remove risk from users, and allow banks to focus on services.	

	https://blog.digitalasset.com/developers/what-is-a-central-bank-digital-currency-and-why-should-people-prefer-cbdc-over-bank-accounts	71
Image 15	The two main types of CBDCs https://corporatefinanceinstitute.com/resources/cryptocurrency/central-bank-digital-currency-cbdc/	74
Image 16	Bank of International Settlements, The CBDC Pyramid. https://doi.org/10.1080/05775132.2021.2004738	81

Introduction

Much progress has been achieved by financial institutions on their digital banking transformation journeys, although levels of maturity vary. Others are still in the nascent phases. As with most of the shift occurring in the financial services business, the largest financial institutions have demonstrated the best results and highest level of maturity. The smallest banks and credit unions have also experienced some progress, although the majority of mid-sized enterprises (\$10 billion to \$100 billion) have lagged behind the market as a whole (Marous, 2022).

There are various elements that can influence the amount of digital banking transformation maturity of financial organizations. They include the organization's size and complexity, the level of investment in digital technology, the level of regulatory compliance currently in place, and the level of client demand for digital banking capabilities. The good news is that there are a variety of choices for working with third-party providers who can execute digital banking transformation solutions more quickly than in-house solutions. In addition to updating their systems and operations, incumbent institutions can also form partnerships with fintech and big tech rivals (Marous, 2022).

Many underlying themes influence the prioritization of investment and the advancement of digital banking transformation as we enter 2023. One of the most significant underlying trends is the ongoing expansion of digital banking usage and client expectations. As more consumers adopt smartphones and other mobile devices, banks are increasingly emphasizing the development of mobile-first strategies and mobile-optimized services. This includes mobile payments, mobile check deposits, and other services that make managing finances on the go easier for customers. The use of artificial intelligence (AI) and machine learning is a topic that is garnering a tremendous lot of attention, but is still exceedingly difficult for enterprises to adopt and deploy. In addition to utilizing AI and machine learning to boost cybersecurity and prevent fraud, banks and credit unions are employing sophisticated analytics to improve the accuracy and efficiency of operations and to create personalized client experiences. This includes offering customers with time-sensitive, individualized product recommendations to improve their financial health (Marous, 2022).

When digital banking transformation happens, financial institutions must consider modifying their current business model to meet the changing needs of the market

and to remain competitive as new competitors enter the market. It is certain that addressing the client experience will be at the core of future business model innovation. Financial institutions will prioritize enhancing the client experience by providing tailored services, enhancing the value proposition, streamlining distribution channels, and leveraging technology to make banking more convenient and efficient (Marous, 2022).

The purpose of this paper was to examine the phenomenon of digitalization of banks, the use of new technologies by financial institutions and related frameworks, and new trends in the digital banking industry. The methodology that was employed for this dissertation was an integrative literature review, constructing knowledge based on academic literature, recent reports and articles.

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Marous, J. (2022). Digital Banking Transformation Trends for 2023. *The Financial Brand*. [online] 19 Dec. Available at: <https://thefinancialbrand.com/news/digital-transformation-banking/digital-banking-transformation-trends-for-2023-157279/>.

Chapter 1: Digital Banking

1.1. Short history of banking

The development of digital banking has followed that of technology and the internet. It began with the appearance of the first ATMs and the first electronic bank cards in the 1960s, a period when the majority of banking customers began to accept and trust new technologies (Bátiz-Lazo, 2018).

In the 1970s, the development of computer technology, the creation of the first electronic transaction systems and the establishment of the SWIFT payment network were a major step in the evolution of digital banking (Scott & Zachariadis, 2012: 5). This was followed by the development of the internet in the 1980s, which enabled retail banking customers to use the first digital channels for their transactions. In the period 1980-2000, digital banking is now also used by home users, and the term 'on-line' is introduced, which refers to the combined use of a terminal, keyboard and computer screen to access banking systems via the user's telephone line (Schulte, 2008).

From the 1990s until 2000, digital banking was increasingly chosen for banking transactions (Salehi & Alipour, 2010: 202), reaching its peak at the dawn of the 21st century. Wireless technology and widespread use of smart phones ushered in a new era in digital banking, which fundamentally changed the way banking is done. The percentage of customers who now choose digital banking to conduct their transactions is believed to be as high as 60% (Beers, 2022).

1.2. Digital Banking

Digital banking refers to all banking services that are carried out with the help of technology and especially the internet (Aladwani, 2001: 214). The transition from traditional banking to digital banking has been gradual and is still ongoing (GateHub, 2020). The rapid growth of technology has brought about tremendous changes in the banking sector as well (Ismail, 2018). These changes in the banking sector did not happen by chance, great importance was given to the fact that banks had to take advantage of new technologies. In Greece, the four systemic banks had developed a plan starting in 2016, which emphasized the adoption and promotion of new

technologies. The aim of the country's banks is to create a solid foundation in order to take more decisive steps as the ever-changing developments require it. According to a survey by consulting firm Ernst & Young titled 'Global Banking Outlook 2018', digital transformation was the top priority for 85% of banks globally in 2018 (EYGM, 2018).

According to the same survey, banks considered investing in new technologies to improve their efficiency as important parameters for their success. but also risk management. Addressing cybersecurity was a top priority for global banks by 89% in 2018. Also another factor that helped e-banking was its low cost.

According to a survey, twenty-two percent of owners say more than a quarter of their business is currently transacted online, but 32% expect that to be the case within the next five years (Newport and McMurray, 2018).

1.3. New Trends

The rapid expansion of digital banking has made it necessary to transform the current strategy of banks to include all the channels used by their customers (Internet, mobile phones, physical branches), offering a range of digital products such as phone banking, online banking, mobile banking, etc. (Kaur et al., 2021: 107).

The multiple benefits of digital banking have led bank managements to prioritize investments in digital banking technology over conventional banking models.

The main factors shaping the future banking industry following the onslaught of the digital age are (Abbott, 2022):

- Changing customer behaviour as well as changes in their expectations of the Banks served to date.
- The constant pressures from bank regulators.
- Super-apps are dominating more aspects of the digital world and human interaction. Banks face a high-stakes choice to compete or collaborate.
- As Environmental, Social and Governance concerns grow, banks are being urged to become guardians of the planet. There will be costs—but the returns are sure to make it worthwhile.
- Fintechs and other trends
- “Free” products from digital-only challengers and BNPL firms are forcing banks to be more transparent—and more creative—with fee structures.

- Banks are looking for ways to have meaningful conversations with customers in digital spaces. Technology like AI can help make the human connection.
- With crypto currencies here to stay, experiments like Central Bank Digital Currency Trackers are gathering momentum. The search is on for use cases that prove the economic benefits.
- Artificial intelligence and machine learning in banking now surpass humans in some tasks. Applying this tech will bring zero waste operations within reach.
- The next payments revolution will stem from open networks, which empower banks to reimagine their payments offerings for newly-demanding customers.
- Search for growth in international markets
- The pandemic disrupted the supply chain for banks' most critical asset: talent. Competition is rising. Winners will transform themselves as employers.

1.4. Advantages of Digital Banking

In recent years, online banking has been gaining more and more users, who are fascinated by the positive aspects of digital banking (Shamdasani et al., 2008: 132).

Some of the advantages of e-banking are the following (Franke-Folstad, 2022):

- **Immediacy:** It is true that the user can choose the time to carry out his transactions as well as the place, 24 hours a day and 7 days a week and even from any place he wishes. Also electronic banking knows neither holidays nor public holidays, the transaction can be carried out and can be seen on the first working day in the system.
- **Easy to use interface:** the interface of electronic banking is increasingly user friendly, by pressing simple buttons, with videos and online explanations it becomes possible to use it even people who are not so familiar with technology. Alternative means: one can, as mentioned above, carry out transactions in many ways,
 - i. from their computer,
 - ii. their mobile phone, their smart watch,
 - iii. by phone, mobile wallet.
 - iv. Via ATMs
 - v. By means of cards and POS

- Sense of control: the e-banking user can see on his screen step by step the movements he makes , after executing the movement he wants he will have to give the final confirmation before the movement is valid, having even been informed of the supplies that will have occurred. He can also at any time see the history of the moves he has made.
- Update. He can check if the transaction he made on his own was done, when, and at what time. He can also learn about new products of the Bank and new services offered by the banks.
- Organization. It makes it easier for the user, with proper planning, not to forget to fulfill his obligations, with a simple transfer order.
- Cost: the commissions required by banks are lower through their website than from the branch. It makes sense since it does not require the help of a bank employee for each transaction. The user of the online banking page becomes a bank employee all by himself.
- Automation of transactions: the user can by standing orders schedule some payments so that they are made automatically. That is, when he knows the date when an account expires he gives a standing order electronically to have the payment happen a specific day of each month without any additional movement for each month, as long as of course there is money through in his account. Especially in payments that may incur interest in case of delay the standing order policy can be very useful.
- Security: most importantly, banks ensure that customers can enjoy all of the above in a secure environment. Security through e-banking is ensured by strict standards and safeguards such as the unique user code that each transactor has, the pin number required for each login to the internet site, the code confirmation that comes on the mobile ,are some of these safeguards

Besides, banks are wasting time and money in this area by hiring specialized staff and programs that provide them with the security that their customers require. Properly trained staff is key to the successful implementation of a digital reform. Continuous and adequate training, using them in the right position and properly evaluating their skills as well as their opinion on processes and suggestions can solve problems in processes and techniques that could not be implemented digitally. A properly and technologically trained employee will have an even more correct opinion on the outcome of actions.

Similarly, from the banks' side there are some benefits, such as:

- Reduction in costs; with the help of digital banking banks use much less staff and thus save money.

- The services provided are always active. The service offered is 24 hours 7 days a week and 365 days a year. All the bank's customers, whether through branches or web are served better and faster since e-banking helps to avoid crowding of bank customers in the branches and no queues
- Banks can serve even their customers who are located in small areas and remote from the city.
- By developing innovative services and technologies, banks enhance their competitiveness, their reputation and their customer base. This results in attracting more customers.
- Banks can gather a significant number of statistics. quantitative and qualitative characteristics resulting in the development of their products and services.

1.5. Disadvantages

Digital banking also has some disadvantages. On the customer side the main disadvantages are (Natter, 2019):

- Specific technological equipment is required to be able to connect to a bank's digital page, one must have a computer or smartphone and definitely an internet connection.
- It is required to be knowledgeable in a specific expertise. Internet pages are very user friendly however however the user should be familiar with the use of electronic media.
- Distrust: a major hurdle to overcome in order to use e-banking was that customers had to be convinced to trust the new technologies. Customer mistrust often stems from the lack of physical contact with employees, and there is always a fear of the security of transactions due to external factors or personal error, in which case, of course, the cost is not borne by the banking institution but by the customer himself.

There are some disadvantages on the bank's side as well, such as:

- Initial investment and maintenance costs: banks have to spend huge amounts of money on the new technologies necessary to provide all these services to their customers. There are new products appearing every day and increasing the competition between banks, whose staff is discovering new improvements every day so as to attract more customers. Therefore, in addition to the costs required for the design and implementation of the banks' network ,an additional cost is

required for the maintenance of this network and for its evolution and adaptation to the new technologies that are constantly emerging.

- Costs of educating customers: new technologies are not familiar throughout the world, especially to older people. Banks employ qualified staff who give instructions at all times by telephone. There are also video tutorials on the banks' internet sites which make it easier for users. Advertisements are also used from time to time which also contribute to the same purpose. Especially after the pandemic, there are many difficulties in visiting a branch, such as: having to make an appointment first, withdrawing or depositing more than a certain amount, paying pensions only by card, etc., all of which force even older people to use the electronic banking system, usually with the help of someone close to them, of course.
- Security of transactions: Another major cost incurred by banks is transaction security, either through updating and upgrading security protocols to ensure the solvency of transactions and protect customers from fraud or even through closed circuit monitoring at ATMs. In recent years, the number of people using digital banking has been increasing, but this has not happened by chance, banks have slowly convinced and educated their customers.

1.6. The digitalisation of banks in the face of the pandemic

Beyond the impacts the COVID-19 pandemic has had on human health, the virus has had a significant impact on regional and worldwide economies, at the level of all economic sectors, with particular significance in the sphere of technology. The pandemic crisis has been compared by analysts to the phenomenon of the black swan, which is a sudden, unexpected event of significant significance that causes serious consequences and profound changes in the political and economic environment. The COVID-19 pandemic crisis has impacted corporate operations and performance and increased demand for contactless financial goods and services. Infection control measures like social exclusion and lockdowns of specific areas of society were implemented to prevent the spread of COVID-19. The vital part that digital infrastructure may play in the quick provision of services by banks and other financial institutions has been underscored by this pandemic. The magnitude of the changes may be seen in the fact that, globally, 76% of adults now have a bank account, up from 51% a decade ago, and that, in developing countries, 71% of individuals now have one, up from 42%. When there were mobility constraints and

when the government considered restricting the usage of cash because it was unhygienic, the highest rise in digital payments was observed. Despite all the negative consequences on most economic sectors, other activities showed increasing patterns, particularly in the area of internet commerce, which created a demand for digitalization in order to conduct online business. The conditions imposed by the epidemic have caused people to do more transactions online, which has sped up the adoption of banking and financial digitalization, including technical advancements in banks, in order to boost their efficiency and offer present clients better services. Due to pressure from central banks and governments to absorb the shocks brought on by the pandemic crisis to the economy, which had an impact on their profitability and performance, banking institutions also played a significant role in supporting the real sector. To lessen the impact of the pandemic crisis on homes and businesses, governments in European nations have taken a number of actions (Doran, Bădîrcea and Manta, 2022: 1-2).

The surge in e-commerce and contactless payments brought on by the epidemic has led to more initiatives in the field of payment services, boosting up-and-coming competitors that pose a threat to established companies and could reduce bank earnings in the next years. For individuals and businesses looking to exchange money, banks often serve as a gateway in traditional business models in the payment services industry. Banks are the ones exchanging information on amounts to be debited/credited and paying outstanding balances via the central bank, despite the fact that the front-end infrastructure may differ (e.g., debit cards, credit cards, online banking, and other remote banking services for businesses) (Resti, 2021).

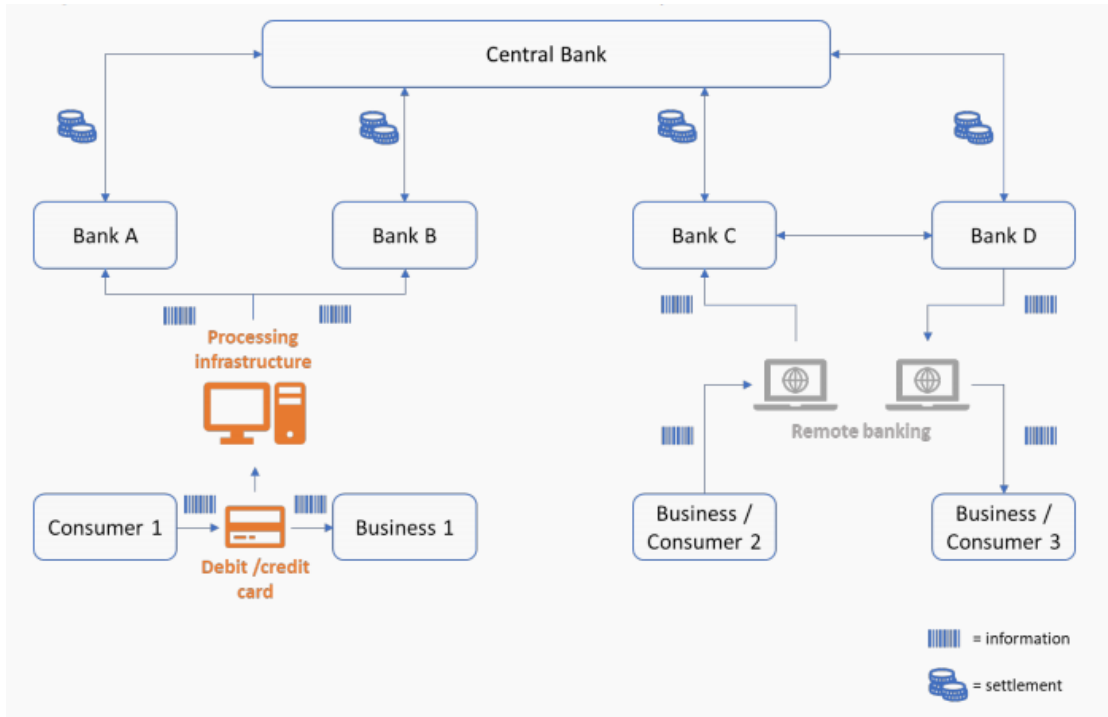


Image 1 Traditional business models in the payment services sector ([https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA\(2021\)689460](https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA(2021)689460))

In the past 15 years, new initiatives and technologies, whose potential has been further increased by the epidemic, have reduced the market dominance of banks.

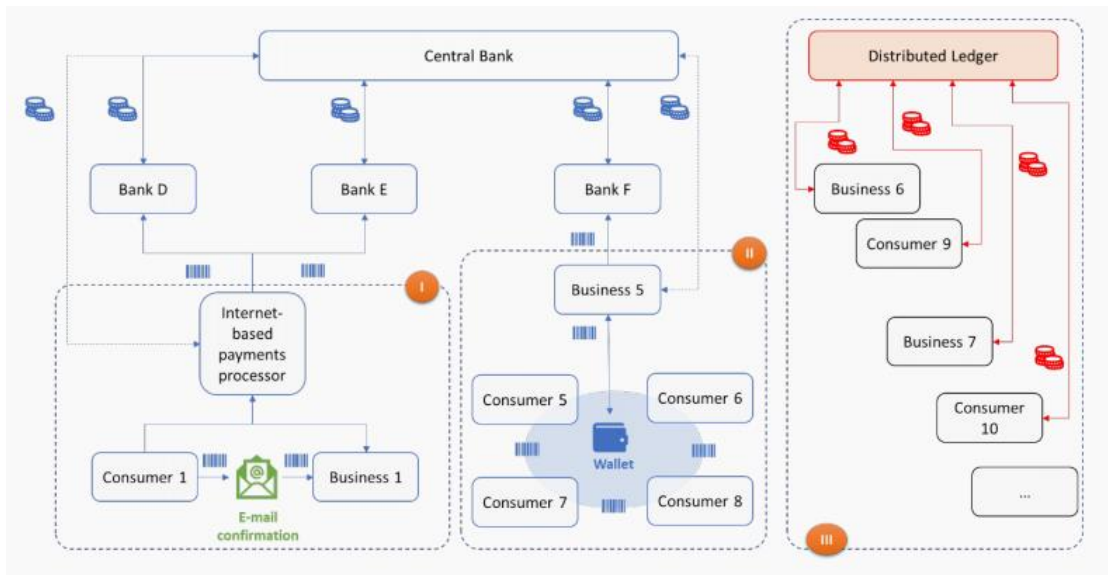


Image 2 Examples of new business models in the payments arena ([https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA\(2021\)689460](https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA(2021)689460))

First (Case I), new payment processors with a focus on e-commerce transactions have emerged, giving consumers a quick and secure way to transfer

money (often with free insurance coverage on their online purchases) and giving merchants the chance to sell products and services globally using a single tool in exchange for a fee. Second (Case II), non-financial businesses such as e-commerce websites and phone companies have begun running their own "electronic wallets," giving customers a simple and affordable way to exchange money among themselves, sometimes focusing on small transactions for which traditional transfers would prove to be too time-consuming and unprofitable. In both Cases I and II, new payment providers can choose to become chartered institutions to acquire access to central bank settlement or they can use a bank to handle interbank payments. In the meantime (Case III), new distributed technologies have made it possible to conduct payments without depending on the banking system or even the Central bank. This includes crypto-assets (which, however, do not provide a reliable means of payment due to the significant volatility in their market value) and global stablecoins, which can be pegged to actual currencies and backed by a sufficient amount of low-risk assets (Resti et al., 2021). Traditional lenders' profitability is under risk due to the entry of non-bank companies in the payment services industry. In order to provide the same simplicity of use, standardization, and service breadth given by the new entrants, institutions must improve the accessibility of their systems since more and more consumers have grown accustomed to alternative channels throughout the pandemic. This necessitates considerable IT expenditures and can result in additional consolidation. Banks have also been embracing Internet-based platforms (including sites owned by non-financial companies) as an outlet to approach new clients and sell customized goods with minimal distribution costs in response to the growing involvement of new entrants in traditional payment services (Resti, 2021: 22).

According to Fu and Mishra (2021), the Covid-19 crisis has significantly increased the amount of new technology testing and adoption in the EU financial sector. Customers' lifestyle changes as a result of the pandemic have been found to have increased willingness to trust the security of internet/mobile banking services, a favorable perception of the usability of new technologies, and an increase in the perceived utility of these services, according to Baicu et al. (2020). In line with this development, the EBA recently conducted a survey on the use of digital platforms by banks, including comparators (websites that compare products provided by various institutions), platforms managed by institutions to provide access to third party services, platforms marketing non-financial goods and providing bank services as a side product, ecosystems (i.e., platforms acting as a single point of entry to numerous third-party providers, both financial and non-financial), and enablers (platforms enabling access to pre-existing payment tools and leveraging data for

service extension). Travel booking websites that offer insurance or foreign exchange, real estate companies that offer credit and/or insurance products, and online retailers that offer installment loans are a few examples of non-financial platforms that advertise banking services. These agreements, often known as "banking as a service" or "BaaS," entail the payment of a brokerage fee to the site owner, who retains ownership of the distribution network (and may decide to switch to a different provider in a way that is almost unnoticeable to the final customer). However, they also bring about a number of benefits, giving banks an inexpensive, novel approach to expand their customer base and develop their product lineup, according to a recent study of retail bank executives.

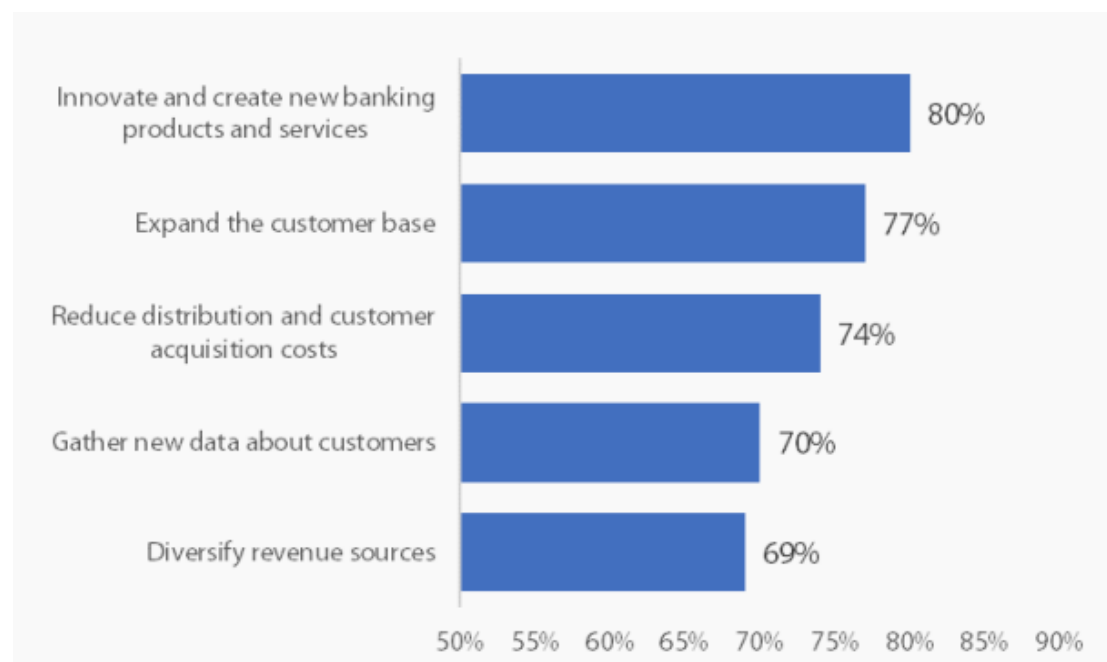


Image 3 Potential benefits of the BaaS model ([https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA\(2021\)689460](https://www.europarl.europa.eu/thinktank/en/document/IPOL_IDA(2021)689460))

Ecosystems differ from traditional business models in that banking services are offered with other financial and non-financial products on the website, not as an add-on service. In turn, they are distinct from enablers (typically, large technology companies), who frequently operate in situations where a contractual relationship with the customer already exists (for example, a deposit account) and who facilitate a new method of payment (for example, a digital wallet hosted on the customer's smartphone that allows payments through an NFC terminal or a QR code). According to the European Banking Authority (2021), the increased use of digital platforms offers a variety of potential opportunities for both EU clients and financial institutions, as it can make it easier for customers to access financial products and services while

giving lenders new ways to meet rising demand without incurring the costs of a traditional sales network. However, as more and more lenders rely on digital platforms to sell their products, this could lead to the emergence of brand-new arrangements in which banks and non-financial entities are financially, operationally, and reputationally dependent on one another.

In addition, the communication between bank supervisors and authorities overseeing digital platforms run by non-financial entities may prove untested and slow to respond (given the sector's rapid rate of innovation and the frequent provision of cross-border services). Non-financial entities that act as middlemen between lenders and customers are typically less regulated than financial institutions. For banks, who believe they would suffer reputational harm if the services offered through digital platforms were disrupted, this may lead to instability and some sort of "step in risk." Network economies that reward huge platforms and anti-competitive behavior that creates a highly concentrated market may also make institutions more dependent on third-party platforms. Digital platforms' capacity to attract new clients unfamiliar with financial services could also present challenges in terms of misselling, conduct risk, and customer protection (including, e.g., complaint handling, as the provision of banking services relies on multiple players and individual responsibilities may become blurred). Concerns over privacy protection may also arise from the platforms' use of personal data to profile user behavior and interests. Recently, the European Banking Authority recognised these dangers and outlined a variety of potential solutions (European Banking Authority, 2021).

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Chapter 2: Digital transformation of the banking system in Europe

2.1. Digital transformation (DT)

Globally, organisations undergo periods of change for many reasons, such as growth, resolving internal issues, adapting to external pressures and adopting additional changes for the future (Kanter, 2003). Organizational change is a double-edged sword, as it is required for organizational viability but it is found to impact the workforce negatively and finds resistance (Demerouti et al., 2021: 374). Aravopoulou (2016: 19) pointed out that organizational change is a broad term that involves changes to a small or large extent. Organizational development affects both the internal and external environment of the organization. For this reason, they act as "drivers" of change and the two types of influences tend to complement each other. Internal environmental changes in an organisation include new equipment, new services and products, recruitment of new staff, new structure in the organisation's operations and change in strategy. That external environmental changes, according to Child (2015), involve new policies from central authority, social and cultural, technological, demographic, economic and changes in market forces (Alvesson & Sveningsson, 2015: 14). The nature of both the internal and external environment, which is subject to change due to the reason of DT, forces organisations to change many departments and areas within the organisation, including their strategy, structure, operations, technology and culture (Andrew & Mohankumar, 2015: 302).

Limerick et al. (1995) defined organizational transformation as a holistic, ecological, humanistic approach to a radical, revolutionary change in the entire context of an organizational system. Transformational changes alter the basic structure, strategy and culture of the organization (including values and norms). It requires new learning, an innovative culture and effective leadership for successful implementation of DT. Many studies describe organizational transformation as a fundamental revolutionary change that occurs in the very structure of the organization. Furthermore, DT can be used as a tool for organizational development by encouraging operational structure and competitiveness while transforming the organization's strategy (Hanelt et al., 2021: 1170).

The rapid adoption of new digital technologies and their development over time has caused huge changes in almost all organisations and across the globe. These large-scale changes are widely known as DT, where it has been the focus of many academics and researchers with the development of business research. Vial (2019: 118) defined DT as a process that aims to improve an entity by inducing changes in its properties through the combination of information, technologies, computing, communications and connectivity of these parts. On the other hand, there are researchers who support the definition of DT as the enormous changes caused by digital technologies in organizations (Hess et al., 2016).

Hess et al. (2016) highlighted DT for its complex nature and its role in transforming the business model of the entire industry. DT encompasses the concepts of "process alignment and culture transformation" (Gong & Ribiere, 2021: 2). According to these changes, improvements in productivity, performance and profitability of an organization can be achieved. Although Chatzopoulos and Weber (2021: 75) reported that DT improves organizations in areas such as customer experience and operations, which Westerman et al. (2014) agree with, however the latter added that success could only be achieved at the individual, organizational and financial levels if strong leadership skills are used to transform the organization and its culture in conjunction with strengthening the areas of business development. Parise et al. (2016: 2) focused on the consumer-focused definition of Digital Transformation, in which digital technologies are used to enhance the customer experience. While Horlacher & Hess (2016: 5133) pointed out that DT occurs when values and revenues are created due to digital technologies. On the other hand, Lundberg et al. (2020: 4347) described DT as "innovations" that provide changes in "structures, practices, values and beliefs". van Tonder et al. (2020: 116) defined the areas that were transformed during the transformation process that include business models, products, services, operations, processes, networks, skills, new talent development and culture production. While, Gurbaxani et al. (2019: 209) added that transformation can occur through vision development, strategy and change in the structure of the organization.

It is necessary to distinguish between digitisation and DT. First, the former can be achieved through the application of technological methods, while the latter requires radical and holistic changes (Fischer et al., 2020: 2). Second, although each of the two terms has a different meaning, some authors use the two terms interchangeably (Legner et al. 2017: 3). Digital innovation is considered the cause of digital penetration (Rodríguez-Abitia & Bribiesca-Correa, 2021: 1). However, DT is considered the change process caused by both digital penetration and digital

innovation. At the same time, DT is also considered as a result of digital innovation (Skog et al., 2018: 432).

According to Tilson et al. (2010: 2), digital technologies have paved the way for digitisation, digital innovation, penetration and digital media. Due to the use of digital technologies, organizations must simultaneously make changes at multiple levels, including its strategy and culture (Ismail et al., 2017).

The implementation of digital transformation is linked to strategies where organisations seek to set and redefine key objectives that are in line with increased customer expectations. Essentially, companies implementing digital transformation can innovate and optimise their operations by upgrading their business model. In addition, the culture of the organisation is directly linked to digital transformation, as it can accelerate its implementation or, conversely, be a problem and a cause of delay. The consumers themselves also play a key role in the implementation of digital transformation, as digital transformation comes to be linked to their real needs, as well as to the requirements they express. Finally, it should be mentioned that through the applications of digital transformation, the levels of interaction between the human resources and the organization are enhanced, as well as between the customers and the organization itself (Ministry of Digital Governance, n.d.).

2.2. The cost-benefit regulation on the traditional banking operations

Regulation ideas have been founded on two basic paradigms: public interest and private interest theories. The assumption behind public interest regulatory theories is that regulators have sufficient knowledge and enforcement powers to successfully promote the public interest. Thus, regulation is provided in response to public demand for the correction of inequitable or inefficient market processes (Baumol, 2004). The implication is that regulations are designed to serve society as a whole rather than popular vested interests.

According to the public interest viewpoint, regulation supports the efficient operation of banks by simply avoiding market failures for the benefit of larger civil society (Whynes and Bowles, 1981). Because regulators are regarded as neutral arbiters, they would not be hampered by information market failures, and they could more easily package information to establish the point at which the marginal cost of

intervention equals the marginal social benefits (Asch, 1988). As a result, the public interest would be served if the banking system allocated resources in a socially optimal manner that maximizes production while minimizing variations, i.e. maximizes social welfare. In contrast, the private interest theory of regulation is more skeptical of regulators' motivations and behavior, viewing regulation as socially ineffective. The regulators are supposed to be under-informed about cost, demand, quality, and other aspects of corporate behavior. They are also vulnerable to regulatory capture by advocacy or special interest groups. As a result, when it comes to controlling enterprises or societal activities, they can only do it imperfectly, if at all (Den Hertog, 2010: 20).

2.2.1. Capital Requirements and Cost Efficiency

Bank capital adequacy is critical in mitigating financial insolvency. Several studies have found that tight capital requirements improve bank cost-efficiency (Haque and Brown, 2017: 7; Chortareas et al. 2012: 297). Other studies, on the other hand, have claimed that strict financial market regulation has the potential to harm banks' performance by prohibiting them from enjoying economies of scale and scope through a more diverse variety of banking products or a bigger scale of operations (Barth et al., 2013: 26-27). In this situation, regulations may result in inefficient resource allocation; thus, deregulation allows and pushes banks to use more efficient manufacturing practices (Claessens & Laeven, 2004: 5).

According to Anginer, Demirguc-Kunt, and Zhu (2014: 21), prudential capital requirements appear to have a favorable influence on bank stability in banking sectors with (1) relatively weak supervision and monitoring and (2) underdeveloped institutions. Furthermore, he established that banks in transition nations saw a surge in demand for bank loans during the research period because the majority of those countries had seen sustained growth and low inflation rates for over two decades. However, the presence of regulatory capital requirements has constrained banks' ability to develop.

When controlling for other supervisory and regulatory policies, Barth et al. (2004) discover that, while stringent capital requirements are associated with fewer nonperforming loans, capital stringency is not robustly linked with banking sector stability, development, or bank performance (measured with overhead and margin ratios). Furthermore, in determining whether greater capital requirements are worthwhile, D'Erasmus (2018: 5) discovered that higher capital requirements cause

major banks to grow larger, placing pressure on small banks to combine or collapse. As huge banks' market clout develops, they extract higher profits by hiking lending rates, which tightens credit and depresses the economy's productivity. Furthermore, fewer fail while taking more risks because their charter value is higher under the tighter capital requirements.

2.2.2. Liquidity Requirement and Cost Efficiency

Liquidity is crucial to the stability of the banking system, given that it represents the ability to fund assets and satisfy obligations when they fall due. According to Ryan et al. (2014: 28), tougher liquidity laws would compel banks to change both their asset and liability organizations in order to meet these new criteria. This suggests that their policies tend towards improving their share of high-quality liquid assets and funding from more stable non-financial deposits while at the same time, strive to lower the short-term intra-financial loans share and short-term wholesale funding. Corporate lending rates and interbank funding costs are also influenced by the liquidity ratio. Bonner and Eijffinger (2012) discovered that Dutch banks who fell short of their liquidity targets did not impose a higher interest rate on business loans. Furthermore, the banks paid higher interest rates on unsecured interbank loans, despite the fact that this regulatory information was not made public.

2.2.3. Interest Rate and Cost Efficiency

According to Eregha (2010: 41), interest rates have a favorable impact on domestic loan demand in the short term but a detrimental impact in the long run. Increases in actual lending rates may not have an immediate impact on credit demand; nevertheless, in the long run, they may lead to a decrease in credit demand and vice versa. As a result, the possibility that interest rate regulation is an unproductive policy choice emerges. According to Maimbo and Gallegos (2014: 23), interest rate caps are ineffective at addressing the underlying causes of high rates, such as a lack of market competition, market inefficiency, large fiscal deficits, and legal bottlenecks that prevent customers from switching banks, and they introduce additional distortions into the system as banks attempt to circumvent caps.

2.2.4. Quality of Funding and Cost Efficiency

According to Arnould et al. (2021: 2), excessive funding costs caused by bank-specific vulnerabilities can erode banks' revenues and deplete banks' capital buffers in bad times or slow their build-up in good times. This means that excessive funding costs caused by bank vulnerabilities might harm banks' ability to absorb macroeconomic shocks and jeopardize the banking sector's overall stability. Furthermore, Arnould et al. (2021: 11) believe that if increased funding costs are carried through to higher lending rates, the real economy will suffer by decreasing demand for new lending, causing deleveraging, and resulting in weaker economic activity. Ellis and Flannery (1992: 485) demonstrated the relationship between capital levels and interest rates. They give empirical evidence that lower capital levels are connected with higher interest rates on uninsured deposits.

2.2.5. Security Market Regulation and Cost Efficiency

The creation of an informationally and financially efficient market is aided by the security market. According to Avgouleas and Cullen (2014: 8), countries with underdeveloped capital markets and inefficient legal frameworks make market discipline an inadequate instrument for improving banking sector efficiency. Furthermore, a lack of openness in financial transactions and poor information quality cause principal/agency relationships to fail, resulting in severe restrictions in comprehending and assessing risks, rendering traditional models of corporate governance useless. In opposite, Barth et al. (2013) believe that regulatory scrutiny has been severely influencing the efficiency of the banks by imposing expenses, including higher origination standards, slower loan growth, compliance costs and inefficiencies.

2.2.6. Bank size and Cost Efficiency

Bank size, which is frequently assessed by total assets, determines both the scope of activity and the type of clients it serves. Huge banks, for example, have a customer that is more stable, such as governments, large enterprises, and international corporations. Small banks, on the other hand, primarily serve disadvantaged and low-income households and their microenterprises. Larger banks

are more efficient, according to Tecles and Tabak (2010: 1592). On the contrary, Isik and Hassan (2002: 731).

2.2.7. Macroeconomic Environment and Cost Efficiency

Economic growth increases cost-efficiency, whereas inflation increases cost-inefficiency. The negative relationship between GDP growth and cost inefficiencies is that increased disposable income leads to increased demand for goods and services produced by enterprises. Increased sales would, in turn, enhance enterprises' and consumers' debt service capabilities, resulting in a decrease in non-performing loans. Rinaldi and Sanchis-Arellano (2006: 6) discovered that rising inflation impairs the performance of the bank loan portfolio, implying a positive (negative) link between inflation and cost inefficiencies. In studies to capture the effect of the macroeconomic environment, inflation and GDP growth rate have been utilized (Osoro & Kiplangat, 2020: 10).

Mulidy (2021) estimated the Bank regulation - Cost inefficiency nexus at Industry-level. According to the findings, rigorous capital requirements have a favorable and statistically significant influence on bank cost efficiency. This finding indicates that banks' cost-cutting behavior is positively related to capital-requirement tightening. The findings are consistent with those of Barth et al. (2013), Haque and Brown (2017) and Chortareas et al. (2012), who found that rigorous capital requirements improve bank cost efficiency.

	Coefficient	T-ratio
Constant	16.387	5.00
Capital adequacy	-3.9519	-4.21
Liquidity Ratio	5.4464	9.60
Interest Rate	-0.00005	-1.36
Quality of Funding	-0.31717	-1.31
Size	-0.93942	-2.89
Security Market Dummy	0.67314	1.11
GDP Growth Rate	-18.9698	-1.90
Inflation rate	-4.0909	-1.46

Table 1 Bank Regulation - Cost Inefficiency Nexus at Industry-Level (Mulindi, 2021)

According to Cambis (2012), since the 1960s and 1970s, with the seminal work of Phelps, Friedman, and Lucas, inflation expectations have been a central

factor in models of inflationary dynamics, and they play a crucial role in New Keynesian dynamic stochastic general equilibrium (DSGE) models used to inform and evaluate monetary policy. In many inflation models utilized by central banks, inflation is driven by three primary factors: some measure of a resource utilization gap (such as the output gap or unemployment rate gap) or marginal cost of production; lagged inflation, which captures the inertia in the inflation process; and inflation expectations. According to Coibion, Gorodnichenko, and Ropele (2019), enterprises do base pricing decisions on their inflation forecasts, and their research demonstrates that firms boost prices in response to rising inflation expectations.

Additionally, the OECD Composite Leading Indicators (CLIs), which are designed to predict economic activity reversals over the next six to nine months, continue to indicate a deteriorating picture in the majority of the world's largest nations. The CLIs continue to foresee a loss of growth momentum in the majority of significant OECD nations, as they are weighed down by historically high inflation, poor consumer confidence, and falling share market indexes. The OECD composite leading indicators are cyclical indicators based on a variety of forward-looking measures, including order books, building permits, confidence indicators, long-term interest rates, and new vehicle registrations, among others (Cambis, 2022).

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Chapter 3: FinTech companies

3.1. Financial technology

The term FinTech is an abbreviation of the term "financial technology", which in Greek is translated as "financial technology" and is a combination of financial services and information technology. The term "FinTech" was first used in the early 1990s, in the title of a Citigroup project aimed at enhancing technological cooperation (Hochstein, 2015).

Academic and business literature defines the term FinTech differently. Generally, the term FinTech refers to innovative and personalized financial services and products (Dany, 2016). On the other hand, authors such as McKinsey (2016) and Gulamhuseinwala, Bull and Lewis (2015) associate the term FinTech with business models, while Kim et al. (2016) perceive it as an entire sector of economic activity. At the same time, Zavolokina, Dolata and Schwabe (2016) summarize that either new services, products and processes or new business models emerge from the FinTech industry, while Dany et al. (2016) point out that a characteristic of FinTech services is that they put the customer at the centre. The Financial Stability Board describes the term FinTech as financial innovation driven by technology and argues that the revolution and innovation of the FinTech industry lies not only in the products used directly by the end consumer, but also in the technology used behind the system in question (Ogunode and Akintoye, 2023). FinTech promotes financial innovation through technological means and develops business models, technological applications, processes and products that have a significant impact on financial markets, financial institutions and financial services, breathing new life into economic growth and posing new challenges (Ogunode and Akintoye, 2023).

In any case, all sources agree that the FinTech industry is leveraging digital technologies, such as the internet, and social media (McKinsey, 2016; Dany et al., 2016; Gulamhuseinwala et al., 2015), while several sources also refer to the use of data analytics and artificial intelligence (Dany et al., 2016). By leveraging emerging digital technologies, the FinTech industry is enabling, innovating and disrupting the financial services market. Zavolokina et al. (2016) argue that, in addition to technology, the FinTech industry represents an evolution between start-ups and established firms that receive adequate monetary investments. Overall, the term FinTech refers to the integration of technology and finance and the use of emerging

online information technologies to transform and innovate financial products and service business models (Ogunode and Akintoye, 2023). The FinTech industry is characterized by low margins, high rates of innovation and growth, and plays an innovative role in investment and finance, risk management, payments, information security and user experience (Ogunode and Akintoye, 2023).

From an industry perspective, FinTech firms are typically non-financial firms, such as technology-oriented firms and internet-based firms (Gulamhuseinwala et al., 2015). Although some of them hold a full banking license (N26 company is typically cited), most firms in the industry do not hold a similar license. In order to offer services that require a full banking license or to leverage the regulatory and risk management expertise of traditional banking institutions, some FinTech firms are partnering with traditional financial institutions (Gulamhuseinwala et al., 2015). Today, FinTech firms, whether start-ups or established firms in the IT industry, are entering the financial market and attracting customers who traditionally serve This is attributed to three causes (Gomber et al., 2017). First, FinTech firms offer new products and solutions that meet customer needs that were not fully met by financial service providers. In addition, FinTech firms have created new opportunities to sell products and services through the development and implementation of innovative technologies and concepts. Finally, firms with a technological background are relatively better suited to provide services in a particularly innovative environment (Gomber et al., 2017). Since changes and developments in the field of communication and information technologies are taking place at a rapid and dynamic pace, firms operating in this field need to be flexible and innovative. Consequently, such IT companies are usually characterized by a culture that is distinctly different from established financial service providers, with the result that the former put the latter under pressure (Gomber et al., 2017). FinTech firms focus on cost-effective, internet-based business models to attack established financial service providers. In fact, some industry professionals argue that in the future, banking institutions will be used exclusively for deposits, while any other transaction will be carried out through the use of FinTech firms' services.

With numerous venture capital investments over the past few years, FinTech firms have shown impressive growth globally, demonstrating their full potential through rapid growth (Gulamhuseinwala et al., 2015). In 2014, more than 75% of global FinTech investments were made in the U.S., between 10% and 15% were invested in the European market, and between 5% and 10% were invested in Asia (Dietz and Khanna, 2016). Due to the limited bureaucratic barriers, substantial understanding of customer needs and dynamic teams with high technological

capabilities, FinTech firms were distinguished for their short turnaround cycles and short time to market for their products. Although the majority of them adopt customer-centric strategies, their long-term success rates are not yet available and their profits remain uncertain. However, FinTech firms are particularly attractive to traditional financial institutions, which are already investing in FinTech partnerships, acquisitions and internal incubator development to expand their service portfolio, target new market segments and enrich the customer experience (Dany et al., 2016).

3.2. The industry's development

According to Arner, Barberis and Buckley (2015), the evolution of the financial technology industry took place in three stages. The first stage, under the title FinTech 1.0, lasted from 1866 to 1967 and involved the transition from analogue to digital technology. In the late 19th century, the combination of finance and technology led to the first period of financial globalisation, which lasted until the beginning of World War I. During this period, technologies such as the telegraph, railways and steamships strengthened financial links across borders, enabling the rapid transmission of financial information, transactions and payments around the world. At the same time, the financial sector provided the resources needed for the development of these technologies. In the post-war period, when financial globalisation was limited for several decades, technological developments, particularly those that emerged during the war, developed rapidly, particularly in the field of communication and information technology. In detail, firms such as IBM commercially developed the first computers, while Texas Instruments developed the first financial computer in 1967 (Arner et al., 2015). In the 1950s, the first credit cards appeared in the United States, and by 1966 the first global telex network had been developed, which provided the fundamental communications necessary for the development of the next stage of financial technology. In 1964, the Xerox company introduced the first fax machine to the market and in 1967, the Barclays company developed the first ATM (Arner et al., 2015).

The second stage in the evolution of the FinTech industry, called FinTech 2.0, lasted from 1967 to 2008 and involved the development of traditional digital financial services. During the period from 1967 to 1987, financial services evolved from an analogue to a digital industry. Key developments set the stage for the second period of financial globalization, which was marked by the global reaction to the 1987 U.S.

stock market crash (Arner et al., 2015). Reflecting the need to interconnect domestic payment systems across borders, SWIFT (Society of Worldwide Interbank Financial Telecommunications) was developed in 1973, and the Herstatt Bank collapsed in 1974, highlighting the risks of increasing international financial linkages, particularly through new payment system technology.

The aforementioned crisis triggered the first regulatory controls on the FinTech industry, in the form of a series of soft international law agreements to develop robust payment systems and related regulations (Arner et al., 2015). At the consumer level, 1980 saw the first introduction, in the US market, of electronic banking. During this period, financial institutions increased the use of IT in their internal processes, gradually replacing most forms of written mechanisms until the 1980s, when computerization further evolved and risk management technology was developed to manage internal risks. However, it was the development of the internet that set the stage for the next level of development (Arner et al., 2015).

By 2001, eight U.S. banks had at least one million customers online, with major financial institutions worldwide developing similar systems and related regulatory frameworks to address risk. By the beginning of the 21st century, banking institutions' internal processes, their interactions with external parties, and their ever-increasing number of interactions with retail customers became fully digital, which underscored the importance of IT investment by the financial services industry (Arner et al., 2015).

The third stage of the FinTech industry's evolution, under the title FinTech 3.0, started in 2008, lasts until today and concerns the democratisation of digital financial services (Arner et al., 2015). With the global economy emerging from the financial crisis, it became clear that many customers, especially the younger generation, had lost trust in banking institutions, while they had developed different consumption patterns from those of older consumers, as they had become accustomed to having access to personalised and personalised financial services (Arner et al., 2015). The aforementioned trend was accompanied by a steady growth in global FinTech investment, particularly through venture capital and private equity. In the period 2013-2014, in just one year, FinTech investment in the US nearly tripled, with London, Silicon Valley and New York emerging as the main centres of financial innovation, with additional financial centres developing in the following years in Amsterdam, Paris, Berlin and Dublin (Anyfantaki, 2016).

Today, the new opportunities that are emerging are having a very strong impact on the economies of emerging markets, particularly those characterised by rapid growth in the middle-income population. In particular, there is an increased

demand for financial services from people who previously had no access to the banking industry, as mobile-based technology now allows access to financial solutions without the need for a physical banking infrastructure (Anyfantaki, 2016).

In developing countries, the FinTech industry includes, among others, (i) a young population characterized by digital literacy and equipped with mobile devices; (ii) a rapidly growing middle class, with 60% of the global middle class to be located in Asia by 2030; (iii) inefficient financial markets that allow informal alternatives; (iv) lack of physical banking infrastructure; and (v) under-regulated frameworks for data protection and competition. The aforementioned characteristics are further enhanced by the interaction between a dynamic private sector seeking to expand to the provision of financial services and a public sector seeking to reshape the market to achieve economic growth (Anyfantaki, 2016).

As for the Asian and African markets, the recent growth of the FinTech industry is mainly driven by economic developments. Typically, in Hong Kong and Singapore, business development programmes for innovative companies have been developed in less than a year, which act as innovation incubators, providing space, support and every possible form of assistance to young researchers, entrepreneurs and start-ups to develop new ideas and technology-driven solutions in the financial services industry (Anyfantaki, 2016). The emergence of the FinTech industry in Asia is the result of a combination of a number of business and regulatory factors. In particular, IT spending by traditional banks in Asia and Africa is lower than in Europe and the US. This can be attributed to a slightly less competitive market, which is largely controlled and subject to state-owned banks (Anyfantaki, 2016). The lack of trust in the state banking system, due to corruption and inefficiency, implies that users are inclined to adopt alternatives offered by non-banking institutions. As a result, mobile financial services and mobile products are becoming comparatively more attractive (Anyfantaki, 2016).

3.3. The FinTech business ecosystem

The existence of a stable, symbiotic ecosystem plays a fundamental role in the development of the FinTech industry. Diemers et al. (2015) suggest that participants in the FinTech ecosystem include entrepreneurs, government and financial institutions, while Lee and Shin (2018) identify five elements of the FinTech ecosystem: (i) FinTech start-ups, which are active in payments, wealth management, lending, capital markets and insurance, among others; (ii) developers of technology

solutions, such as big data analytics, cloud computing, cryptocurrencies, etc.; (iii) government, as represented by financial industry regulators and legislation; (iv) financial industry customers, whether individuals or institutions; and (v) traditional financial institutions. These are elements that symbiotically contribute to innovation, stimulate the economy, facilitate cooperation and competition in the financial industry and ultimately benefit consumers in the financial industry.



Image 4 Fintech ecosystem (<https://www.gatewayhouse.in/big-fintech-is-here/>)

At the centre of the ecosystem are FinTech start-ups, which are predominantly entrepreneurial and which are bringing significant innovations in the areas of payments, wealth management, lending, capital markets and insurance through reducing operating costs, targeting niche markets and providing more personalised services than traditional financial firms (Lee and Shin, 2018). The aforementioned firms are driving the phenomenon of financial services decentralization, which has been particularly disruptive for banking institutions (Walchek, 2015). The ability to decentralize services is one of the main growth drivers for the FinTech industry, as traditional financial institutions are disadvantaged in this context. Consumers no longer rely on a single financial institution to meet their needs, but instead choose the services they want from a range of FinTech firms. At

the same time, venture capital and private equity managers are contributing to the growth of FinTech firms, resulting in a significant increase in the level of investment over time (Lee and Shin, 2018).

On the other hand, technology solution developers provide digital platforms for social media, big data analytics, cloud computing, artificial intelligence, mobile devices and smart phones. Technology solution developers create an enabling environment for FinTech firms to quickly introduce innovative services to the market (Lee and Shin, 2018). Big data analytics can be used to provide unique personalized services to customers, and cloud computing can be used to enable FinTech firms to develop web-based services at much lower costs than those required to develop in-house infrastructure. Algorithmic trading strategies can be used as the basis of wealth management services, while social media facilitates the development of communities in the case of crowdfunding and person-to-person lending services (Lee and Shin, 2018). Finally, the universal presence of mobile devices substitutes for the advantages of physical tending, while mobile network operators also provide low-cost infrastructure for FinTech firms to develop services. In the same context as above, the FinTech industry generates income for technology solution developers.

As for governments, they have provided a favourable regulatory environment for FinTech companies since the financial crisis of 2008 (Nash et al., 2015). Based on national economic development plans and national economic policies, different governments provide different levels of regulation (financial services licensing, relaxation of capital requirements, tax incentives, etc.) for FinTech companies in order to push them to innovate and facilitate global financial competition. To illustrate, in Singapore, the government has made changes to the regulatory framework for online payments in order to make it friendlier to online payment solution providers and to boost the growth of payment technology (Reuters, 2016). On the other hand, since 2008, traditional financial institutions have been subject to stricter regulations, capital requirements and reporting requirements, by the regulators of the respective government. The looser regulatory requirements imposed on FinTech companies allow the latter to provide more personalised, less expensive and more accessible financial services to consumers. However, while certain regulations are favourable to FinTech companies, the latter need to understand how these regulations affect their service delivery. The example of FinTech company LendUp, which was fined \$3.63 million for violating consumer financial protection laws, is a case in point (Consumer Financial Protection Bureau, 2016).

Financial customers are the source of income for FinTech companies. In fact, while large institutions are important sources of income, the dominant source of

income for FinTech companies is individual customers and small and medium-sized businesses. Moreover, it is found that the use of FinTech services is more prevalent among younger age and better-off consumers (Nash et al., 2015). Early adopters of FinTech services are mainly individual consumers, technology-savvy, young, residing in urban areas and characterized by relatively high income. Today, consumers aged 18 to 34 years old represent a significant share of FinTech service consumption in most countries, and future demographics are also favourable for FinTech companies as it is expected that in the coming decades, young age consumers who are technology-savvy will represent the largest share of the population and will drive developments in the FinTech services industry (Lee and Shin, 2018).

The last element of the FinTech ecosystem is traditional financial institutions. After realizing the disruptive power of the FinTech industry and the diminishing opportunities to mitigate the FinTech industry's impact on the market, traditional financial institutions have rethought their existing business models and developed strategies that will enable them to embrace the innovation of FinTech firms (Lee and Shin, 2018). Traditional financial institutions are characterized by competitive advantages over FinTech firms in terms of economies of scale and financial resources. However, traditional financial institutions tend to focus on bundled services, providing understandable financial products and services to consumers, rather than decentralized but personalized products and services (Lee and Shin, 2018). Moreover, although initially, traditional financial institutions viewed fast-growing FinTech firms as threats, they are now focusing on partnering with them through various financing providers. In return for providing funding, traditional financial institutions can leverage the knowledge of FinTech companies to stay at the forefront of technology (Yang, 2015).

3.4. The importance of financial technology companies

3.4.1. Financial Inclusion

Many people in the United States and throughout the world lack access to the fundamental financial services that others take for granted. Numerous individuals lack access to bank accounts and debit cards due to their location, movement, and financial circumstances. According to the Federal Reserve, 13% of American adults are underbanked, meaning that they have a bank account but rely on expensive services such as check cashing and payday loans instead. 6% of the population is

unbanked, meaning they have no bank account and rely only on these services. Access to banking is closely connected with income, education, and race. Unbanked and underbanked individuals suffer a number of financial obstacles, such as lack of access to credit, difficulty to develop savings, and the risk of losing money to predatory financial service providers. However, fintech has the potential to expand financial services to these groups, which is the essence of financial inclusion (Sullivan, 2022).

Financial inclusion signifies that all individuals and enterprises in a society have inexpensive access to the financial services they require. Checking accounts, credit cards, insurance, and other essential financial instruments are accessible to all, including low-income and underserved regions. Due to the significant number of unbanked and underbanked individuals in the United States, it is evident that we do not live in a financially inclusive society. Nevertheless, numerous fintechs are attempting to remedy the situation. Plaid, for instance, has collaborated with Green Dot's GO2bank, which provides mobile-first banking with no fees and early paycheck access. These banking services are accessible to individuals for whom standard financial services have been inaccessible. Joining the Plaid network provides GO2bank's customers with access to over 6,000 fintech applications, thereby enhancing their financial freedom and well-being (Sullivan, 2022).

Financial inclusion is crucial because it provides low-income and excluded populations with reasonable and convenient access to fundamental financial services, which were historically less accessible. When access to financial services, which is frequently facilitated by fintech, is increased for these groups, financial empowerment increases. Globally, the emergence of fintech has occurred together with the expansion of financial inclusion. Globally, 76% of individuals have a bank or mobile account in 2021, up from 51% in 2011. This has resulted in billions more bank account holders over the past decade, primarily in poorer nations. This growth is attributable to fintech's contribution to financial access and is building a more financially inclusive global community (Sullivan, 2022).

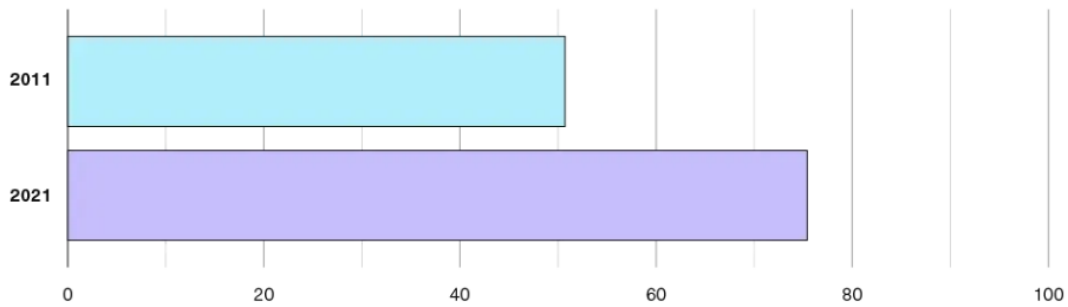


Image 5 Percentage of adults with a bank or mobile depository account worldwide (<https://plaid.com/resources/fintech/financial-inclusion/>)

3.4.2. Cost-Effective Option

Fintechs are improving the quality of payment services by leveraging advanced technologies. Fintechs' transparency has attracted a substantial market share. Fintechs give solutions that are simple, clear, and unified, in addition to being inexpensive. Fintechs connect major client bases with banks in order to facilitate quick payments via wallets, payment applications, or online banking. The flexibility, speed, and affordability of Fintech transactions are made possible by cutting-edge technology. FinTechs are able to attract clients with lower prices because to their virtual operations, flexibility, and lack of regulation as a deposit institution or source of venture financing. Not only have fintechs improved the user experience, but they have also assisted banks in offering consumers with buy-now-pay-later purchasing options. Covid-19 halted global economies, making it twice as difficult for individuals to meet their fundamental needs. Due to the introduction of the buy-now-pay-later (BNPL) option, individuals have been able to resolve their financial troubles. In contrast to the time-consuming process of acquiring a loan, customers without a credit card can use BNPL in a matter of seconds. The BNPL option applies to a variety of products and services, including appliances, autos, travel, and other comparable items, making them relatively affordable to consumers. Banks benefit from Fintechs in a variety of ways, including establishing a massive customer base and winning customers' trust. Banks such as RBL have worked with over 90 start-ups in India and the United Kingdom, acquiring 30% of its total 2.8 million customers. Yes Bank is another example of a bank that has partnered with FinTechs and garnered 20% of its client base (Anand, 2021).

3.4.3. Fintech is Safe and Secure

Although individuals and organizations are generally concerned about cybersecurity, financial institutions take the matter more seriously. According to the findings of a recent survey, banks spend over 70 percent of their budgets on devising and implementing security methods to prevent cybercrime. Other areas of concern for banks include mobile updates, cloud technologies, and system upgrades. These data demonstrate that cybercrime is the most significant threat facing organizations in the financial sector. In addition, the organizations stand to lose a substantial amount if a cybersecurity threat materializes because they hold a substantial amount of customer funds. When hackers gain access to bank networks, the institutions incur two types of damages. First, they lose crucial client information and, with it, their reputation. In addition, regulators around the world are enacting stringent rules to compel businesses to handle client data responsibly. If banks fall victim to cyberattacks, regulatory authorities are likely to investigate them (FSBT.TECH, 2018).

The issue with conventional banks stems from their business model and approach to client service. Large banks are typically inefficient when it comes to serving consumers and adjusting to new trends. Millennials are abandoning traditional banks in droves in favor of challenger banks due to the dreary nature of conventional banks' offerings and the attractiveness of Fintech's innovative banking approaches. Similarly, incumbent banks are slower than challenger banks when it comes to implementing cybersecurity safeguards. Fintech is founded on technology, whereas traditional banking institutions view technology as a necessary addition to their tried-and-true models. In contrast, nothing could be further from the truth. According to credible evidence, huge conventional banks lose more money to hackers than Fintech companies. Cybercriminals are able to easily breach the networks of major and traditional banks since these institutions do not prioritize Fintech. Although Fintech also has risks, their focus on leveraging technology to improve the banking process places them in a better position than their conventional counterparts to address cybersecurity challenges (FSBT.TECH, 2018).

Numerous instances in which huge traditional banks have failed to protect their customers' data do not indicate that Fintech is superior to other financial institutions. There have been a modest number of data breach events involving Fintech companies because there are fewer Fintech companies than traditional banks. However, Fintech is superior to traditional financial institutions since challenger banks prioritize the technological protection of client data. Fintech

companies offer their services via the internet and mobile phones. According to a report by PWC, Fintech can rapidly adapt to market changes and implement stringent cybersecurity procedures to combat new threats. Thus, it is simpler for new banks to prioritize the security of client activity on their systems than for large conventional banks (FSBT.TECH, 2018).

One of the defining characteristics of challenger banks is their use of open banking to service their consumers. In practice, the usage of open banking entails that financial services organizations choose to employ open source technology rather than the highly closed and proprietary ones utilized by conventional banks. Fintech employs open source technology to guarantee that its APIs are accessible. Thus, third-party developers can rapidly create new applications that operate on Fintech's platform. By doing so, challenger banks encourage the creation of an ecosystem of highly sophisticated applications that enhance service delivery overall. In addition, Fintech's use of open technologies revolutionizes how organizations handle customer data. It is typical for Fintech companies to share information with their consumers whenever the customers require access. In the case of conventional banking institutions, it has been the usual for banks to be unable to readily grant clients access to all the data they maintain. Therefore, the open banking methodology aids Fintech in enhancing their services and handling client data in a more transparent manner. Some commentators have argued that the usage of open APIs, for instance, makes new institutions more vulnerable in general. Current trends indicate, however, that while the usage of the open banking model exposes Fintech to new cybersecurity vulnerabilities, the same model is a useful weapon for banks to utilize against attacks. Therefore, banks can use open banking techniques to increase their security and enhance client service (FSBT.TECH, 2018).

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Chapter 4: Reform of the European banking system

4.1. The characteristics of the existing framework

The debate on how to improve the rules and procedures for dealing with bank failures in the European banking union began a few years ago, but gained momentum in 2017 when two major banks – both of which fell under the purview of the Single Supervisory Mechanism (SSM) and the Single Resolution Board (SRB) – failed. These incidents demonstrated how challenging it can be for the existing laws to permit the orderly market exit of various sorts of institutions whose failure could cause systemic disruption. It is somewhat paradoxical that these difficulties have become so pronounced in the EU, as this is arguably the jurisdiction that has modernized its crisis management framework the most by adopting the new international standards on bank resolution (the FSB Key Attributes) in a timely, thorough, and stringent manner (Restoy, 2022).

The current role of ECB and ESCB is to (Cambis, n.d.):

- Serve European Commission's targets
- Remove fragmentation and secure max benefit for EU citizens and firms
- Enhance digital operation resilience framework

The FSB Core Characteristics were one of the most significant regulatory measures implemented by the worldwide community in the wake of the Great Financial Crisis (GFC) to lessen the likelihood and economic effect of financial crises. They intended to implement a bank resolution mechanism that would aid in maintaining the essential functions of failing systemic institutions without requiring a significant outlay of public resources. Based on its own experiences during the global financial crisis, the EU had a clear incentive to adopt the new resolution system (Buch, Bundesbank and Dages, 2018). Europe was the region hardest damaged by the global financial crisis, necessitating substantial public aid. Between 2008 and 2014, the net cost to European governments of sustaining financial institutions exceeded €200 billion (European Union, 2020).

Area	Main causes
Financial system	<ul style="list-style-type: none"> ○ Weak corporate governance and risk management, with risks being insufficiently monitored and inadequately controlled internally, in particular for the process for applying for and granting loans (loan origination), for exposure concentration in specific assets (for example, exposure to real estate in some EU Member States), and for certain complex financial products which were largely outside the scope of any regulation at the time; ○ Weak capital and liquidity buffers compared to the level of risk incurred, with a number of important institutions having an equity capital base that amounted to less than 3 % of their balance sheets at the time of the crisis; and ○ Failures of large banks that were ‘too big to fail’ (such as Lehman Brothers in the US) or risks of large bank failures in the EU, caused the entire banking sector to experience systemic stress.
Regulatory and supervisory framework	<ul style="list-style-type: none"> ○ Inadequate micro-prudential oversight over the quality of internal risk management and capital and liquidity adequacy; ○ Different rules between Member States within the internal market, and weak EU-level coordination for large financial institutions operating across borders and markets; and ○ No resolution and adequate winding-up mechanisms for financial institutions, and no EU framework to deal with failures of cross-border financial institutions.
Economic governance	<ul style="list-style-type: none"> ○ Low interest rates prior to the crisis contributed to the formation of real-estate bubbles; ○ Macroeconomic imbalances prior to the crisis remained largely unaddressed, with no EU macro-prudential framework in place for systemic risks; and ○ High levels of debt accumulated prior or as a result of the crisis among financial institutions and the wider economy, with unbalanced growth in certain euro area Member States. This generated pressures on sovereign yields, financial instability and made it difficult to get finance from the capital markets, requiring assistance as the crisis unfolded.

Image 6 Overview of main causes of the EU financial crisis https://www.eca.europa.eu/lists/ecadocuments/rw20_05/rw_financial_crisis_prevention_en.pdf

This resulted in the adoption of procyclical fiscal austerity programs, which exacerbated the economic recession that followed the start of the crisis. Moreover, this connection between the weaknesses of banks and the need for public support sparked a destabilizing spiral between financial and sovereign risk that spawned redenomination risks, ultimately endangering the very existence of the European

monetary union. To preserve both the social cohesion within member countries and the resiliency of the European integration project, it was deemed necessary for Europe to develop crisis management tools that could reduce reliance on public funds to safeguard financial stability, in accordance with the FSB's Key Attributes (European Union, 2020).

In response, European authorities established a single resolution mechanism (SRM) in 2014 as part of the banking union initiative. In legal parlance, the SRM creates rules, tools, and procedures for addressing the failure of systemic institutions in the banking union, or those that meet public interest criteria. These restrictions include an effective ban on government bailouts and a predominance of creditor bail-ins to preserve the essential activities of failing institutions. In addition, the new framework envisages the centralisation of resolution decisions within a European agency (the SRB) and the establishment of an industry-contributed mutualised fund (the Single Resolution Fund, SRF) (EUR-Lex, 2014, consolidated 2022). This fund may be utilized to support resolution actions, but only if a substantial number of creditors' claims have been bailed in. According with these minimal bail-in standards, banks are ordinarily required to issue huge quantities of financial instruments that could become loss-absorbing at the time of insolvency (the minimum requirement for own funds and eligible liabilities, MREL) (Single Resolution Board, 2022a).

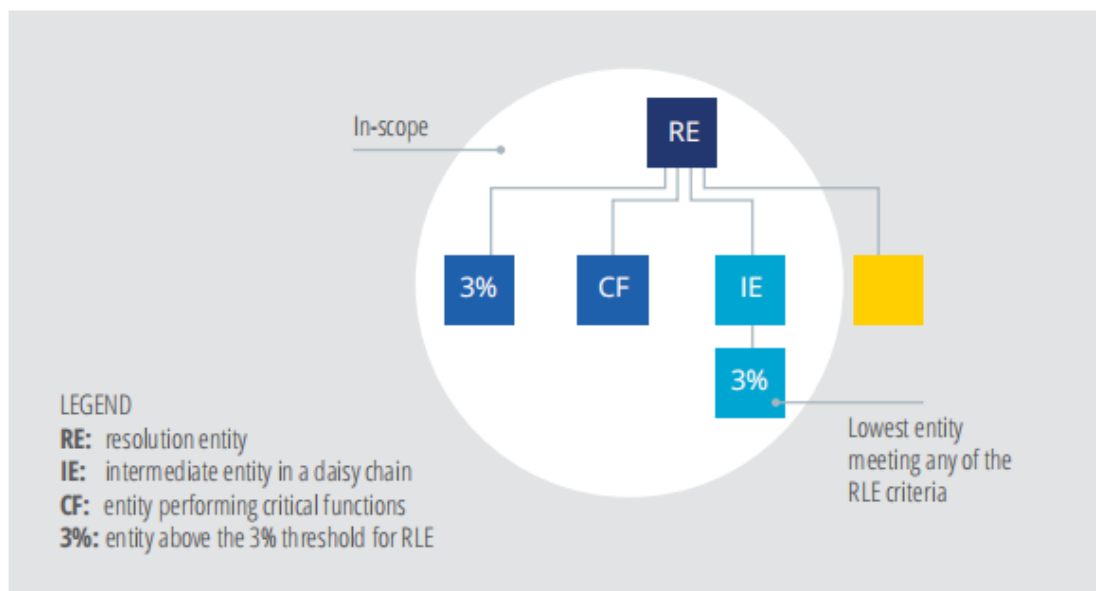


Image 7 Internal MREL for an expanded scope of non-resolution entities

Expanding the number of subsidiaries for whom the SRB will establish an internal MREL. Entities providing important functions and/or those surpassing the 32% criterion of the resolution group's total risk exposure amount, or leverage exposure,

or total operational income (the previous requirement was 43%), or those with total assets exceeding EUR 10bn are included in the scope. They are known as RLEs. Notably, entities delivering vital functions are included in the definition of RLEs even if their size falls below the threshold. In addition, the SRB establishes internal MREL for intermediate entities, which are defined as subsidiaries of resolution entities that are the parent entities of at least one RLE. In accordance with the SRB's guideline on the scope of LDR reporting, the above-mentioned companies are required to submit an LDR to guarantee that the financial data required to calculate MREL is accessible. As considered appropriate in future cycles, the SRB will reevaluate the extent of subsidiaries with internal MREL (Single Resolution Board, 2022a).

The regulations governing the SRM represent a strict adaptation of the FSB Core Characteristics. No other jurisdiction has arguably put more specific and stringent restrictions on the use of foreign funding (public or private) to facilitate resolution. In addition, it is uncommon for authorities outside the EU to require banks (and not just internationally systemic ones) to meet MREL-type obligations. Again, the severity of these limits is essentially a political reaction to recent events and the particular institutional constraints created by the multinational nature of the European banking union (Arda & Dobler, 2022).

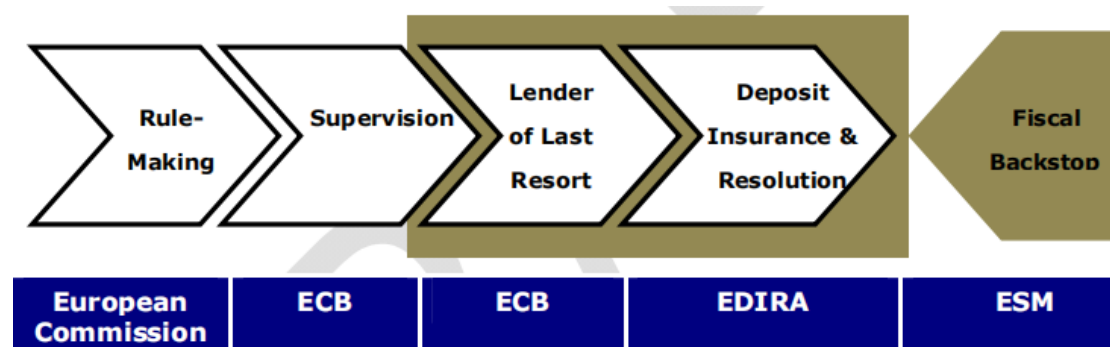


Image 8 European institutions for financial supervision and resolution in a Banking Union

While the design of the EU resolution mechanism is internally coherent, it does not provide a robust blueprint for addressing the failure of a significant portion of banking union institutions. In this regard, it is crucial to underline that the common resolution framework coexists alongside a constellation of domestic insolvency regimes enshrined in national law that have not altered significantly in recent years. When failing institutions do not meet the required resolution criteria relating to the public interest, national regimes – which frequently involve the administration of court-based general insolvency proceedings – are nonetheless implemented. Intriguingly, the availability of public assistance during insolvency (in the form of liquidation aid) is, on average, far less constrained than during resolution.

The Single Resolution Mechanism is a component of the European Banking Union's broader structure. Image 8 depicts the steps of decision-making and the relevant bodies in this new emerging European governance structure. The European Central Bank (ECB) assumes the role of supervisor and lender of last resort for the European financial sector, while the European Commission retains its regulatory authority. If this level fails to fix difficulties, resolution is the next step (i.e. a single resolution mechanism). Schoenmaker and Gros (2012) advocate for the establishment of an independent European Deposit Insurance and Resolution Authority (EDIRA) that would be responsible for this phase. The third component of the governance structure is the fiscal backstop. The European Stability Mechanism (ESM) was established to serve as a fiscal safety net for member nations, but it may also serve as a fiscal safety net for the banking systems of member countries experiencing financial trouble. Hence, the arrow for the fiscal backstop is reversed in Image 8. Given the necessity for a fiscal backstop, the new SRM (in the form of an EDIRA) must work closely with the ESM. Notwithstanding this, it is crucial to preserve the independence of the resolution authority, as the ESM is governed by the ministries of finance (Beck, Gros and Schoenmaker, 2013).

Table of vulnerabilities for 2021

Internal to banks	Weaknesses in management and coverage of credit risk	Structurally low income levels and profitability	IT deficiencies
	Weak governance, incl. weak strategic steering	Lingering cost inefficiencies	
External to banks	High public and private debt levels in the euro area	Overcapacities in banking	Fragmentation in the regulatory and legal framework

Source: ECB and national competent authorities.

Note: Internal vulnerabilities can be addressed by the banks themselves, while external vulnerabilities refer to the environment in which banks operate.

Image 9 table of vulnerabilities

<https://www.bankingsupervision.europa.eu/ecb/pub/ra/html/ssm.ra2021~edbbea1f8f.en.html>

Bail-in policies improve market discipline by guaranteeing that the agents responsible for bank distress are held accountable by removing the bank's managers and lowering shareholder and creditor rights. Shareholders and creditors are held accountable for monitoring the bank and limiting excessive risk-taking, specifically through the pricing of shares and debt. Prior to the crisis, market discipline was failing due to the too big to fail subsidy on the debt of giant banks; troubled banks were not compelled to pay higher borrowing costs. In addition, the capital infusions decreased the losses owners and creditors of bailed-out banks incurred during the crisis. Bail-ins would save the bank from failure, but shareholders and creditors would be responsible for losses and costs associated with the bail-in. The prices of stocks and bonds should be adjusted to reflect these anticipated losses (Meehl, 2022).

Owing to the change in payoffs to shareholders and creditors in the event of a bail-in, the equilibrium values of shares and debt under this new regime should differ from those under the bailout regime. Banks' exit, entry, risk-taking, and debt-to-equity financing decisions could be affected by a shift in prices. For instance, the greater cost of borrowing for banks following the abolition of bailouts could lead to a reduction in investment and lending, which could inadvertently affect consumers. In addition, a prospective loss of shares due to a bail-in may discourage shareholders from investing in a new bank, so limiting the industry's growth. While the bailing-in of a bank may preserve its services for some customers, decreasing entry may result in a decline in banking services generally. Hence, the consequences of this new policy on consumers are unknown, and a structural model is required to compare equilibrium conditions under each policy. A few bail-ins have occurred in the EU thus far, although these resolutions occurred before the Financial Recovery and Resolution Regulation was finalized. In conducting these bail-ins, there was no single policy to follow, and many of them were only partial bail-ins that also included bailout elements. In addition, it is unknown whether banks and their creditors anticipated bail-ins. Consequently, it is impractical to predict how banks' decisions might alter under a "bail-in regime" using EU banking data collected after the financial crisis and before to the finalization of Banking Recovery and Resolution Directive (Meehl, 2022).

If bail-in becomes a crucial component of contemplated resolution procedures, the current structure is ineffective for dealing with the failure of banks whose liabilities cannot be utilised for loss absorption or recapitalization without causing a major disturbance. This describes medium-sized banks that are primarily funded by deposits. These institutions are often too large to be subject to traditional insolvency liquidation procedures, but too small and inexperienced to issue the substantial sums

of bail-in-able debt (such as subordinated bonds) required for resolution. In the absence of those instruments on these banks' balance sheets, authorities would not be able to recapitalise the institutions by making use of internal funds or by gaining access to the resolution funds as the minimal bail-in conditions for the latter would not be met (Restoy, 2016).

Authorities have handled the issues provided by the failure of mid-sized banks by utilizing national insolvency procedures and utilizing public funds to enable a smooth withdrawal from the market. This has necessitated delicacy in the evaluation of the systemic consequences of bank collapses. In specifically, in order to be subject to national insolvency, those failures have to fail the public interest test for resolution. To justify the use of taxpayer cash, these projects have to be judged as having a negative impact on the economic or financial system (Restoy, Vrbaski and Walters, 2020).

This strategy is suboptimal. It implies, rather paradoxically, that in order to activate the necessary support to prevent systemic stress, authorities must avoid employing the framework specifically created to deal with systemic bank crises (resolution) and instead deploy the regime intended for less significant institutions (insolvency) (European Commission, 2014). Moreover, the extensive use of national insolvency regimes – funded entirely with domestic resources – represents a departure from the principles that inspired the creation of the banking union, namely the urgent need to sever the destabilizing link between domestic financial risks and the sovereign. It would necessitate the renationalization of bank failure management and, thus, the renationalization of bank risks.

Prior to addressing the flaws of the current framework for crisis management in the banking union, greater harmonization of domestic insolvency procedures is required. While a comprehensive common insolvency framework appears politically unfeasible at this time, there should be room to further harmonise those domestic solutions that have the greatest potential to cause friction with the common resolution scheme. Moreover, when facing the failure of mid-sized banks, it is necessary to avoid the paradoxical choice between open bank bail-in under resolution and piecemeal liquidation under insolvency, as both approaches have the potential to destabilize the financial system. Additionally, relying on public assistance during insolvency cannot be regarded to be a viable solution to this situation (Garicano, 2020).

Facilitating sale-of-business (SoB) (or purchase-and-assumption) transactions to arrange the orderly exit of failing banks is a potentially effective strategy for tackling the aforementioned difficulties. These strategies – in which

deposits and other sensitive liabilities of failing banks are transferred to stronger institutions – have been employed successfully in other jurisdictions, such as the United States, for a number of years but cannot be easily implemented in the European context at this time (FDIC, 2013). Clearly, the success of SoB tactics is contingent upon the presence of a suitable customer. This is highly dependent on the value of the failing bank's transferable assets and the availability of external finance to compensate buyers for assuming failing banks' deposits if, as is frequently the case, the available assets are insufficient.

It is possible to raise the amount of assets that can be transferred by forcing medium-sized banks to keep, as a counterpart, liabilities that can be written off or converted into capital as the banks fail. Hence, a correctly calibrated MREL could facilitate the implementation of transfer schemes. Yet, given the restricted ability of mid-sized banks to perpetually issue and reimburse bail-in-eligible liabilities, external funds should be available to compensate buyers. In certain jurisdictions, the deposit guarantee scheme (DGS) can offer this external money. However, DGS funding is often constrained to a financial ceiling: it is only accessible if the anticipated cost of the intervention is less than the cost of paying out deposits in liquidation (Restoy, 2022).

In the case of the EU, DGS assistance for SoB transactions is severely constrained (if not rendered irrelevant) by legal rules that place DGS claims above uncovered deposits in the hierarchy of creditors. This "super-preference" of DGS claims shields them from incurring liquidation losses. The conclusion is that European DGS are unable to enable SoB transactions, even though they would prevent a potentially disruptive and value-destroying piecemeal liquidation (European Banking Authority, 2019). Similarly, the SRF is not an appropriate source of capital to enable SoB transactions for mid-sized banks under the current system. The SRF is only available to failing institutions that satisfy the public interest criteria for resolution and only after a substantial bail-in of creditors has been implemented. As previously noted, it will frequently be extremely challenging for mid-sized banks to achieve these standards (Restoy, 2021).

Thus, the viability of SoB transactions necessitates substantial modifications to the current structure to permit adequate coverage of their finance requirements. One alternative is to loosen the limit on the use of DGS money to assist transfer transactions, which is now tied to the expenses associated with payout deposits in liquidation (European Commission, 2012). But, any action in this area must retain the DGS's ability to fulfill its primary mission, which is to safeguard insured deposits. Whether the existing super-priority of DGS claims in Europe is justified on public

policy grounds is a topic of controversy. It might be claimed that there is no clear policy justification for DGS claims to take precedence over uncovered deposits. In fact, the super-preference of DGS claims implies that individuals holding deposits in excess of the maximum amount insured by the DGS are less protected in insolvency than the indirect positions held by DGS-affiliated banks in relation to the failing organization.

In addition, following the example of other countries, such as the United States, and replacing the super-preferred of DGS claims with a general deposit preference rule could assist in mitigating risks of bank runs, hence preserving financial stability. This alternative preference rule would automatically loosen the current restriction on the use of DGS money to support SoB transactions, without jeopardizing the DGS's primary objectives (Mecatti, 2020).

The SRF could serve as an alternate source of financing. This would necessitate relaxing the current minimum bail-in requirements for the usage of these resources. In fact, there appears to be a compelling case for considering that the conditions for the SRF to facilitate an orderly market exit of failing banks, such as through a SoB transaction, should be less stringent than those imposed to ensure that the failing bank could continue operating and performing essential functions. Following a SoB resolution method, it is conceivable that banks (usually medium-sized) might be subject to less stringent minimum bail-in criteria. Note that while funds from the SRF would only be available for banks submitted to resolution, funding from the DGS could support bank failures regardless of whether the public interest requirement is met (Single Resolution Board, 2022b).

4.2. Crisis management for EU banks

The creation of a crisis management framework for failing or likely-to-fail institutions is a crucial step towards enhancing the resilience of the financial sector. In the absence of a proper structure to handle the process in an orderly manner, bank failures can have enormous disruptive impacts on the economy. In order to address these concerns, the EU has devised a comprehensive crisis management framework for banks, which consists of the Banking Recovery and Resolution Directive and the Single Resolution Mechanism Regulation (European Union, 2020).

Four essential steps comprise the crisis management framework for banks (see Image 10). In the preparatory phase, supervisors watch banks to detect any

impending crises as soon as possible. In addition, resolution authorities guarantee that all banks are resolvable and that all resolution plans are current. Supervisors may employ early intervention methods if a bank encounters difficulty. Yet, if the situation worsens, regulators or resolution authorities must proclaim the bank to be failing or likely to fail (FOLTF). After determining if resolution is required, appropriate, and in the public interest, resolution authorities must devise a resolution strategy. If resolution is not in the public's best interest, the bank is liquidated in accordance with national insolvency proceedings (European Union, 2020).

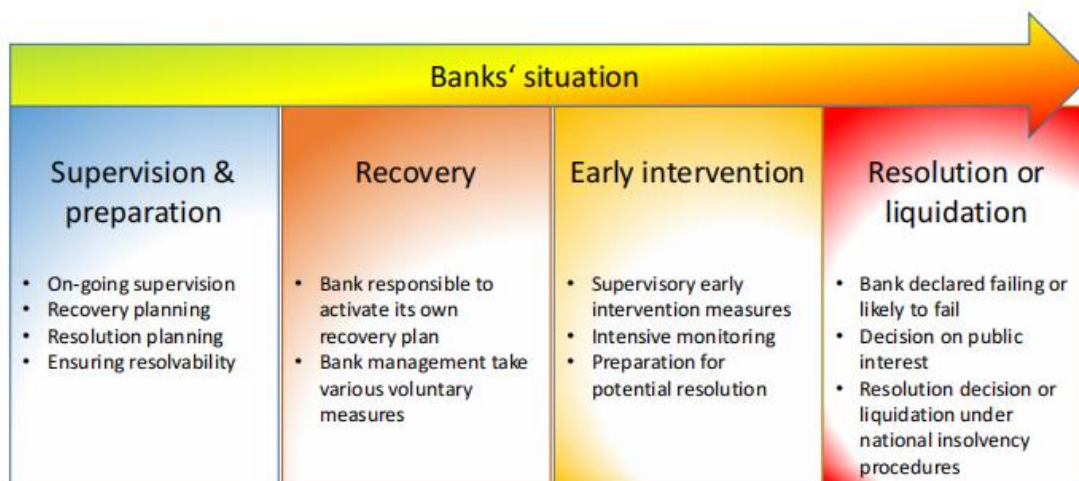


Image 10 Four phases of crisis management for EU banks https://www.eca.europa.eu/lists/ecadocuments/rw20_05/rw_financial_crisis_prevention_en.pdf

The new resolution framework includes the write-down and conversion of capital instruments tool and the bail-in tool, which are designed to shift the loss burden from taxpayers to shareholders and creditors (who would have benefited from any profits). It also contains three resolution tools: "sale of business," "bridge institution," and "asset separation." To defend the right to private property, the "no-creditor-worse-off" concept ensures that under national insolvency laws, no shareholder or creditor is treated less favorably in resolution than in liquidation (European Union, 2020).

The requirement that banks keep a sufficient level of loss-absorbing capacity in the form of the minimum requirement for own funds and eligible liabilities (MREL) is a crucial element for ensuring resolvability, as it enables the use of the bail-in tool. The MREL comprises of the required capital and bail-in-eligible liabilities, which could be utilized to recapitalize the bank (Single Resolution Board, 2017). The identification and elimination of substantive barriers to resolution is another crucial step. In addition to the bail-in mechanism, the SRF, the required Deposit Guarantee Schemes, and the proposed EDIS supplement the resolution framework to permit banks to fail in an

orderly way without resorting to public bailouts, which might potentially start the doomsday loop. They are sponsored in advance by the industry (European Union, 2020).

All of the aforementioned resolution steps are intended to break the doomsday loop and prevent banks from becoming "too big to fail." The Banks Recovery and Resolution Directive stipulates that public funds may only be utilized "in the most exceptional circumstances of a systemic crisis, as a last option," and under stringent restrictions and requirements. Both liquidation and resolution must adhere to State aid regulations anytime public funds, including the SRF, are employed. State aid regulations prohibit any use of public funding that could impair internal market competition. Throughout and after the financial crisis, the Commission issued a number of interpretative Communications on the application of State assistance rules. It still applies the Banking Communication from 2013 (European Commission, 2013).

The Bank Recovery and Resolution Directive (BRRD) ushered in a new crisis management system for the European Union in 2015. (EU). The decree was intended to address the "too-big-to-fail" problem and eliminate the need for public bailouts in the case of bank collapses. In accordance with the Key Attributes of Effective Resolution Regimes for Financial Institutions published by the FSB in the wake of the global financial crisis of 2007-08, the focus of this reform was on systemically important banks, i.e., those banks whose failure would likely threaten financial stability and have severe repercussions for the domestic and international real economy. During the global financial crisis, as as as during prior crises, the bailout of these institutions was extremely expensive for governments and, ultimately, taxpayers. Hence, the answer envisioned on a worldwide scale was to internalize the losses through the deployment of "bail-in," the principal instrument supporting the new resolution structure. By moving the cost of the financial crisis from taxpayers to investors and creditors, the framework aimed to decrease moral hazard and level the playing field between larger and smaller banks by eliminating the implicit subsidies enjoyed by the former. However, less attention has been paid to banks that are not systemic, especially the vast majority of EU banks, which are small and medium-sized (Cunliffe, 2016).

Nonetheless, small and medium-sized banks contribute significantly to the economy's finance. In the euro area, smaller banks own 19% of the banking sector's total assets; in some countries, such as Austria, Germany, Ireland, and Luxembourg, this proportion exceeds 33% (European Central Bank, 2020). In addition, small and medium-sized institutions may suffer the most from the pandemic's economic

repercussions. Could this generate an unprecedented "too-many-to-fail" dilemma that is challenging to solve within the existing framework? A recent Bank of Italy analysis reveals that the impact of the pandemic on Italian banks' credit risk exposure could be greater for smaller institutions than for larger ones, due to the disparate sectoral compositions of their loan portfolios (Banca d'Italia, 2020). The national insolvency proceedings of EU member states are extremely diverse. Some nations, for instance, have special insolvency regimes that apply primarily to banks, while others have standard bankruptcy regimes that apply to all types of businesses; some countries have judicial-based frameworks while others implement administrative-based frameworks. This diversity causes an issue with equal playing fields, as creditors and depositors may be handled differently within the Union, thereby fostering financial fragmentation (Visco, 2021).

The primary goal of any change of the current system should be to prevent disorderly, fragmented liquidations and the resultant wasteful destruction of assets. In Europe, this objective is being pursued in the area of insolvency procedures for non-financial enterprises, for which continual efforts at harmonization are made. It should also be followed, a priori, in the banking industry, where it is essential not only to prevent the destruction of value but also to maintain public confidence in the banking system. In recent years, disorderly liquidations may have become more common due to a number of causes. Banks are reducing their branch network as a result of technological advancement and shifting consumer preferences; a fundamental consequence of this phenomenon is a diminished appetite for purchasing failing institutions. The economic crisis is also causing "overcapacity" in the EU banking industry, which struggles to remunerate capital on average, further lowering merger and acquisition returns. In these circumstances, the "franchise value" of failing banks is low, and potential buyers are frequently only willing to transact at negative prices. It is common knowledge, piecemeal liquidation would immediately undermine the bank's basic operations. Assets would have to be liquidated quickly at fire sale prices, and collateral would have to be enforced; non-insured liability holders would have to endure lengthy delays to receive only partial reimbursement; and borrowers, particularly small businesses, would be exposed to liquidity constraints, which could then lead to solvency issues. Other banks' confidence could be undermined, heightening the hazards for the economy as a whole. Consequently, disorderly piecemeal liquidation is largely untested at this time (Visco, 2021).

4.3. Developments in Greece

In the first half of 2022, the stock of nonperforming loans (NPLs) in the banking sector continued to decline. The stock decreased by 20% from the end of 2021 and stood at EUR 14.8 billion as of June 2022, showing a 10% non-performing loan ratio compared to 12.8% at the end of 2021. This decline was caused by loan write-offs, the accounting reclassification of the remaining Hercules securitizations, and certain outright sale transactions. By the end of 2024, the systemic banks hope to be closer to the average of their EU peers. Given the expiration of the Hercules Asset Protection Scheme in October 2022, systemic banks will need to rely increasingly on their in-house management of loans in default or at risk of default, as well as their capacity to offer viable long-term solutions or proceed with effective collateral recovery, to achieve this objective. This may prove to be more difficult than the inorganic NPL reduction strategy that has been the norm to until, especially for smaller institutions with large nonperforming loan percentages that have not utilized the Hercules plan (European Union, 2022).



Image 11 Evolution of the stock of gross nonperforming loans and the corresponding non-performing loans ratio for Greek banks https://economy-finance.ec.europa.eu/system/files/2022-11/ip191_en.pdf

The net flow of new non-performing loans remains modest, but there are early indications of a rise in delinquencies as asset quality problems persist. Despite the

fact that pandemic-related state support measures (Gefyra I and II schemes) have nearly expired, default rates for these programs remain low (between 5 and 7 percent). In the second quarter, there were no indications of a significant increase in the gross inflows of nonperforming loans into banks' loan portfolios. In addition, systemic banks continue to report lower-than-anticipated default rates for loans that have exited the Covid-19 payment moratorium, including instances in which particular solutions were supplied to viable customers experiencing transitory difficulties. However, the net inflow of non-performing loans became positive again in the second quarter of 2022, while the growth in early arrears (loans less than 90 days past due) in that quarter may be an early indicator of pressure on the asset quality of banks in the near future. The deteriorating macroeconomic outlook and rising interest rates on the majority (75%) of variable-interest loans have an impact on the disposable income of families and may accelerate the influx of nonperforming loans. Yet, this could be substantially mitigated by the budgetary support measures already in place. As a result of the uncertain economic climate, banks are currently changing their non-performing loan strategy by increasing their forecasts for new non-performing loan inflows and provisioning requirements (European Union, 2022).

Slowly, legacy non-performing debt is being restructured. 87 billion euros of private debt has left bank balance sheets but remains in the economy, managed by non-bank financial organizations with specialized expertise (i.e. credit servicers). This is a drag on the economic recovery and decreases the opportunity for banks to conduct business on the local market. Despite the fact that the majority of securitized non-performing loan portfolios outperform their business plan objectives, there have been instances of divergence in relation to these objectives, in part because to the protracted suspension of enforcement proceedings during the pandemic. Taking advantage of the gradual resumption of the debt collection process as of April 2021 as well as sales of loan portfolios on the secondary market for nonperforming loans, servicers are adopting targeted measures to gradually reduce these disparities. These sales will increasingly include loans that have been restructured and are once again performing. The ability of credit servicers to promptly resolve and restructure debts, as well as the efficient operation of the secondary market for non-performing loans, will be crucial to economic performance and will be reviewed continuously. The authorities are supposed to continually reevaluate the present monitoring mechanism and suggest modifications, if necessary, to ensure its efficacy (European Union, 2022).

Although being buoyed by one-time gains, the profitability of banks is rising and might be bolstered by the banks' loan expansion and rising interest rates. The

first half of 2022 was profitable for all four systemic banks because to one-time trading gains, consistent fee and commission increases, and efficient cost management. The banks' net interest revenue has been stable due to new lending and the decline in the cost of risk as a result of the repayment of nonperforming loans. These variables have substantially mitigated the income impact of the steep loan book deleveraging in 2021, while simultaneously enhancing the quality of the revenue mix. It is anticipated that the tightening of monetary policy will increase the net interest margin of banks, given the significant proportion of loans with variable interest rates in their loan books. This tendency, along with the realization of banks' objectives to expand net lending, particularly in the business sector, should aid in the short- and medium-term maintenance of profitability. Due to their significant holdings of domestic sovereign bonds, systemic banks have taken measures to mitigate the impact of volatility in sovereign yields on their profitability by increasing the proportion of their sovereign bond portfolio valued at amortised cost to 80% and implementing hedging strategies for the remaining portion (European Union, 2022).

The capital position of banks is being steadily recovered, but the quality of capital remains an issue. The regulatory phase-in of IFRS 9 accounting regulations worsened banks' capital position, but the earnings of the first half of 2022 and the lower provisioning needs have largely offset this impact. The average Common Equity Tier 1 and Total Capital ratios of banks at the end of June 2022 were 13.2% and 15.9% of risk-weighted assets, compared to 12.5% and 15.9% at the end of March 2022. The banks plan to bolster their capital position through internal capital creation and upcoming capital-enhancing measures (e.g. sale of non-core businesses and synthetic securitisations). While banks have already fully provisioned for the transfer of the relevant loan portfolios, the completion of the other three nonperforming loan securitisations under Hercules will offer banks with additional capital relief from the state guarantee granted on the retained senior tranche. However, the capital position of Greek banks remains one of the lowest in the EU, and the quality of their capital remains a concern, as it contains a substantial and rising proportion of deferred tax credits (about 64% of consolidated supervisory capital at the end of March 2022) (European Union, 2022).

Notwithstanding strengthening fundamentals, banks face obstacles and negative risks that must be closely monitored. Profitability and the ability of banks to generate capital internally could be negatively impacted by a) a potential deterioration in asset quality as energy costs and interest rates rise and reduce the ability of debtors to repay, b) a possible reduction in credit demand in the event of a recession, and c) increases in their cost of funding. The cost of long-term unsecured

funding for Greek banks has already risen, which, if prolonged, could alter their strategy for future debt issuances to meet the MREL, both in terms of time and kind of instruments released. Moreover, the repayment of the most recent round of targeted longer-term refinancing operations (TLTRO III), which is nearing its conclusion, may still result in an increase in the cost of funding for banks and a potential decline in their prudential liquidity ratios, particularly if deposits decline and long-term unsecured funding remains expensive. On the other hand, the substantial proportion of currently committed collateral under TLTRO III that is eligible for Eurosystem funding via the standard refinancing instrument is anticipated to support liquidity ratios (European Union, 2022).

In nominal terms, the growth of credit extended to non-financial firms has accelerated in 2022. In September 2022, the annual growth rate of lending to non-financial firms reached 12.3%, up from 3.7% at the end of 2021. From January to September 2022, a sizeable cumulative net credit flow to non-financial firms of EUR 5.1 billion was recorded, comparable to the flow for the same period in 2020 and significantly greater than the entire net credit flow in 2021. This was mostly the result of capital flows to large nonfinancial firms. The rise in gross new lending to families was more than offset by the payback of existing mortgages, resulting in a negative net credit growth for housing loans. Notwithstanding a spike in September, the average cost of bank lending to businesses has increased by only 3.1% in 2022 and is still lower than that to micro businesses and individual entrepreneurs (5.3%) and consumers (5%). The Hellenic Development Bank terminated operations under the Covid-19 Enterprise Guarantee Fund in June 2022, having disbursed a total of EUR 6.2 billion in loans since the fund's creation in 2020. It is currently launching new small- and medium-business loan programs for late 2022 and early 2023. Given the amount of loan applications and signed loan contracts, loan disbursements related to the RRF Lending Facility are anticipated to increase beginning in 2023. In the future, credit demand should gain from a reduction in risk aversion as a result of an overall improvement in the medium-term economic outlook, but in the short term, it may be negatively impacted by slower economic growth, greater inflation, and rising interest rates (European Union, 2022).

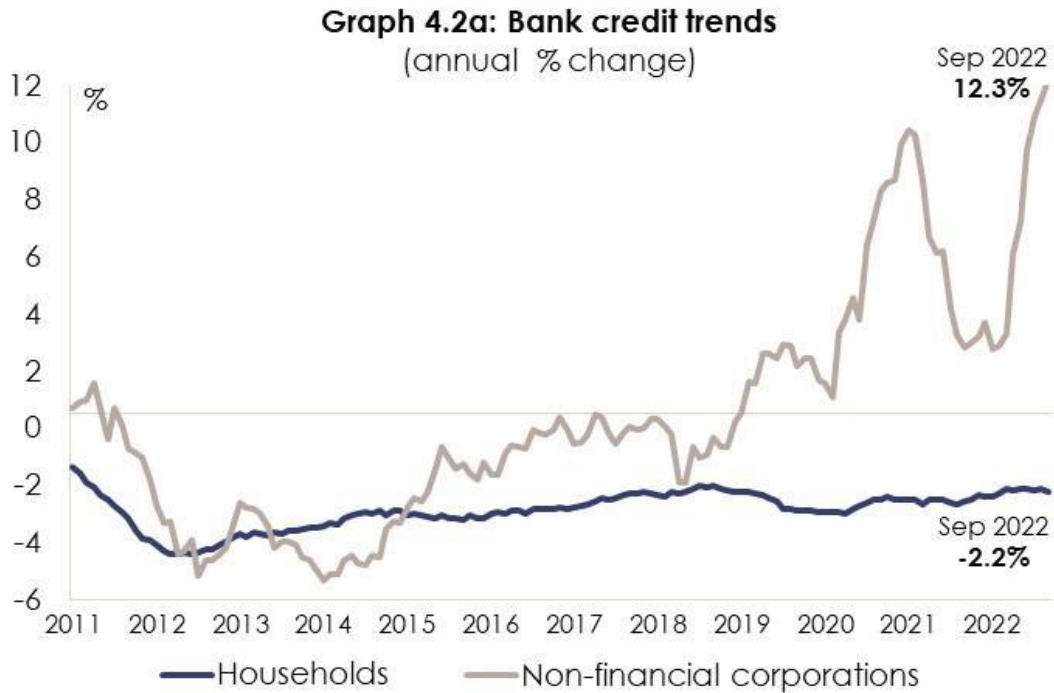


Image 10 Bank credit and deposit trends https://economy-finance.ec.europa.eu/system/files/2022-11/ip191_en.pdf

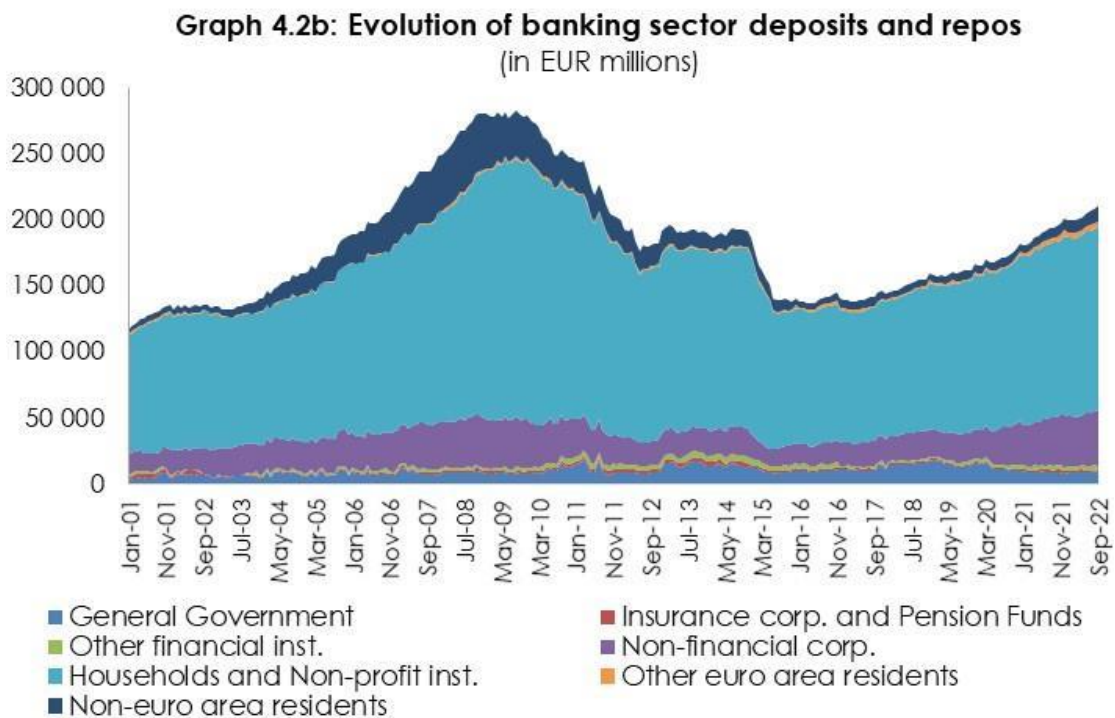


Image 11 Bank credit and deposit trends https://economy-finance.ec.europa.eu/system/files/2022-11/ip191_en.pdf

With the amended legal framework, the Hellenic Financial Stability Fund has begun operations. The legislation revision was published in June 2022. Since then, the Fund has modified its governance by establishing a new Board of Directors to

replace the old dual system. The bill prolonged the tenure of the Fund to the end of 2025 so that it can more effectively achieve its dual purpose of helping to the stability of the Greek banking system and disposing of its assets. In this regard, the Fund has already enlisted the assistance of independent private consultants to formulate and implement its divestiture strategy in accordance with the recent reform. In addition, the Fund has decided to participate in the second share capital increase of a smaller institution in which it already holds a controlling ownership. The capital increase will total 490 million euros and will be implemented throughout 2022. The three primary shareholders, including the Fund, will contribute around 459 million euros (European Union, 2022).

4.4. Policies in Greece

Under the new insolvency framework, the usage of electronic platforms is gradually gaining traction. This is especially true for out-of-court workout and second chance (i.e., insolvency proceedings) platforms. For the rehabilitation and early warning mechanisms, which could benefit from increased knowledge, there is less interest. The consistent flow of completely submitted petitions to the out-of-court settlement mechanism has maintained, reaching 9,600 by the end of October 2022, representing 5 billion EUR in debt. 43% in terms of loan value (EUR 2.1 billion) of these fully submitted applications had been evaluated by the end of October, resulting in the restructuring of EUR 511 million worth of debt, where the restructuring proposal was accepted by both creditors and debtors, with an additional EUR 273 million awaiting implementation. The completed reorganizations involve an average haircut of 19.5% for debts owed to the government and 30.7% for obligations owed to financial institutions. In the following months, the rate of successful restructurings is anticipated to accelerate significantly. Simultaneously, the authorities are focusing their efforts on improving the approval rates of creditors and debtors for the restructuring proposals generated by the platform's algorithm, as well as addressing data quality issues that are dragging down the overall process. The efficiency of each component of the insolvency framework will be continuously monitored as part of postprogramme surveillance (European Union, 2022).

The implementation of other agreed-upon banking sector activities generally advances on time. This pertains to the execution of the Sale-and-Leaseback entity and the elimination of household insolvency case backlogs and is referred to as governmental guarantees. The number of auctions continues to increase, but the

large proportion of empty auctions (auctions with no buyers) remains a cause for concern. Taking into account seasonality, the upward trend in the conduct of auctions as compared to the same period in prior years was verified. 75% of the 12,252 auctions scheduled for the third quarter of 2022 were conducted, 25% were suspended, and a minor number were canceled for procedural reasons. Nonetheless, the high proportion of fruitless auctions remains a cause for concern, with around 75% of concluded auctions resulting in fruitlessness and only 25% being fruitful. The recently implemented automatic reserve price adjustment system is anticipated to reduce the number of empty auctions in the next months, but the ratio is anticipated to stay high, which is cause for concern. The high percentage of barren auctions is attributed to the following factors: a) inadequate streamlining and dissemination of information on post-auction steps, coupled with cadastre registration delays; b) ineffective post-auction eviction process; c) insufficient financing for potential interested auction buyers; and d) overall low market demand for certain assets. Positively, an increasing proportion of transferred properties (about 60%) were acquired by third parties during successful auctions (European Union, 2022).

Recent rulings of the Supreme Court may have a disruptive impact on enforcement actions. As reported and evaluated by the authorities, a chamber of the Supreme Court has issued contradictory rulings regarding the legitimacy of credit servicers to proceed with auctions and other enforcement procedures in the name and on behalf of the foreign special purpose vehicles they represent. According to the authorities, the matter has been referred to the Supreme Court's plenary formation. The date and outcome of the Supreme Court's final decision are, nevertheless, uncertain. The problem at hand is likely to influence forthcoming lower-court judgements in comparable cases and diminish the debtors' willingness to negotiate reasonable restructuring options with servicers. This legal ambiguity might hinder attempts to resolve non-performing loans and pose a significant threat to the business plans for non-performing loan securitizations under the Hercules program. Legal ambiguity must be resolved as soon as possible to prevent future unnecessary delays in the resolution of non-performing debt in the economy (European Union, 2022).

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Chapter 5: Central Bank Digital Currencies

5.1. Definition

As a medium of exchange, money has evolved from shells, dogs teeth, knotted fabric, precious metals, banker's notes, cash to cryptocurrency (Davies, 2010). While cryptocurrency is still a largely unregulated area, the introduction of the Central Bank Digital Currencies (CBDCs) will manifest the beginning of a new monetary era (Laboure et al., 2021). Now, the Bahamas has already implemented CBDC in its territory, and China has recently completed two CBDC tests. The CBDC wallet app is now available in Suzhou, Xiongan, Shenzhen, and Chengdu, and the People's Bank of China and the Hong Kong Monetary Authority has begun 'technical testing' for cross-border use of e-CNY. Uruguay has also completed a CBDC pilot test. CBDC is a virtual form of a country's fiat currency issued by the central bank (Yao, 2018). CBDC was initially called a Digital Fiat Currency (DFC) (Krylov et al., 2018), which draws inspiration from famous crypto assets such as Bitcoin, Ethereum, Binance Coin, among others. In 2013, Shoaib et al. (2013) introduced the alternative terms of Official Digital Currency (ODC) and the Official Digital Currency System (ODCS).

Central bank Digital currencies are a type of digital currency issued by the central bank of a country. They are comparable to cryptocurrencies with the exception that their value is fixed by the central bank and is equivalent to the country's fiat currency. Numerous nations are currently creating CBDCs, and a few have even implemented them. Due to the fact that so many countries are studying ways to transition to digital currencies, it is crucial to comprehend what they are and what they signify for society (Seth, 2021).

Government-issued fiat currency is not backed by a tangible commodity such as gold or silver. It is considered legal tender that can be exchanged for goods and services. Technology has enabled governments and financial organizations to supplement physical fiat currency with a credit-based paradigm in which balances and transactions are digitally recorded. Real cash is still extensively used and accepted; however, its use has declined significantly in several affluent nations, and this tendency increased during the COVID-19 epidemic. The introduction and development of cryptocurrencies and blockchain technology have increased interest in cashless societies and virtual currencies. Consequently, governments and central

banks around the world are investigating the use of government-backed digital currencies. When and if they are deployed, these currencies will be backed by the government that issued them, just like fiat currency (Seth, 2021).

Many people lack access to financial services in the United States and numerous other nations. 5% of adults in the United States do not have a bank account. An further 13% of adults in the United States have bank accounts but utilize costly alternative services such as money orders, payday loans, and check cashing services. CBDCs are intended to give organizations and customers with confidentiality, transferability, ease, accessibility, and financial security. CBDCs could also reduce the need for complicated financial system maintenance, slash cross-border transaction costs, and provide lower-cost options to people who now use alternative money transfer methods (Seth, 2021).

A CBDC also gives the means for a country's central bank to undertake monetary policies in order to ensure stability, limit growth, and impact inflation. Digital currencies issued by central banks would also minimize the dangers associated with utilizing digital currencies in their current form. The value of cryptocurrencies is highly volatile and continually fluctuating. This unpredictability could result in severe financial strain for many individuals and have an impact on the economic stability as a whole. Government-backed and central bank-controlled CBDCs would provide homes, consumers, and companies with a stable way of trading digital currency (Seth,2021).

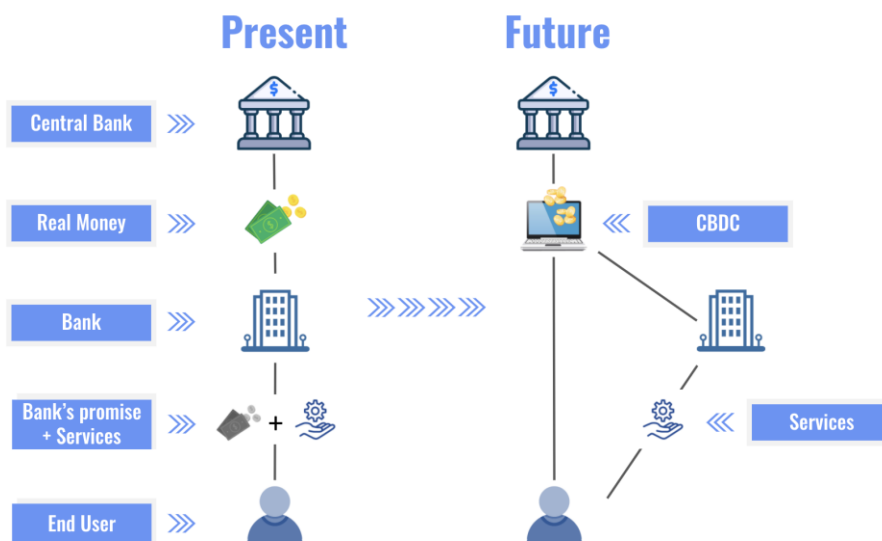


Image 12 Possible Future: The introduction of CBDC could remove risk from users, and allow banks to focus on services. <https://blog.digitalasset.com/developers/what-is-a-central-bank-digital-currency-and-why-should-people-prefer-cbdc-over-bank-accounts>

According to the literature, the main goals of CBDCs are (Edwards, 2021):

- (a) Improve the efficiency (and reduce the cost) of the payment system.
- (b) Encourage financial inclusion, especially among the poor.
- (c) Facilitate and reduce the costs of cross-border transactions.

To these generally accepted objectives, the European Central Bank has added that the implementation of CBDCs would provide a new and more efficient policy transmission channel for monetary policy, while supporting 'improvements in the overall cost and ecological footprint of the monetary and payment system' (Edwards, 2021).

A CBDC is a government credit-based digital currency, thereby reducing their risks. Therefore, some economic agents and individuals might prefer to transfer money from commercial banks to CBDCs during financial crises (Sinelnikova-Muryleva, 2020). Many regulators and researchers regard a CBDC as a nationally issued 'tablecoin', and believe it can balance the banking system (Sissoko, 2017) and positively impacts financial stability (Larina & Akimov, 2020; Copeland, 2019; McLaughlin, 2021; Buckley et al., 2021). Indeed, Zams et al. (2020), using an analytic network process and the Delphi method, demonstrated that the cash-like CBDCs model is the most suitable CBDCs design for Indonesia because it can improve financial inclusion and reduce shadow banking. Tong and Jiayou (2021) investigated the effects of the issuance of digital currency/electronic payment on economics based on a four-sector DSGE model, and conclude that CBDCs can mitigate the leverage ratio and the systemic financial risk. Barrdear and Kumhof (2016) examined the macroeconomic consequences of launching CBDCs by a DSGE model, and found that CBDCs issuance 30%'s GDP, against government bonds, could be permanently raised by 3%. Additionally, Fantacci and Gobbi (2021) focused on the geopolitical, strategic, and military impacts of CBDCs. However, CBDCs are new research fields within digital currency and fintech domain, and a few paper available to date can be roughly allocated into five main sub-groups.

The first group discusses, among other aspects, the definition, characteristics, classification, main models, and implications of the CBDCs variants, and the potential advantages and risks of its introduction (Yao, 2018; Masciandaro, 2018; Cunha et al., 2021; Kochergin, 2021; Li & Huang, 2021; Allen et al., 2022). While the above mentioned researchers hold positive attitudes towards CBDCs, Kirkby (2018) criticised CBDCs as they would increase the central bank's costs for the whole money supply system.

The second group of studies focuses on the CBDCs' design theory, technological innovation, and model optimisation. Sun et al. (2017) proposed a multi-

blockchain data centre model for CBDCs in order to help central banks manage the issuance of currency, prevent double-spending issues, and protect user privacy. Qian (2019) introduced a CBDC issuance framework designed for forward contingencies in order to prevent the currency from circulating beyond the real economy. Wagner et al. (2021) discussed and proposed a potential blueprint for a digital euro and proved its possibility.

The third group illustrates CBDCs' security and privacy. Tronnier (2021) and Borgonovo et al. (2021) demonstrated the significance of anonymity for increasing the overall attraction of CBDCs' social medium payment.

The fourth group analyses the impacts of CBDCs on monetary systems and policy. Meaning et al. (2021) discussed CBDCs' potential impact on monetary transmission mechanisms, and found that monetary policy can operate as it does now by adjusting the price or quantity of CBDCs. Shen and Hou (2021) applied a qualitative analysis of China's CBDCs and their impacts on monetary policy and payment competition, and argued that CBDCs have potential to transform the field completely rather than be a mere regulatory toolkit, especially when CBDCs will be adopted at a large-scale. To put it simply, some scholars hold positive views towards CBDCs on monetary policy. They have argued that CBDCs are useful complements to monetary and reserve policy (Davoodalhosseini, 2021), and that they have the potential power to strengthen the monetary transmission mechanism and bear interest (Stevens, 2021). However, other studies have discussed CBDCs' monetary risks, for example, Viuela et al. (2020) listed the sources of these risks, and presented both solutions and suggestions for further CBDCs research.

The fifth group investigates the relationships between CBDCs and banking, including commercial and central banking. Cukierman (2020) provided two proposals CBDCs' implementation, i.e the moderate and radical. The former suggests that only the banking sector can have access to deposits at central banks, while the latter suggests that the whole private sector could hold digital currency deposits at central banks. Cukierman supported the radical proposal due to its ability to condense the banking system and reduce the need for deposit insurance. Furthermore, some discussions have centred around the new role of central banks in the digital currency era. Some scholars believe that CBDCs can upset commercial banking because central banks are more stable and can play an essential role in reducing risks in economic transactions (Yamaoka, 2019; Zams et al., 2020; Sinelnikova-Muryleva, 2020). This could possibly even lead to commercial banking panic (Williamson, 2021) or allow central banks to become deposit monopolists (Fernandez-Villaverde et al., 2021). None of these studies have linked CBDCs to financial markets. One possible

reason for this research gap is the lack of a time series proxy that relates to the CBDCs. However, several scholars have shown that an index of news coverage frequency can serve as a proxy to reflect the uncertainty of one economic or financial objective (e.g., economic policy, cryptocurrency policy, or cryptocurrency price) (Baker et al., 2016, Huang & Luk, 2020; Lucey et al., 2021), or draw public attention to an economic or financial objective (e.g., cryptocurrency, cryptocurrency environmental, P2P lending) (He et al., 2021; Smales, 2022; Wang et al., 2022). These papers further confirm that the uncertainty or attention indices mentioned above can act as validity and efficiency proxies by investigating their impacts on micro or macroeconomic variables. This research gap is the motivation behind our work to uncover the effects of CBDC news on financial markets. This is achieved by introducing new CBDC indices to capture existing trends and reflect the variations of CBDC uncertainty and attention by gathering a large amount of CBDC news items and analysing the interconnections between the CBDC indices and financial market variables using a variety of quantitative techniques.

5.2. Types of CBDCs

Two broad categories of CBDC can be distinguished: general-purpose or retail (CBDC-R) and wholesale (CBDC-W) (Kulkarni, 2019).



Wholesale CBDC



Retail CBDC

Image 13 The two main types of CBDCs

<https://corporatefinanceinstitute.com/resources/cryptocurrency/central-bank-digital-currency-cbdc/>

Retail CBDC (e-R) may be utilized by the private sector, non-financial customers, and businesses, whilst wholesale CBDC (e-W) is exclusively meant for select financial institutions. Retail CBDC is an electronic version of money intended primarily for retail transactions, whilst Wholesale CBDC is meant for the settlement of interbank transfers and related wholesale operations (Kulkarni, 2019).

Wholesale CBDCs would be deployed largely by financial institutions like banks. The usage of CBDCs would enable banks to conduct faster and more automated payments. Transnational transactions may become more efficient and trustworthy. In their present form, payment settlement systems are limited to a particular jurisdiction or currency. Using blockchain technology might potentially make transactions more efficient, trustworthy, and rapid (CFI Team, 2023).

CBDCs for sale at retail would mostly be utilized by individuals. Consumers could effectively use them as digital cash, secure in the knowledge that they are issued and backed by the country's central bank. This innovation may supplant the requirement to carry physical currency and minimize the economic rents associated with dealing in the current financial system (CFI Team, 2023).

CBDC's structure can either be "token-based" or "account-based." A token-based CBDC is a bearer instrument, similar to banknotes, meaning that whoever is holding the tokens at any one time is presumed to be the owner. In contrast, an account-based system would require the maintenance of records of all CBDC holders' transactions and balances, as well as the identification of the financial balance owners. Given the qualities offered by both types of CBDCs, a token-based CBDC is favored for CBDC-R since it would be closer to physical cash, but an account-based CBDC may be chosen for CBDC-W (Kulkarni, 2019).

5.3. Cryptocurrency Vs CBDC

CBDC initially refers to the digital form of a country's fiat currency, which is issued by the country's central bank. Even though it is in digital form, it can be exchanged for the country's fiat money. This money is the central bank's liabilities. Central banks retain complete control over its supply and transactions are documented in a centralized ledger. CBDC has the same purchasing power as the country's fiat currency (notes or coins). In contrast, cryptocurrency is a digital currency designed to act as a medium of exchange. In addition to regulating the

creation of new units of a particular digital currency, it employs encryption to secure and validate transactions (Kulkarni, 2023).

Cryptocurrencies are decentralized, independent digital currencies that operate without a predetermined value or backing. Bitcoin (BTC) and Ethereum (ETH) are examples of cryptocurrencies in this category. By contrast, CBDC is supported by central banks. For instance, the RBI has given its CBDC the name "Digital Rupee." The proposed CBDC of China is digital yuan (e-CNY). Certain cryptocurrencies, known as Stablecoins, are tied to the dollar but are supported by private businesses. Examples include Tether (USDT), USD Coin (USDC), and Diem. Moreover, while cryptocurrencies use an open network that does not require permission, CBDCs employ a private Blockchain network that requires authorization. Also, users stay anonymous when transacting on the network with bitcoins. Yet, CBDCs will be linked to a person's bank account, which will contain their personal information. Moreover, CBDCs are administered by a central authority, which simplifies network scaling. In contrast, all nodes on the network must authorize any changes to the cryptocurrency network. If the network needs to expand, but the nodes differ on how to proceed, this could be problematic (Kulkarni, 2023).

5.4. Benefits

A CBDC is of great importance over conventional cryptocurrencies and fiat currencies when studying. First, from the perspective of payment, it saves costs, prevents counterfeiting, and strengthens the authority of legal tender while enhancing the inclusive character of the payment system (Sun et al., 2017). It also optimises the payment function of legal tender, reducing the reliance on payment services on business banks and private sectors, thereby decreasing the burden and pressure of supervision on the central bank (Qian, 2019). Second, CBDCs can benefit to the monetary supervision and regulation. The structured currency circulation data allows total amount of money supply to be regulated precisely (Fernandez-Villaverde et al., 2020). This ameliorates the dilemmas facing modern monetary policies, such as inefficient policy transmissions, difficult regulation of conversion periods, the flow of money from the real economy to the virtual one, and the failed realisation of expected requirements by monetary policies. Moreover, capital flow information can be fully and quickly investigated, thereby aiding anti-corruption, anti-money laundering, anti-terrorist financing, and anti-tax evasion efforts (Tronnier, 2021; Dupuis et al., 2021). Third, CBDCs have the potential to promote financial market stability by adjusting

monetary, mitigating financial systemic risk, reducing shadow banking, among others (Larina & Akimov, 2020; Copeland, 2020; Zams et al., 2020).

The Fed suggests that a major advantage of providing widespread access to a CBDC would be the introduction of credit- and liquidity-risk-free digital money into the system. This risk applies to all other kinds of digital currency, including stablecoins. The report suggests that such a significant advantage would level the playing field, encourage innovation among private companies, reduce costs, and ultimately accelerate the payments process. The Fed also observes that a CBDC has the potential to expedite cross-border payments through the use of new technologies, the introduction of simpler distribution routes, and the creation of further cross-jurisdictional collaboration and interoperability opportunities (Hoenig & Knight, 2022).

Although these advantages are impressive, they are not contingent on the Fed making a CBDC available to the public. The private sector has been mostly responsible for the development of digital currencies, as opposed to the Federal Reserve. The private sector has brought much quicker and simpler payment processing. Venmo, Square, and Stripe are examples of new companies that have disrupted existing legacy systems and substantially improved the payments system without government assistance. As it pertains to cross-border payments, the private sector has also significantly improved speed and ease (Hoenig & Knight, 2022).

In addition, while it is true that a CBDC would be exempt from credit and liquidity issues, this advantage is exaggerated. Secondly, it is uncertain whether the difference in credit and liquidity risk between a CBDC and private alternatives, such as private coinage backed by safe assets or commercial bank money with FDIC protection, is significant enough to warrant a CBDC. Second, there are policy alternatives for reducing liquidity and credit risks associated with payments that do not entail the issuance of a CBDC. Such hazards can also be mitigated by insuring bank deposits to the full extent of FDIC coverage. Lastly, it is not certain that a CBDC will lower overall credit and liquidity risk. With the implementation of a CBDC, banks would have to rely on alternative funding sources to cover their typical funding needs, and these new sources would continue to be subject to credit and liquidity issues. Hence, a CBDC would serve to transfer risks rather than eliminate them (Hoenig & Knight, 2022).

It is also proposed that the creation of a dollar-denominated CBDC would bolster or better secure the United States' position as the issuer of the world's reserve currency. With China's creation of its own national CBDC, which is viewed as a bid to make its currency a worldwide medium of trade and settlement, this viewpoint has gained prominence. To be a reserve currency, however, a CBDC is

neither essential nor sufficient. A sustainable reserve currency necessitates an economic structure that is not just well-developed, but also operates under the rule of law and permits the free flow of capital. The American financial system possesses these characteristics and is one of the most dependable mechanisms for international settlements, which are also conducted digitally. The introduction of a CBDC would have minimal effect on these characteristics. In terms of the United States' national and international role in payments, the FedNow initiative's development of real-time settlement has become increasingly important (Hoenig & Knight, 2022).

Providing a CBDC to the general public and businesses would make it accessible to unbanked folks. However, the logistics of offering a CBDC directly, via banks, or, as some have suggested, via the local post office would be a huge issue for all parties. Offering a subsidy to ensure free access to a CBDC and related banking services for the 7.1 million unbanked households would be challenging and possibly unpopular. However, doing so would raise the question of whether a substantial enough fraction of the unbanked population would join the system for it to be cost-effective. Not only do many unbanked persons mistrust banks, but they also mistrust the Federal Reserve and the federal government. As a result, although assisting unbanked individuals is a commendable objective, it entails a hefty price tag, given that some unbanked households may be reluctant to use the service (Hoenig & Knight, 2022).

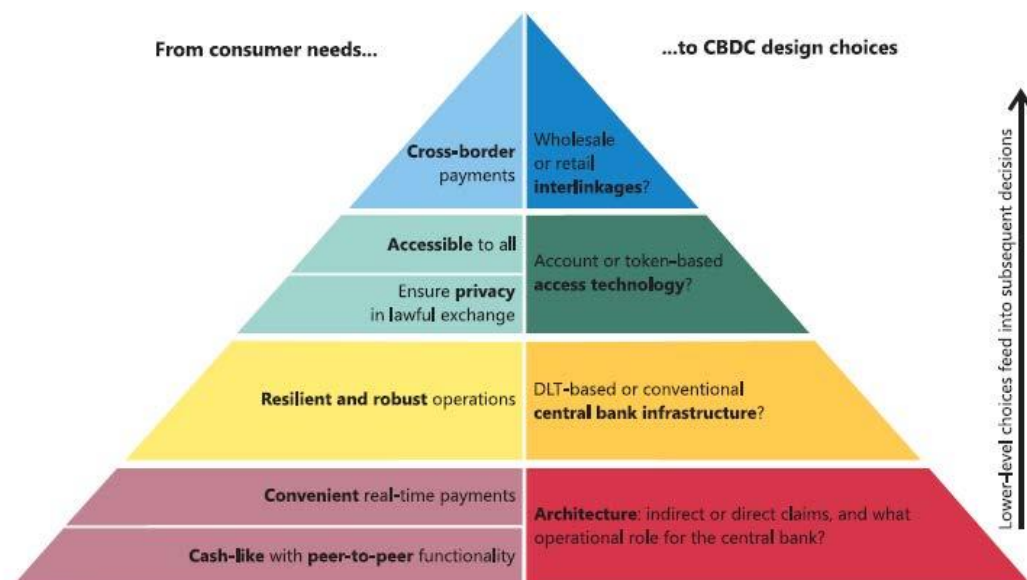


Image 146 Bank of International Settlements, The CBDC Pyramid. <https://doi.org/10.1080/05775132.2021.2004738>

Wang et al. (2022) developed and made available two CBDC indices the CBDC Uncertainty (CBDCUI) and the CBDC Attention (CBDCAI), that can be used to track CBDCs' trends and variations. Their data covers the main period of CBDC development and the period of the most active discussion of this new asset in the media, i.e. from January 2015 to June 2021. They empirically examined the impact of CBDC news on the financial markets. Their indices capture CBDC trends and uncertainties as they are able to react to major relevant events. For example, their indices spiked near new CBDC announcements, digital currency flash-news, and main policy debates. Second, the paper reports that CBDCUI and CBDCAI indices had a significantly negative effect on the volatilities of the MSCI World Banks Index, USEPU, and FTSE All-World Index, where the volatilities of the financial variables reacted more strongly to shocks transmitted from the CBDCUI. Third, the paper by Wang et al. (2022) presents the historical decomposition results, that show that the cumulative positive and negative effects of CBDCUI disturbances tend to be larger than those of the CBDCAI on the financial variables. Positive news items and government policy announcements can have a significant negative affect on the CBDCUI historical decomposition results, i.e. decreasing the uncertainty around CBDC introduction.

5.5. Disadvantages

While a CBDC could provide some benefits, it may also bring several significant challenges for society. First, CBDCs could exacerbate financial uncertainty during periods of economic stress (Ferrari et al., 2020; Sinelnikova-Muryleva, 2020). Without effective regulations, individuals can hold CBDCs indefinitely. Therefore, in the event of a crisis, individuals or economic agents could try to substitute CBDCs for bank deposits, as they may be perceived as less risky (Williamson, 2021). This behaviour may lead to bank runs and financial instability. Second, similar to the first point, CBDCs could have negative consequences for financial intermediation, aka the banking sector. Banks play an important role in deposit management and payments. Now, some FinTech payment platforms have emerged that only focus on one function of money: payments. Meanwhile, other financial services are organised around the payment function, including features such as credit, fund management, and insurance (good examples of this kind of platform are Alipay and WeChat Wallet). These FinTech payment platforms connect consumers (borrowers, debtors, investors, among others) together, rather than the banks, so that banks can be replaced.

CBDCs could have the same characteristic as these FinTech payment platforms because they also allow the general public easy access the central bank balance sheet. Therefore, some scholars worry that digital currency and digitalisation could cause an inversion of the currency financial intermediation system (Meaning et al., 2021).

Although Brunnermeier and Landau (2022) argue that CBDCs would only have small negative effects on the financial intermediation system because of the low circulation volume, the real effects of CBDCs on the banks business model could only be proved with the development of CBDCs and would also vary depending on their liquidity. Third, CBDCs could pose risks to individual privacy (Tronnier, 2021). The original intention of the CBDC design tries to strike a balance between the 'controllable anonymity' and 'anti-money laundering' (Turrin, 2021). Therefore, CBDCs do not allow for anonymous transactions in the same way that cash can be spent anonymously (Lee et al., 2021c). Data privacy regulations could provide some protections, but these may be insufficient to eliminate public concerns over the risk of state surveillance (Borgonovo et al., 2021). Fourth, as a kind of digital currency, CBDCs could bring about environmental issues (Laboure et al., 2021). The production, deposit and transaction of CBDCs would likely consume a plethora of energy and emit a large amount of CO₂, leaving carbon footprints and causing increased environmental pollution. Finally, CBDCs could trigger a new round of trade wars between China and the United States (Waller, 2021; Goldman, 2022). The Society for Worldwide Interbank Financial Telecommunications (SWIFT) system gives the United States a strong economic sanction capability. However, the digital renminbi supported by China's Cross-Border International Payments Systems (CIPS) can replace SWIFT and challenge the existing international payments system, which is dominated by the United States (Goldman, 2022). This potential threat could trigger U.S. sanctions on Chinese banks by pressuring their transaction nodes, leading to a renewed U.S.-China trade war. CBDCs' encouraging progress has generated extensive attention and discussions among academics and economists. The majority of available studies still concentrate on the fundamental qualitative analysis of CBDC and its technological innovations.

Central bank digital currencies can provide a more accurate assessment of CBDC's potential. CBDCs have significant geographical constraints, as they are only valid in the issuing country. Central banks could become direct competitors of payment service providers, causing financial losses for banks. Moreover, new investment alternatives with CBDC could diminish customer demand for deposits. In turn, CBDCs can reduce bank lending to the overall economy and economic growth.

Crypto-based CBDCs have no ties to fiat money and may be subject to greater price volatility. The disadvantages of central bank digital currency also include increasing rivalry for commercial banks. As an alternative for bank deposits, CBDCs can encourage banks to improve their deposit rates. Then, it may result in a transition from deposit funding to wholesale funding. Digital currencies issued by central banks can also enhance the possibility of system-wide bank runs. Such bank runs may increase more rapidly in times of financial crisis, regardless of time or vicinity (Geroni, 2021).

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Conclusions

The production and provision of financial services by banks is evolving as a result of the introduction of new technology. These shifts have repercussions for conventional banks, introducing additional forms of systemic risk that may pose regulatory and legislative issues. Banks are compelled to adopt modern technology as a result of fluctuating client expectations and pressures to reduce expenses and boost productivity. The coronavirus (COVID-19) pandemic had a huge effect on the digital revolution, generating a direct requirement for banks to engage with their clients via digital channels, such as platforms and apps, at a time when social distancing was the norm. From the beginning of the pandemic, the number of digital users has grown by 23%. Yet, these technological advancements cannot be considered novel. For decades, bank consumers have shifted from traditional branch-based banking to online and mobile options. Consumers' familiarity with online product use has increased. This has enabled new entrants, such as fintech companies and large digital platforms, to design appealing and user-friendly customer interfaces for their services. As a result, services are provided to clients in an efficient manner, enabling the unbundling of financial services and providing customers with a greater variety of options, hence increasing customer participation in the process.

Modern technological advancements place banks under competitive strain. Banks will be need to adapt to the alterations in client behavior, which demand more effective and convenient online services. There are also new dangers associated with technology advances. Using technology more broadly and involving third parties more significantly, such as through outsourcing and cloud computing, will increase banks' reliance on the availability of IT services and their susceptibility to cyber risk. Nonetheless, banks are not completely unfamiliar with these dangers, as banking supervisors have expected them to control all risks, including those associated with technology progress.

And banks have vast knowledge of regulation and compliance, having already cleared the primary regulatory obstacles faced by new entrants. Additionally, numerous fintech companies and large tech platforms offer financial services in close partnership with banks. In actuality, it is unclear whether or not large technology companies would desire to enter the banking sector themselves, with all the constraints that would entail. Overall, banks are cognizant of the need for digital

transformation adaptation. The COVID-19 pandemic has demonstrated, to some extent, that digital expenditures by banks have paid off — at least in terms of operational resilience. Their IT infrastructures proved to be equal to the task; service continuity was maintained without interruption and in a safe manner. The majority of banks are currently accelerating technological innovation.

The most recent wave of financial innovation based on the opportunities presented by digitalisation has largely emanated from outside the incumbent banking system in the form of new financial service providers, either in competition or cooperation with incumbent banks, but with the potential for significant disruption. The European banking system faces major structural changes and difficulties that will determine its future and its capacity to service the actual economy's financial demands. Several of these concerns, such as overbanking and non-performing loans, have existed for a number of years and can be viewed as relics of the global financial crisis and the European sovereign debt crisis. Some concerns, such as climate change, are prospective in nature and relate to societal changes beyond the banking and financial institutions. In addition, the COVID-19 pandemic is influencing economic structures and exerting an influence on the banking system that may change the fundamental business models and operations of European banks.