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**FUTURE OF MONEY: THE CASE FOR A DIGITAL  
EURO AMID GLOBAL MONETARY EVOLUTION**

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**Abstract:** As the use of cash continuously declines in favor of private (commercial bank) digital money and cryptocurrencies and stablecoins are hurled to the public, Central Banks (CB) worldwide have been forced to take a proactive stance in the digitalization of the monetary system. The main, if not the only path they are considering, is the issuance of their own digital currencies, also known as Central Bank Digital Currency (CBDC). The European Central Bank (ECB) is amongst the most proactive in studying and analyzing the possibility of issuing a digital euro. At the time of writing this paper, extensive research has already been conducted, with more expected in the future.

This paper aims to clarify the ongoing discussions about CBDCs in general, and the digital euro in particular. It explains the various positions on key topics and explores the latest developments announced by the ECB. Additionally, it provides insights from interviews with industry experts and a survey conducted among knowledgeable professionals.

**Key Words:** Digital Euro, Central Bank Digital Currency (CBDC), European Central Bank (ECB), Monetary System, Financial Stability, Payments.

**Resumen:** A medida que el uso del efectivo disminuye en favor del dinero digital privado (de bancos comerciales) y las criptomonedas y stablecoins se lanzan al público, los Bancos Centrales (BC) de todo el mundo se han visto obligados a adoptar una postura proactiva en la digitalización del sistema monetario. El principal, si no el único camino que están considerando, es la emisión de sus propias monedas digitales, también conocidas como Monedas Digitales de Bancos Centrales (CBDC, por sus siglas en inglés). El Banco Central Europeo (BCE) es uno de los más proactivos, con el estudio y análisis de la posibilidad de emitir un euro digital. Al momento de escribir este documento, ya se ha realizado una extensa investigación y se espera mucho más en el futuro.

El objetivo de este documento es aclarar las discusiones en curso sobre las CBDC en general, y sobre el euro digital en particular. Explica las diversas posiciones sobre temas clave y explora los últimos desarrollos anunciados por el BCE. Además, proporciona información de entrevistas con expertos de la industria y una encuesta realizada entre profesionales.

**Palabras clave:** Euro digital, Moneda Digital de Banco Central (CBDC), Banco Central Europeo (BCE), Sistema monetario, Estabilidad financiera, Pagos

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## Abbreviations

1. AML/CFT - Anti-Money Laundering and Countering the Financing of Terrorism
2. BIS - Bank for International Settlements
3. CB - Central Bank
4. CBDC - Central Bank Digital Currency
5. DLT - Distributed Ledger Technology
6. ECB - European Central Bank
7. EEA - European Economic Area
8. ELTEG - Euro Legal Tender Expert Group
9. EMU - European Monetary Union
10. FUNCAS - Fundación de las Cajas de Ahorros (Savings Banks Foundation)
11. e-CNY – Digital Yuan
12. G7 - Group of Seven
13. GDPR - General Data Protection Regulation
14. ICT - Information and Communications Technology
15. KYC - Know Your Customer
16. MS - Member State
17. N€XT - Eurosystem's Centralized Settlement Engine
18. OSA - Open Strategic Autonomy
19. POS - Point of Sale
20. PSP - Payment Service Provider
21. P2P - Peer-to-Peer
22. UTXO - Unspent Transaction Output

## Section 1. Introduction, Objectives and Methodology.

### Introduction and Literature Review

#### Introduction

The payments revolution has arrived. Predominant means of payment are being replaced by innovations in the retail payments and electronic payment ecosystems. A progression towards a cashless society in financial transactions is ahead. As a consequence, most central banks around the world<sup>1</sup> are meticulously evaluating the feasibility of introducing digital forms of money, such as Central Bank Digital Currencies (CBDCs).

A CBDC is a digital means of payment denominated in the national unit of account that represents a direct claim on the Central Bank, instead of a liability for a commercial bank (Auer et al., 2022). In this study, I focus on one of the most advanced CBDC projects among developed economies: the digital Euro. I will analyze the economic arguments for a Euro CBDC, explore the various facets of the digital Euro project and its potential design and implications.

A CBDC, such as the digital euro, could have a wide variety of architectures and attributes (Auer et al., 2021):

- (i) One primary differentiation relates to the **purpose and audience** of CBDCs, namely, *wholesale* and *retail* CBDCs. Wholesale CBDCs are designed for use in reserve relationships between central banks and financial institutions, whereas retail CBDCs, often referred to as *general purpose* CBDCs, are intended for use by households and businesses. For the Digital Euro project, the focal point is the creation of a retail CBDC, as it directly addresses the evolving landscape of diminishing cash usage and the emergence of cryptocurrencies and stablecoins, factors that are not as relevant to wholesale CBDCs.
- (ii) A second critical distinction revolves around the **base** of CBDCs, with *account-based* and *token-based* models standing out. In the account-based model, some form of identification is necessary for transaction purposes, resembling the workings of traditional bank deposits.

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<sup>1</sup> 93% of central banks worldwide are currently conducting some sort of work related to CBDCs, according to a survey by the Bank for International Settlements (Kosse and Mattei, 2023).

Conversely, the token-based model offers a high degree of anonymity, much akin to cash transactions<sup>2</sup>.

- (iii) Furthermore, the **supporting technology** behind the CBDC plays a pivotal role in design decisions. Authorities must select between traditional systems with centralized ledgers and the various forms of Distributed Ledger Technologies (DLT), notably considering the tradeoffs between permissionless and permissioned variants.
- (iv) Another essential aspect in classifying different types of CBDCs is the **operational architecture** of their implementation and the role assigned to the private sector, including commercial banks and other financial institutions. This perspective enables a distinction between direct, hybrid, and intermediated CBDCs, each offering unique features and balancing the level of central bank control with the involvement of private entities in the CBDC ecosystem.

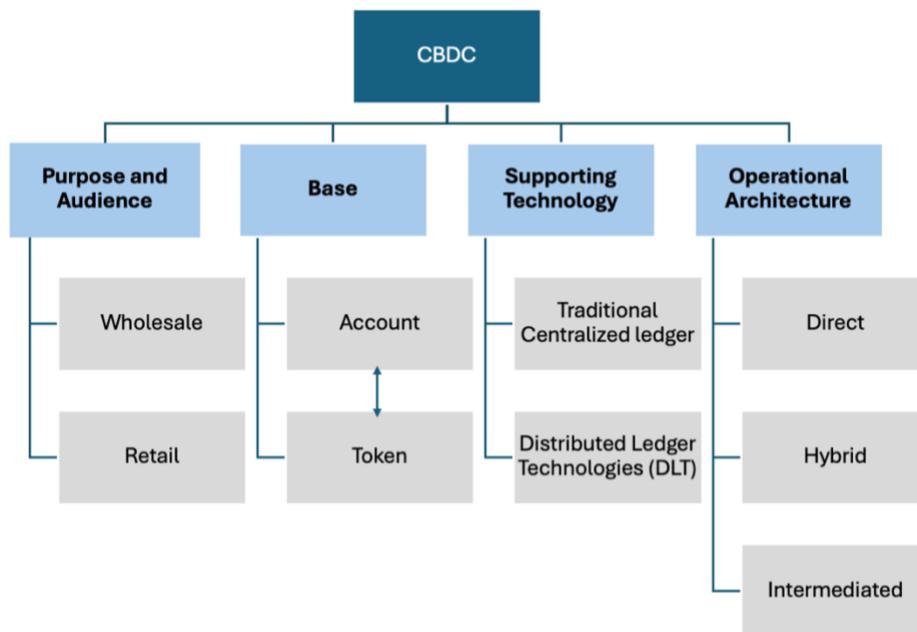


Figure 1. Types of CBDC. Source: own elaboration.

<sup>2</sup> Today, this distinction might have become antiquated, because many digital currencies demonstrate that these categories are not mutually exclusive. Bitcoin, for instance, uses public-key cryptography, requiring identity verification like account-based systems, while also validating transactions through its history, akin to token-based systems. A CBDC can thus combine elements of both approaches, (Keister, T. and Monnet, C., 2020)

Apart from the digital euro – which is just in an exploration phase, there are some central banks around the world that have already issued a CBDC and others that have started a pilot. Only three countries and one monetary union have officially issued a sort of CBDC: The Bahamas, the Eastern Caribbean Currency Union, Nigeria, and Jamaica. And China, one of the most prominent players in this space, is developing its digital yuan (e-CNY), which is the largest CBDC pilot in the world. Indeed, the e-CNY pilot has reached 260 million wallets across 25 cities and is used in various settings, including transit, healthcare, and even crude oil purchases. In 2024, the focus is on optimizing its use for overseas tourists and expanding cross-border applications (Atlantic Council Geoeconomics Center, 2024)<sup>3</sup>.

The ECB started its investigation for a digital euro in 2021, and in October 2023 it launched a preparation phase that will *lay the foundations for the potential issuance of a digital euro*<sup>4</sup>. Its exploration of a digital euro aims to ensure financial stability by perpetuating public money in the digital era. Additionally, it seeks to enhance the EU's strategic autonomy by strengthening the euro's international competitiveness and reducing dependency on foreign payment service providers. Both justifications, as well as other complementary ones, are surrounded by debate and uncertainty, while the ECB moves forward with preparations for a potential rollout by November 2025

### Literature review

This research contributes to several literatures spanning the fields of economics of CBDCs, banking, financial stability and payments. In particular, this work is closely related to the recent literature that tries to understand the **factors and determinants of issuing a CBDC**, which highlights several key themes. [Alfar et al. \(2023\)](#) identified that economic factors negatively impact CBDC issuance as underdeveloped countries are the most engaged, while demographic factors like urbanization and a young population are positive influences. [Mazambani \(2024\)](#) emphasizes the importance of public trust, finding that central bank approval, perceived security and trust in the government are crucial for CBDC acceptance, while trust in internet technologies might have been underrated. [Maryaningsih et al. \(2022\)](#) differentiate the factors affecting CBDC adoption in emerging and advanced countries, noting that wholesale CBDCs thrive in developed

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<sup>3</sup> In addition to these initiatives, several other countries are advancing in their CBDC projects. Brazil, Russia, India, and South Africa are all in the pilot phase of CBDC exploration. These countries are part of the BRICS group, which is also exploring cross-border wholesale CBDCs as a potential alternative payment system to the dollar. This exploration has intensified due to recent geopolitical tensions and economic sanctions ([Atlantic Council](#)).

<sup>4</sup> [https://www.ecb.europa.eu/paym/digital\\_euro/timeline/html/index.en.html](https://www.ecb.europa.eu/paym/digital_euro/timeline/html/index.en.html)

financial markets, whereas retail CBDCs are more prevalent in countries with low financial inclusion. In the same line, [Demertzis and Martins \(2023\)](#) argue that retail CBDCs can enhance financial inclusion and protect consumers from volatile cryptos, so long as there is sufficient digital infrastructure and penetration in the country, while wholesale CBDCs offer greater benefits for regions like the euro area, where great savings can be reaped from cross-border payments. However, they also consider that the studying of a retail euro CBDC is a worthy investment, in as much as the future digital financial system might demand it. [Ahnert et al. \(2023\)](#) discusses the broader economic implications, suggesting that CBDCs could replace banknotes as the monetary anchor and help retain monetary sovereignty amidst the rise of global stablecoins, one of the main narratives at the ECB. Together, these studies provide a window to the complex and multifaceted considerations central banks must evaluate when deciding to issue a CBDC.

Secondly, I also contribute to the literature analyzing the **impact of issuing a retail CBDC in the banking system**. Here, [Vollmar and Wening \(2024\)](#) find that CBDC-induced deposit outflows pose significant disintermediation risks for deposit-dependent banks, necessitating alternative funding strategies. [Kumhof and Noone \(2018\)](#) propose strategies to mitigate digital bank runs, such as paying an adjustable interest rate on CBDCs, ensuring they are distinct from reserves and not convertible into one another, or issuing them only against eligible securities to manage liquidity. Similarly, [Bindseil \(2020\)](#) also suggests a tiered remuneration approach, offering lower interest rates for higher balances to discourage large-scale withdrawals and balance the benefits of CBDCs while preventing excessive impacts on bank balance sheets. [Niepelt \(2022\)](#) discusses how CBDC can discipline banks and potentially raise funding costs, while also exploring optimal monetary policies for CBDC systems. [Adalid et al. \(2022\)](#) focus on the digital euro, agreeing that reduced demand for bank deposits could impact credit provision and financial stability, and also highlighting the importance of holding limits and remuneration in moderating these effects.

Thirdly, this manuscript also relates to the literature that focuses on exploring the impact of a CBDC in **financial stability and payments**. In this space, [Bofinger and Haas \(2020\)](#) emphasize the microeconomic implications, arguing that CBDCs do not address a clear market failure and suggesting a central bank-operated payment system without new payment assets. Those systems might include offline functionality, which entails a lot of potential but, simultaneously, significant security challenges, as highlighted by [Chu et al. \(2022\)](#). On the impact that the introduction of the CBDC could have on bank intermediation and welfare, CBDCs might reduce welfare by interfering with the complementarity between credit lines and deposits [Piazzesi and Schneider](#)

(2022), while [Meller and Soons \(2023\)](#) support the idea that a €3,000 holding limit can mitigate liquidity risks and stabilize bank balance sheets, even under adverse conditions. [Nyffenegger \(2023\)](#) shows that CBDCs used both as a medium of exchange and a savings vehicle significantly increase disintermediation impacts, while interest-bearing CBDCs can enhance welfare if interest rates are managed properly.

## Objectives

In this context, the aim of this paper is to shed light on the overarching debate of whether a Digital Euro is really needed, by depicting the different argumentations that have been brought forward and analyzing them with insights from the literature reviewed and from the industry (Section 2). The paper will also address the ECB's progress and forthcoming steps, along with the probable characteristics and design features of an eventual digital euro, as portrayed in the most updated reports (Section 3). Overall, this paper seeks to provide a comprehensive understanding of the complex and nuanced discussions surrounding the future of money.

## Methodology

This study employs a descriptive approach, combining a thorough review of existing literature with qualitative data from industry experts. The literature review encompasses academic papers, official reports, and relevant publications to provide a comprehensive overview of the current state of Central Bank Digital Currencies (CBDCs) and the specific case of the digital euro. Additionally, insights are gathered from interviews with industry experts and a survey conducted among knowledgeable professionals to capture diverse perspectives on the necessity, design features, and implications of a digital euro. This approach ensures a detailed and nuanced understanding of the ongoing discussions and potential impacts of a digital euro.

## Section 2. Understanding if there is a need for a Digital Euro.

James Tobin (1987) argued that cash was not a very convenient means of exchange and proposed a “*deposited currency*” or “*a medium with the convenience of deposits and the safety of currency*”. In that spirit, general purpose CBDCs have been researched for quite some time now. Since the first projects were run in 2014 in China and the next year by the central banks in Canada, the Netherlands, Singapore and the United Kingdom, to the last survey by the Bank for International Settlements (BIS) in 2022, virtually all Central Banks (93%) have joined the trend (Anneke Kosse and Ilaria Mattei, 2023). In the middle, as a catalyzer of interest, are the fast-paced developments in the **digitalization of the economy**, to which payments and money itself have, by no means, been immune.

Indeed, the BIS points to the emergence of cryptocurrencies and stablecoins to explain the rapid rise in interest amongst central banks (Auer et al., 2021). They have, as the BIS puts it, been forced into a proactive (defensive) stance, as the declining use of cash threatens the two-tiered financial system.

But this does not threaten all in an equal manner. At the US Federal Reserve, some members are highly skeptical about the need for a CBDC. For example, on a speech in August 2021, Governor Christopher J. Waller claimed that private stablecoins, rather than a threat to US monetary policy, could act as an amplifier of such policy, in as much as they are often pegged to the dollar and hold US currency in their assets. Very much like countries that peg their currency to the dollar, these entities surrender their monetary policy and import that of the US, the Governor said (Waller, C.J., 2021).

This highlights the **political and strategic** aspects of CBDC development, the context and circumstances of each jurisdiction influencing the decisions made. For another example, China’s fast paced development of the e-CNY can be seen as an attempt to bolster its currency in international metrics (use as reserve currency or in transactions) which, due to its capital controls and fixed exchange rate, remains low relative to its economic capacity (Longaric and Casola, 2022, box 2)

But CBDCs also pose relevant **moral and structural** questions that ought to be answered in the design of any eventual CBDC. The most important lies in the trade-off between privacy and law

enforcement, but others also point to excessive economic power in the hands of the Central Bank, or the critical threat in terms of cybersecurity.

In this section of the paper, we will navigate through these issues in the following order. First, we begin by discussing the two-tiered financial system and the challenges posed by the digital economy, including the rise of cryptocurrencies and stablecoins. We then evaluate alternatives to a CBDC, considering why regulation alone may be insufficient. Then, we delve into the strategic importance of a digital euro for enhancing the EU's strategic autonomy, by defending the international role of the euro and promoting the integration of European payments. Finally, the section also considers other justifications for a digital euro, such as enhancing financial inclusion, spurring innovation, and serving as an instrument of monetary policy, and incorporates survey results and expert insights.

#### 1) Necessity to Perpetuate Public Money in the Digital Era

##### A two-tiered financial system

Nowadays, it is not well-understood that the current financial system follows a two-tiered model. Private bank money (deposits) is always at par with public money (cash), and people fully trust that banks can honor their claims. Thus, transactions are comfortably carried out digitally through transfers of private bank money, deposits that represent a claim on the bank.

However, the effectiveness of private money is anchored in the legal tender status of public central bank fiat money. By controlling the supply of money in the system through different policies, the authority backing the currency can keep it functioning as a unit of account, means of exchange and store of value. Therefore, although it represents only 15%<sup>5</sup> of the total supply of money, public money constitutes a fundamental anchor of stability (Brunnermeier and Landau, 2022, as cited in Ahnert et al., 2023).

If that disappears, the **singleness** of the currency is threatened. Without an undisputed monetary anchor, people would have to monitor the safety of private money issuers in order to value each

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<sup>5</sup> Measured by the narrowest monetary aggregate M1.

form of money<sup>6</sup>. Different values depending on the trustworthiness of the issuer renders money ineffective as a coordination device (unit of account, means of exchange, store of value). Stability, then, requires a **widely used** public money of reputation alongside private monies that are reinforced through bank regulation and supervision, insurance on deposits, and the CB as lender of last resort, in times of distress (Ahnert et al., 2023) (Eichengreen, B., 2019).

Currently cash is doing this job alone<sup>7</sup>, and it is finding it difficult to cope with the **unwavering digitalization** of the economy.

### The digital economy challenge to the financial status quo

We can distinguish two different sources of pressure on cash. On one side, the uptake of ICTs and the rapid rise in **e-commerce** have reshaped the economy, cutting across sectors and leaving cash behind, as it cannot be used to transact online. Simultaneously, rapid developments in **electronic payment** services explain the decline in cash usage at the point of sale (POS) and between peers (P2P), non-online payments.

In the euro area, the share of online payments in consumers overall non-recurring payments increased an 11% from 2019 to 2022, to settle at a 17% of the total. As online payments are frequently used for larger amounts, the total share is larger in terms of value (28%) (ECB, 2022).

Accordingly, the share of enterprises participating in e-commerce and the fraction of turnover generated online have both increased (Eurostat E-commerce statistics). Many reports tie this to the Covid-19, arguing that it led to many consumers carrying out purchases online, a fraction of which has retained the habit after the pandemic passed (ECB, 2022 & Di Iorio, A. et al., 2024). Recurring payments are made through direct debit/credit transfers.

In the other hand, POS transactions in cash declined from 72% in 2019 to 59% in 2022. In terms of the value of payments, cards overtook cash in 2022 accounting for 46% of the total amount of transactions. In P2P payments, cash remains dominant, but it has also experienced a sharp decline

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<sup>6</sup> During the so called “free banking era”, banks could issue their own paper currency (banknotes) backed by their reserves of gold or silver. These banknotes circulated as common currency but were frequently subject to discount based on the perceived stability of the issuing bank (Ahnert et al., 2023) (Eichengreen, B., 2019).

<sup>7</sup> Public digital money exists in the form of Central Bank Reserves, but these are only available to financial institutions (wholesale).

both in terms of number and value of transactions, especially amongst tech-savvy users, as new, more agile electronic services are growing for this use case (KANTAR PUBLIC, 2022).

Altogether, for the first time ever, the cash stock started to decrease in 2023 (figure 2).

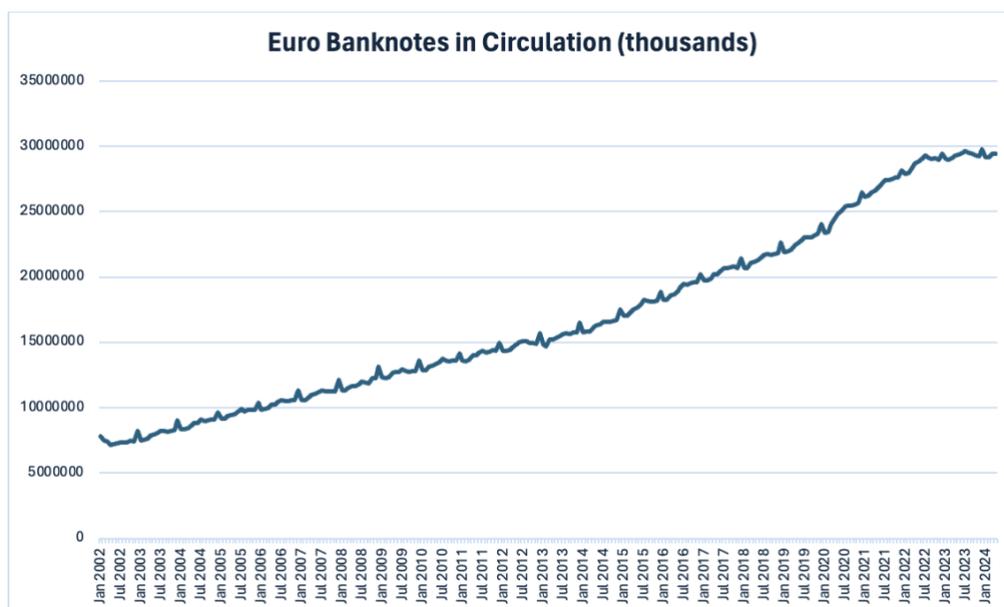


Figure 2. Euro banknotes in circulation.

Source: Net Circulation - number of banknotes/coins in circulation in Euro Area ECB Data Portal

Therefore, although cash remains used, the trend is clear. The convenience of electronic payments is expected to keep pushing down the usage of cash, the advantages of which are related to anonymity and protection of privacy, as well as the perception that it makes one more aware of one's own expenses (Payment preferences, in ECB, 2022).

Importantly, although the trend is generic, data differs across countries, and within countries it differs amongst demographic groups. For example, while in Finland only 19% of POS transactions were made through cash in 2022, in Germany cash was preferred in a 63% of the occasions (66% in Spain). The downward trend, however, is common to all European countries (Country-specific data, in ECB, 2022).

All this information pointing to a decline on the use of cash raises the question of what will happen when cash usage reaches a critical low. Should we expect a free banking era type of dynamic? That does not seem to be a concern for Fed Chair Christopher J. Waller, unconvinced of the idea that a cashless economy would necessarily need a CBDC: “*Physical currency can effectively*

*disappear, and everything still works. All the central bank needs to do is promise to provide the currency if requested”* (Waller, C.J., 2021). According to him, the decline in the use of cash cannot be understood as a market failure capable of justifying public intervention through issuance of a CBDC. In the other hand, in one of investigation phase papers, the ECB reflects a different opinion, affirming that a public currency, as monetary anchor, must be used: *“As the use of cash is declining, the promise of convertibility at par becomes less and less meaningful. To ensure that public money can perform its function as anchor of the monetary system, it must be widely accessible and used”*. They do not deny, however, the possibility that monetary policy can work in an “almost” cashless economy (Lagos and Zhang, 2019, as cited in Ahnert, T. et al., 2023 pg. 13).

As the decline in the use of cash seems to be one of the main drivers for Central Banks to study the possibility of issuing a CBDC (Auer et al. 2020b), we decided to ask some experts their opinion in our survey (question 8). Almost 64% of respondents replied that the financial system could work in a cashless economy, while 27% answered that it could not (the rest where not determined).

Whatever the case may be, in this landscape, it is not surprising that the advent of **cryptocurrencies and stablecoins** raises concerns.

### The advent of cryptocurrencies and stablecoins

Bitcoin launched in the outburst of the financial crisis, promising to revolutionize the status quo of the financial system by eliminating all intermediaries. This is achieved through DLT technology and a permissionless scheme that remunerates participants in verifying transactions (miners) by creating for them new currency or through fees.

Underlying the system is the concept of digital scarcity, embedded in Bitcoin through its fixed supply cap of 21 million coins. This scarcity mimics precious metals like gold and is fundamental to Bitcoin's value proposition as an asset. The rate of new Bitcoin creation is halved approximately every four years in an event known as the “halving”, ensuring that the total supply will gradually approach the 21 million cap ([bitcoinnews](#)).

No to be too quick to dismiss Bitcoin’s achievements, it is sufficient to say that it has failed to replace sovereign currencies in use for transactions, and to disintermediate financial institutions. Bitcoin and all the cryptocurrencies that followed have, for the most part, been reduced to

speculative assets of high volatility, rendering them inoperable as a means of exchange, unit of account or store of value (Arner et al. 2020).

The ECB recently voiced some strong words against the cryptocurrency. Bindseil U. and Schaaf J. (2024) highlighted Bitcoin's lack of success in kicking of network effects, even with governmental backing (in El Salvador), alleging that its use is constrained to criminal activities in the darknet. They underlined its lack of scalability, with slow and inconvenient transactions that, also according to the BIS, become more costly as the throughput increases, with the possibility of orders getting stuck in a queue for hours (BIS, 2018).

Further, the ECB goes on to voice other societal concerns, including the fact that, however marginal its use may be, the Bitcoin network already consumes as much energy as entire countries<sup>8</sup>, and its speculative runs cause a *redistribution of wealth at the expense of the less sophisticated* (Bindseil, U., and Schaaf, J., 2024).

And the list of problems goes on. Some of these, however, are solved by private **stablecoins**, which are taken as a more serious threat, as they can purport the essential elements of stability and uniformity that are required to be a competent alternative monetary system. As we will explain later, the adoption of this digital coins threatens the monetary sovereignty of many countries, as successful stablecoins are typically linked to the US Dollar.

We can differentiate four different stablecoins according to the scheme they implement to deliver on their promised stability (Eichengreen B., 2019).

- i) **Fiat fully collateralized stablecoins** are backed by an equal amount of fiat currency held in bank accounts, typically U.S dollar deposits (e.g. Tether). Eichengreen makes the point that this are closer to commercial bank money than the currency created by CBs. They are obviously costly, complicating scalability. On top of that there is always the risk that, seeking profitability, the issuer might cut corners<sup>9</sup>.

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<sup>8</sup> The BIS estimated in 2021 that the energy consumption of Bitcoin matched that of the Netherlands (Auer et al., 2021).

<sup>9</sup> The author mentions that Tether had issued millions of tokens without allowing its reserves to be audited. He draws parallelisms with the *wild cats* of the free banking era, who bought government bonds with their own circulating bank notes, which they could not really redeem, as their reserves were actually *kegs of nails and broken glass with a layer of coin on top*.

- ii) **Crypto-collateralized stablecoins** are backed by a cryptocurrency, freeing the issuer from relations with any bank (e.g. Dai). However, since the reserves are very volatile, they are often overcapitalized, making them also extremely expensive. Still, they are subject to runs when the basket of cryptocurrencies falls.
- iii) **Partially Collateralized Stable Coins.** These are backed by a combination of cryptocurrencies and fiat currencies in a reserve, with a decreasing reserve ratio over time based on the coin's stability.
- iv) **Uncollateralized Stable Coins.** The issuer plays with digital coins and bonds to control the supply of the coin with “smart contracts” so as to keep the currency pegged<sup>10</sup>. As the incentive to hold bonds is the promise of “dividends” when more coin is issued, the viability of this scheme depends on success at growing the platform, which raises suspicion of a Ponzi scheme.

As stablecoins continue to surprise with their success, it will be important to keep these models in mind, as they might define what money looks like in the future. And we might not have to wait that much. According to research by Morgan Stanley, USD pegged stablecoins reached a volume of transactions of \$10 trillion on public blockchains, rivaling payments giant VISA (Peel, A., 2024).

Consequently, the entry of stablecoins has been taken very seriously by existing players, who have been quick to adapt, integrating stablecoins to their portfolio of services to take part in the main developments, particularly in efficiency in payments and cross-border transactions<sup>11</sup>.

However, the world is struggling to keep up with the US in these developments, as the gap in terms of market capitalization and volume of transactions made with stablecoins has been and remains very significant:

- According to one analysis by the ECB, the **volume of transactions** made using the two biggest euro stablecoins represented only a 0.03% of the volume of transactions made using the two main US stablecoins, over the same period (Ferrari, M. M. and Habib, M. M, 2022).

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<sup>10</sup> When the currency falls below the peg, the issuers reduces the supply by selling bonds (and vice versa).

<sup>11</sup> [Visa Expands Stablecoin Settlement Capabilities to Merchant Acquirers](#), [PayPal stablecoin](#) & [Mastercard creates simplified payments card offering for cryptocurrency companies](#).

- In terms of **market capitalization**, the same report accounted for a 99% of stablecoin capitalization belonging to coins pegged to the USD, while only a 0.2% represented coins pegged to the euro, at that time. The most updated data, as shown in figure 3, would highlight a widening gap with the US in this space.

Market Capitalization (Million USD, Jun 2nd 2024)			
Peg Type	\$ Stablecoins	€ Stablecoins	Total
Market Cap.	160.009,00 USD	243,08 USD	160.378,00 USD
Share	99,77%	0,15%	100%

Figure 3. Comparison of USD v. Euro Stablecoins.

Source: <https://defillama.com/stablecoins>

In conclusion, although different voices defer in the assessment of their success and viability, crypto and stablecoins have transformed the playing field. And even if they have not yet achieved the information insensitivity desired by economic agents, should use continue to increase, States could **lose monetary sovereignty**, understood as the supremacy of the domestic currency as unit of account, medium of exchange and store of value in an economy. This phenomenon, often referred to as *currency substitution* (dollarization, euroization) has many consequences. First and foremost, it entails that the public authorities cannot implement **monetary policy** to tackle domestic economy issues, whether it is addressing price stability, economic output, balance of payments imbalances<sup>12</sup>... Losing monetary sovereignty, in turn, impacts **financial stability**, as the CB can no longer act as a lender of last resort, nor control the institutions behind the stablecoin. Furthermore, if economies endorsed these private foreign currencies, States would also lose **seignorage**<sup>13</sup> and the political power that comes with it, being unable to rely on this privilege when the State is in distress, as goods and services would be traded through a currency which they cannot produce (Eichengreen B., 2019).

Consequently, Central Banks are wary of cryptocurrencies and stablecoins, underscoring their shortcomings while taking notice of the technological promise.

<sup>12</sup> It is very well explained by Ahnert, T., et al. (2023): *Monetary policy transmits to the economy because prices are sticky in terms of the domestic currency. This is crucial for a monetary expansion to generate an increase in output rather than just a bout of inflation. If prices are quoted in a different unit of account, the transmission of monetary policy is impaired. Moreover, (...) the presence of alternative means of exchange in the economy, such as cryptocurrencies and private digital currencies, constrains monetary policy (pg. 14).*

<sup>13</sup> Essentially, the difference between the value of money and the cost to produce and distribute it.

## Alternatives to a CBDC: why regulation is not enough.

When questioned after his speech whether the Federal Reserve was falling behind in CBDC development and ceding leadership to other Central Banks, Fed Governor Christopher J. Waller replied: ... *we do not need a CBDC to allow innovation or get things under control, all we need to do is get the regulatory aspect right* (Waller, C.J., 2021).

Other jurisdictions, however, may not have that privilege. As the ECB recognizes, *the threat of “digital dollarization” is particularly acute for open economies with a significant reliance on foreign digital players*. American BigTech is best positioned to launch stablecoins, leveraging large customer bases and making bundles with their digital platforms<sup>14</sup>. This is consistent with the idea that *“an economy’s dominant unit of account is determined by agents that are large and generate lots of payments”* (Doepke and Schneider, 2017, as cited in Ahnert et al., 2023, pg. 13).

According to the European Commission, during the public consultation prior to the formal Proposal for a Regulation that ought to be passed before the ECB can decide to launch the digital euro<sup>15</sup>, many credit institutions voiced concerns of a scenario where a stablecoin succeeds as a means of payment and the ECB fails to deploy a CBDC. They said that the level of the threat would depend on the issuing entity, currency, backing assets, interoperability between systems, transaction costs, convenience, and programmability of the stablecoin. Further, *most* credit institutions advocated for a proper regulation of stablecoins, limiting issuance to credit institutions, establishing issuance requirements, and passing a **prohibition of foreign stablecoins used as payment instruments** (Stakeholder consultation, in European Commission, 2023).

However, that seems to be a **shortsighted solution** to the ECB. Convinced that cash is unfit for a digital future, it seems to be certain that no regulatory approach can promise to eliminate the threat to the two-layer monetary system. In a speech at the Bank of Italy, Fabio Panetta said that, although regulation can go a long way to preserve the integrity of the digital payment system, *it is important to recognize that regulation alone cannot replace the essential role of public money and the*

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<sup>14</sup> In the Impact Assessment accompanying the Proposal for a Regulation Establishing the Digital Euro, the Commission highlighted that, *according to ECB simulations, Libra/Diem could have been a global stablecoin leveraging Facebook/Meta’s user network and whose assets under management could have ranged from EUR 152.7 billion in a ‘means of payment’ scenario to around EUR 3 trillion in the most extreme ‘store of value’ scenario*. (European Commission, 2023, pg. 19)

<sup>15</sup> [https://finance.ec.europa.eu/publications/digital-euro-package\\_en](https://finance.ec.europa.eu/publications/digital-euro-package_en)

*confidence it inspires* (Panetta, F., 2023). For the ECB, the deployment of a digital euro “*appears to be the only solution to guarantee a smooth continuation of the current monetary system*” (Ahnert et al., 2023, pg. 31).

And that is the first and main objective of the digital euro project, in words of the Commission, “*to reinforce the euro’s monetary anchor in the digital age by ensuring that central bank money in both its physical and future digital form is widely available to and accepted by all euro-area residents/businesses and tailored to their needs, while preserving financial stability*” (European Commission, 2023, pg 28.).

In any case, regulation charges ahead, and it is likely that, by the time the digital euro is deployed, there will be private digital euros alongside electronic commercial bank money, which, with even lower use of cash, will further challenge the objectives of the ECB, as users and businesses will see little added value in a public digital euro<sup>16</sup>.

## II) (Open) Strategic Autonomy

Europe currently finds itself at a **crossroads**. Analysis of the current international landscape speaks of a halt or decline in globalization and rising fragmentation and protectionism. Although many studies challenge this view, and more optimistic scenarios of a renewed international order are also considered possible, the fact remains that after enjoying the benefits of openness for more than 60 years, drawbacks in European economies have been left at plain sight. Amongst them is the offshoring of a significant part of its industry and greater vulnerability to external shocks, with a reduced ability of governments to ensure the wellbeing of their citizens (Spain’s National Office of Foresight and Strategy, 2023).

Indeed, the COVID pandemic, during which the European lack of capacity to produce key products like ventilators and masks *resulted in thousands of deaths and millions of euros in losses*, the trade war between the US and China, the global shortages of supply and the Russian invasion of Ukraine have all underlined the EU’s vulnerabilities, and the need to address them by increasing Europe’s autonomy (Spain’s National Office of Foresight and Strategy, 2023).

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<sup>16</sup> The Markets in Crypto-Assets Regulation (**MiCA**), first of its kind, institutes uniform EU market rules for crypto-assets. For an example of an already compliant issuer see <https://quantozpay.com> (EURD).

But, although the EU seems willing to shift to a more interventionist approach to protect its interests, it cannot afford a fragmented and closed global landscape. Not only because it draws a large part of its strength, prosperity and success from the openness that has characterized it<sup>17</sup>, but also because the EU aspires to project its values beyond its borders, often using trade and investment agreements as an instrument to ensure the commitment of partners.

In this context, the concept of **open strategic autonomy** (OSA) can be defined as the *capacity to act autonomously when and where necessary and with partners wherever possible* ([Council of the European Union](#)). It is a loose and contested concept that has evolved with geopolitical developments and has horizontally impregnated EU policy efforts, which, importantly, includes the financial and payments systems (Ioannou, D. and Pérez, J.J., 2023, [Council of the EU](#)).

When it comes to the digital euro project, these policies include strengthening the international role of the euro and the payments systems in the EMU.

#### i) Defending the International Role of the Euro

According to the Commission, the second specific objective of the digital euro is to “*strengthen the EU’s open strategic autonomy by increasing the euro’s competitiveness vis-à-vis other currencies, third country CBDCs and “stablecoins” not denominated in euro*” (European Commission, 2023, pg. 28).

The objectives of strengthening public money as the monetary anchor and Europe’s OSA intertwine in the digital euro project, as the declining use of cash and entrance of foreign stablecoins affects both simultaneously: leaving financial stability and monetary policy in the hands of a foreign power is a problem in terms of strategic autonomy.

We have already discussed the argument for preserving public money as an anchor, but why/how exactly is Europe’s OSA threatened? Ioannou, D. and Pérez, J.J., (2023) lead an effort by the Eurosystem to better understand how shifts in the geopolitical environment challenge the monetary

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<sup>17</sup> Consider that Europe comprises only 3% of the Earth's surface area, 6% of raw materials and 6% of the global population. Yet, it accounts for 15% of the world's economy and 54% of its social welfare spending (Spain’s National Office of Foresight and Strategy, 2023).

sovereignty of the Eurozone. Among the ideas found in their report, we can highlight the following:

- i. **The international use<sup>18</sup> of an issuer’s currency can lead to broader, cheaper and more easily accessible funding for the domestic economy, even in times of geopolitical stress.** It effectively opens up the capital account of firms that only borrow in that domestic currency. This “exorbitant privilege” of the global reserve currency comes with an “exorbitant duty” that can be identified, amongst other things, in the appreciation of the domestic currency during global crisis episodes.
- ii. **International seigniorage** as the government also benefits from financing privileges.
- iii. **Greater monetary policy autonomy** with stronger international transmission (“*positive spillbacks*”).
- iv. **Invoicing of strategic materials and commodities.** The fact that those materials and commodities are traded in an issuer’s own currency protects it against exchange rate volatility and provides greater price transparency and *room for manoeuvre should economic tensions arise*.
- v. **The international role of a currency may also make it easier to maintain or increase influence in global decision-making.** It allows the issuer to exert political leverage, as it controls financial resources that others find vital<sup>19</sup>. For the same reason, it helps to mitigate the effects of unilateral decisions taken by third countries. This **international monetary power** is found to be especially relevant for an issuer that has a relatively modest military power, as compared to its economic and financial weight.

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<sup>18</sup> International use of a currency refers mainly to international funding markets, trade invoicing and settlement, and foreign exchange reserves.

<sup>19</sup> For example, to maintain access to these resources, foreign actors may be required to comply with restrictions on certain trade and business practices outside the jurisdiction of the dominant reserve currency issuer or uphold sanctions against other foreign parties (EP Compilation papers: International Role of the Euro: A Monetary Policy View: *The International Role of the Euro: State of Play and Economic Significance*). From a different perspective, other countries may also gain from using a currency that provides stability and protection. Some nations, specially EMEs choose to issue debt denominated in a foreign stronger currency, as this provides deeper funding sources, mitigates investor fears of local currency fluctuations, and reduces financial frictions, however, they run the risk of their currency depreciating against that foreign currency, which makes repaying the debt more expensive. This may bring geopolitical benefits for the issuer of that currency as it encourages cooperative behavior in times of geopolitical tension (on the level of debt that some Asian and Latin-American economies have in dollars, see: <https://www.stlouisfed.org/on-the-economy/2021/august/dollar-exposure-public-debt-asia-latin-america>).

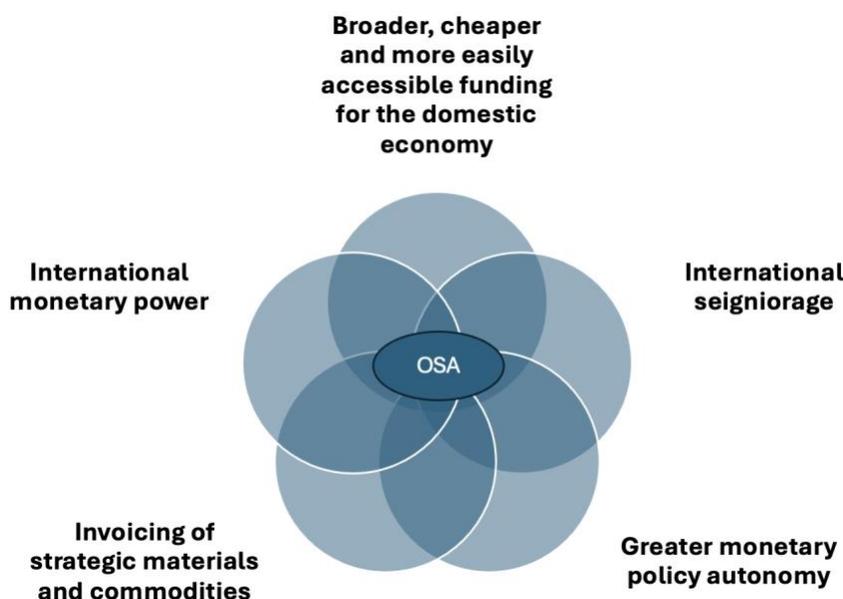


Figure 4. International role of the euro and OSA

Source: own elaboration

All these considered, from an EU (and ECB) point of view, in an increasingly unpredictable geopolitical landscape, the logic behind strengthening the international role of the euro makes growing sense. Currently, the euro is at a comfortable second-best position, although the US Dollar enjoys a wide lead in many of the most relevant indicators (Ioannou, D. and Pérez, J.J., 2023).

The question then is, **would a digital euro strengthen its international role?** As said at the beginning of this point, the Commission hopes that, with this project, they can enhance the autonomy of the EU, increasing the competitiveness of the euro vis-à-vis other currencies, which might issue their own CBDC, as well as vis-à-vis private stablecoins denominated in other currencies.

However, the ECB highlights that the motivations behind the digital euro project are mainly domestic (monetary anchor) and that its use beyond the frontiers of the EMU is a design question yet to be answered (more on this in Section 3). Furthermore, the ECB argues that if the use of the digital euro was opened for international transactions, this would have a limited effect on the role of the euro, as factors such as stability of macroeconomic fundamentals, size of the issuing economy and geopolitical considerations are more important in determining the international status of a currency. It is therefore more sceptic about this justification for the digital euro, underlining

that the literature is yet unclear on this point. Nevertheless, the ECB does acknowledge that other central banks have accelerated their plans for CBDCs possibly with a view to enhancing the status of their own currency, referring mainly to China, who, as we have already mentioned, has an interest in growing an alternative to the US-centered financial system<sup>20</sup> (Patrick Kosterink, in Ioannou, D. and Pérez, J.J., 2023) (Longaric and Casola, 2022, box 2).

Whatever the case may be, even if the main justification for a digital euro is domestic, the ECB agrees that *it may still be a relevant indirect factor in OSA*, in as much as it affects the financial infrastructure and addresses the potential use of private (or public) foreign digital currencies in the euro area **and beyond**. In this sense, the digital euro project is justified in the uncertainty of the future; if other economic powers opened their CBDCs for use beyond its borders, the Eurosystem would be ready to respond in defense of the euro (ECB, 2020. *Scenario 6: the international role of the euro gains relevance as a Eurosystem objective*).

## ii) Strategic Autonomy & Efficiency in Payments

The digital euro is much more than a CBDC project. It has become totally transparent that the ECB is not only designing a new form of money, which we could see as the **raw material**, but it is also creating a bast **infrastructure** through which that currency would be used for transactions.

That bast infrastructure would suppose a public intervention in the **payment's ecosystem**, which involves many players that intervene every time a transaction is made electronically. Of course, this intervention raises a lot of concerns, as the ECB would be touching something that, essentially, works already quite well. So, why then are the ECB and other EU institutions intervening?

To answer that question, we first must walk through a simplified explanation of the complex payments' *ecosystem*. The current payments ecosystem operates through a well-established network of financial institutions, card networks, payment processors, and regulatory frameworks

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<sup>20</sup> Amongst the steps taken in China to achieve this, such as the “*petroyuan*” (a yuan-denominated oil futures contract), *CIPS* (an alternative to SWIFT), and international financing under its “*Belt and Road Initiative*”, we must highlight the “multiple CBDC bridge”, a project that would interconnect the digital currencies of China, Hong Kong, Thailand and the United Arab Emirates for wholesale cross-border payments ([Project mBridge](#)). A similar project called Agorá involves the central banks of France (representing the Eurosystem), Japan, Korea, Mexico, Switzerland, England and the Federal Reserve Bank of New York.

that collectively facilitate the movement of money. Financial institutions (i.e. banks), serve as the foundational pillars, providing accounts that store consumer and business funds. Card networks (Visa, MasterCard, etc.) and payment processors bridge the gap between consumers, merchants, and banks, enabling transactions by verifying transaction details, ensuring funds are available, and transferring funds from the payer's account to the payee's account. This system is governed by a complex set of regulations that ensure security and privacy in the transfer of funds. Banks and other intermediaries cooperate in the achievement of public policy goals related to anti-money laundering and countering the finance of terrorism (AML/CFT) amongst others. Bank and non-bank payment service providers (PSPs) offer merchant services, including payment gateways and point-of-sale systems, to facilitate transactions across various channels such as in-store, online, and mobile payments, and often bundle other additional services (e.g. fraud protection, analytic reports). In parallel to the flow of valuable data, a fee paid by the merchant is distributed between the different intermediaries (the issuing bank, the acquiring bank, and the technical infrastructure/processor of the transaction). The exact functioning of the scheme may be different for different volumes, use cases, devices... (Stripe, 2023, [The Payment Industry Ecosystem Explained](#)).

The payments system is evidently a highly **strategical sector**, as it critically affects all consumers and businesses, being therefore at the core of the overall economy (Garner, J., 2023).

Since the card brand and operator of the bridge infrastructure has an intermediation business model, strong **network externalities** are at play. Users are interested in a brand that is accepted by all businesses, and businesses are interested in a brand which most customers use. Thus, this service has been concentrated in the hands of very few providers, namely **Visa and Mastercard**.

This creates problems both of an economic and geopolitical nature:

- From an economic point of view, this concentration generates competition concerns. Visa and Mastercard are said to have a hold on European banks and merchants, who struggle to find a competitive alternative. Visa & Mastercard have leveraged their position to rise their fees, which have doubled from 2016 to 2021 ([Expansión](#)).
- Strategically, 70% of European card payment transactions are handled by non-European payment-related service providers, and those PSPs that are European, rely heavily on

foreign critical services (e.g. cloud services). Thus, shall geopolitical tensions arise, the European payment system would be vulnerable<sup>21</sup> (Ioannou, D. and Pérez, J.J., 2023).

To intervene, the ECB has combined the Eurosystem **retail payments strategy** and the **digital euro** project, with the goal of reinforcing the resilience of retail payments and exploiting the complementarity between these projects, essentially by making the digital euro work through a pan-European technical infrastructure alternative to that offered by Visa and Mastercard (Cipollone, P., 2024).

The ECB believes that **private attempts** to shake of this dependency have failed<sup>22</sup>, as European private payment solutions have succeeded only at a national level. This has left behind unevenly developed and unintegrated payment ecosystem in the euro area. However, could also mean that the level of dependency is not the same across the EMU<sup>23</sup>.

In an **interview with Juan Gandarias**, who until June 2023 was the head of the payments filial of Caixa Bank (Comercia Global Payments), one of the main players in the sector, he argued that Spain was an example of country with a highly developed payments sector. He pointed to the existence of local infrastructure (Redsys) to bridge the different intermediaries for payments within the country, as well as successful fast-payment local solutions. He was referring to Bizum, created through the cooperation of 23 Spanish banks, which can settle payments instantly, has reached over 26 million active users, and is trying to expand from peer-to-peer to other use cases, namely e-commerce and point of sale<sup>24</sup>.

Consequently, the Spanish banking sector is following closely the developments of the digital euro project. In a conference organized by FUNCAS and the Spanish Central Bank, the digital euro project manager Evelien Witlox and representatives of the Spanish banking industry were brought together to discuss various important issues. First and foremost, Spanish bankers worry about their **investments being displaced** by the digital euro infrastructure (the “European rails”) and advocate

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<sup>21</sup> In addition to cybersecurity risks, other concerns relate to user data privacy and traceability in the AML/CFT context.

<sup>22</sup> The European Payments Initiative (EPI) is an attempt to join the European banking industry to solve this problem by creating a pan-European payment solution, considered a failure after 20 out of the initial 31 banks pulled out, including all the Spanish banks ([European Payments Initiative hits troubles as majority of Banks leave](https://www.epicompany.eu)) (<https://www.epicompany.eu>).

<sup>23</sup> For information on the degree of development of each EMU country in this space, see *Study on New Digital Payment Methods*, Kantar Public (March 2022) and *Study on Digital Wallet Features*, Kantar Public (March 2023).

<sup>24</sup> *Spain's Bizum Banks on Point of Sale Expansion to Drive Growth*, [PYMNTS](#)

that it is paramount to build on existing solutions, a claim that seems to be acknowledged by the ECB. Secondly, they worry about **difficulties to explain the digital euro to the end users**, and advocate that, if the digital euro is finally deployed, it will be key to roll it out gradually and to build on the operational experience of the existing intermediaries<sup>25</sup>. This also seems to have been acknowledged by the ECB, which is aware of the dangers of failing to achieve a minimum level of use by the population but is, simultaneously, wary of the perils of achieving too much (*Too much vs. too little*, Ahnert et al. 2023). Lastly, the industry places a lot of attention in the **compensation model**, and warns the ECB against destroying incentives, which would drive innovation out of the ecosystem (FUNCAS, 2024).

By way of conclusion, although the vulnerability is obviously important, underlining here is a degree of **distrust in American BigTech companies**. During the Spanish presidency of the Council of the EU, in the informal paper RESILIENT EU2030, to which we have referred when addressing the EU's OSA, it was advised that autonomy should be pursued when reliance was dangerously placed on companies with ties to non-like-minded countries (Spain's National Office of Foresight and Strategy, 2023). However, the EU is not alone in pursuing more autonomy in payments. In the U.K, relevant reports also call for alternatives to Mastercard and Visa, and advise the Government to pursue a National Strategy, although it also recommended a diplomatic approach to Big Tech companies<sup>26</sup> (Garner, J., 2023).

### III) Additional Justifications

In addition to reinforcing the monetary anchor and strengthening the European strategic stand in payments, other additional justifications have been used to support the digital euro project. We will now walk through these justifications and concerns, namely, the enhancement of privacy, the stimulation of competition, efficacy and innovation, the boosting of financial inclusion and the improvement of monetary and fiscal policy.

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<sup>25</sup> The ECB considers a “staggered roll-out” in the fourth progress report, which would prioritize P2P and e-commerce use cases, generating network effects while allowing more time to adapt the infrastructure for POS payments (ECB, 2023b).

<sup>26</sup> As an example, it pointed out a *Silicon Valley embassy* that the EU has opened to reinforce its [Digital Diplomacy](#).

## Market failure: defense of privacy

Nobody questions the growing centrality of data in the digital economy. It is acknowledged by all, ECB included, that data is the lubricant of the economy, and that the use of data on consumer preferences “*promises large social gains through more efficient matching and better goods and services*” (Ahnert et al. 2023, Pg. 8).

However, as the internet economy has developed, privacy awareness has increased and users are more conscious about the data generated in their day-to-day activities, including payments. An important question we must understand then, is why users worry about their privacy. Adopting an economic perspective, the ECB defines privacy as *the claim of individuals, groups, or institutions to determine for themselves when, how, and to what extent information about them is communicated to others* (Westin, 1967). From that starting point, it identified three different reasons why agents demand privacy. One of them is to conduct **illicit activities** like drug trafficking or tax evasion. However, users might demand privacy for other, **legitimate reasons**, which can be identified in the mitigation of a “*moral hazard*”. For example, users may want to conceal their consumption of alcohol, or anti-conceptive drugs and abortion services. Additionally, other authors consulted by the ECB identified an **element of control** or interest in the part of the consumer. While in certain circumstances withholding information can be economically efficient (monopoly) in others it can result beneficial to disclose it (competition). According to this perspective, the inclusion of optional data sharing features is thought to be beneficial for welfare (Ahnert et al. 2023).

The ECB believes that market forces are unable to provide an adequate level of privacy. Payment data is indeed very valuable and profitable, as it allows to determine willingness to pay, which in turn enables price discrimination against customers. Simultaneously, however conscious, users tend to give away their data for free or at very low cost, a *paradox* that, according to the ECB, rises greater skepticism about market forces reaching an adequate level of protection. In any case, the public authorities having access to too much of our data is also a source of concern that must be duly addressed (Ahnert et al. 2023).

These are political decisions that must be made in the Regulation on the establishment of the digital euro. The exact design of the CBDC will be different across jurisdictions, and we will delve into what is known about the digital euro in the next section of this paper. In any case, it is worth

mentioning that in 2021, the G7 set out their basic common principles for CBDC development, the 3<sup>rd</sup> being data privacy, in equilibrium with other public policy objectives (AML/CFT), which shows potential for cooperation in this space (G7, 2021).

### Spurring innovation, competition, and efficiency

From the first progress report in 2020 to the last in October 2023, the ECB has maintained that the digital euro would simultaneously address various market imperfections. In terms of **competition**, it would provide an alternative to bank deposits, which could raise the rate paid to the depositor. However, as we will see in the next section, the ECB has decided that, for motives of financial stability and provision of credit, the digital euro shall operate as a means of payment, and not as a store of value, limiting the mentioned effect on rates. A CBDC could also strengthen the position of the merchant, by providing a competitive alternative means of payment, which would force down the fees they currently pay. Banks could also negotiate in better terms with Visa and Mastercard, as they would be able to build their own services on the new infrastructure (*European rails*), gaining automatically pan-European reach<sup>27</sup> (ECB, 2020 & ECB, 2023c).

In addition, the digital euro would increase **efficiency** by making instant payments widely available across the Eurozone so that merchants (and users) would have instant access to their funds. As we have said before, these solutions have remained national, and with the digital euro the ECB ensures that there would be a solution under European governance for the whole euro area. However, this is expected to generate market concentration (ECB, 2023c).

CBDCs are also expected to lower the cost of making cross border transactions, as various “multi-CBDC” projects are already being researched. For example, at the BIS, the *project Dunbar* in partnership with the Central Banks of Australia, Malaysia, Singapore, and South Africa, or the *m-bridge* and *Agorá* projects for wholesale cross-border payments, that we have already mentioned above (BIS Innovation Hub, Projects).

Finally, regarding **innovation**, the ECB believes that, although there has been a lot of change recently in payments, new solutions are largely based on pre-existing infrastructure, and merely

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<sup>27</sup> Remember that the digital euro would be legal tender, which, although it is no guarantee, it clearly a great enhancer of network externalities (ECB, 2023c).

provide more convenient front-end solution for users (e.g. digital wallets, mobile phone payments). The underlying infrastructure has become obsolete, giving opportunity to new PSP entrants in the form of BigTech companies that bundle their platforms with payment services (e.g. Paypal & Ibay) and stablecoins and cryptocurrencies that build on Distributed Ledger Technology (DLT) to provide alternative means of payment. The ECB hopes that by creating a CBDC and offering it itself the infrastructure to run transactions, it can facilitate private innovations that do not fragment the interoperability of the system and do not further increase the dependence of the EU on foreign providers. For example, through this infrastructure, local solution Bizum could reach all euro area users, so long as they are using digital euros (Evelien Witlox, at FUNCAS, 2024)<sup>28</sup>.

To all these justifications, some are of the view that the ECB is overstepping, as it does not address a market failure, but a direction of the industry it is uncomfortable with. Additionally, Banks oppose that fees are already very low, as they are currently capped to 0.2/0.3% of the transaction value for consumer debit/credit cards (Interviews, Juan Gandarias). The need to adapt for the distribution of the digital euro and the new dual solution will create additional costs for banks, especially those that are less updated (i.e. smaller entities). Also, pan-European reach may not be as attractive for users that can already pay around the world with brands like Visa and MasterCard (interviews, Pedro Martinez Ruiz).

### Enhancing financial inclusion

The digital euro is also said to be inclusive, in as much as it would be made accessible to people from vulnerable social groups who do not have bank accounts, allowing them to access digital payment services. It would also be easy to use, to include those who find more difficulties with digital devices. However, survey data suggests that the share of unbanked population in Europe is below 5%, which limits the effects that the deployment of a digital euro could have in this sense, at least compared to the potential in developing economies. In addition to the low share of potential beneficiaries, a survey by the Federal Reserve suggested that a 75% of the unbanked population (in the U.S) would not be interested in holding a CBDC account. (Ahnert et al. 2023) (Waller, C.J., 2021).

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<sup>28</sup> To ensure this is possible, the digital euro scheme would establish common standards that are currently being developed by the Rulebook Development Group. These standards include user management, liquidity management (funding and defunding) as well as initiation, authentication, validation and settlement of transactions, amongst other things (*Mandate of the digital euro scheme Rulebook Development Group*, [ECB](#)).

## Instrument of monetary policy

Although not an objective in itself, the ECB acknowledges that many potential enhancements of public policy could be unlocked by a CBDC. For starters, the ECB pointed out that in a scenario of a bank run, if deposits were turned into CBDC, the ECB would notice immediately, and could intervene in a more timely manner (Ahnert et al. 2023). But other, more complex, functionalities could also arise, the most noteworthy being the possibility of **CBDC remuneration**, which is thought to be capable of strengthening the transmission of policy rates by making deposit rates more sensible and, in turn, reaching lending rates quicker, or by allowing a shift towards non-bank sources of finance, which would make bank borrowing more sensitive, as it would rely more on wholesale funding (Panetta, F., 2022). Additionally, the ECB is aware that remunerated CBDC could also eventually be a means of overcoming the effective lower bound on interest rates, if banknotes were phased out (Ahnert et al. 2023).

On the other hand, CBDCs could also provide a more efficient channel for the **government transfers** to citizens, with the additional feature of being programable, which could, for example, make the transfer subject to expiration, and therefore creating a greater propensity to consume in a time of crisis (Ahnert et al. 2023).

## IV) Survey results

In our survey, we asked a group of experts about their thoughts on the digital euro project. The group consisted of professionals from the banking industry (58), but also from other fields such as payments, policy academia, crypto and others (45). Close to 80% of respondents were from Spain, and only 9 replies were from outside the Eurozone.

In the survey, we asked two questions about **data concerns related to the digital euro project**. Specifically, we asked whether they considered the digital euro to pose a threat to privacy among European consumers, and whether and to what extent cybersecurity risks is a concern (figure 5). Although closely related, the questions allow to discriminate and analyze the main source of concern for data privacy, which seems to emphasize the safety of the infrastructure against adversarial attacks (7.65/10), above concerns about the use that the Eurosystem and public authorities themselves might do of consumer data (5.05/10). Scores of this last concern showed

the largest dispersion of all the questions (standard deviation: 3.193), showing varying degrees of concern regarding payment data and trust in the Eurosystem.

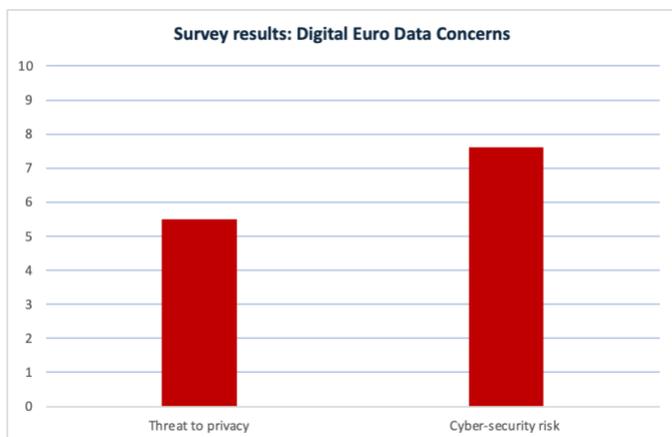


Figure 6. Survey results: Digital Euro Data Concerns

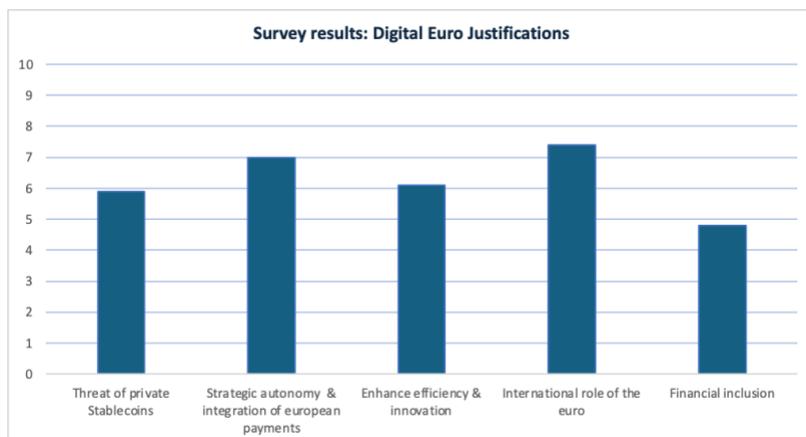


Figure 5. Survey results: Digital Euro Justifications

In figure 6 we show the average score given by the respondents to the different argumentations backing the digital euro. Enhancing financial inclusion received the poorest score (4.87/10), probably because respondents are aware of the low proportion of unbanked population, which, as we mentioned above, limits the effect that the digital euro could have in this respect.

The threat posed by private stablecoins received an average score of 5.9/10, which, together with a 63% of respondents believing that the financial system can work in a cashless economy, shows little conviction with these fundamental arguments for CBDC deployment.

Slightly better scores were obtained for the objective of achieving strategic autonomy and integrating payments in Europe (6.9/10). Although these two received the same average score and they are displayed together in figure 6, they were two different questions in the survey, and the correlation between the two was smaller than one could expected (correlation = 0,37). Between the two, the need to integrate payments showed slightly higher dispersion in the scores.

Finally, the concern or motivation that received the highest score was defending the international role of euro (7.47/10), which was especially high amongst researchers (8.67/10).

Altogether, 47.5% of the participants believe that the digital euro is necessary, 22.8% believe it is not, and 29.7% believe it is hard to say at this point in time.

## Section 3. The Digital Euro. Design and trade-offs.

The design of the digital euro is a complex question. It involves many different issues, entails several trade-offs, descends to very technical knowledge and draws from competences distributed between the Eurosystem and other institutions of the EU. In this Section, we are going to discuss the main relevant aspects of design to the extent that they have been advanced by the ECB, avoiding excessive technicalities. We will pay attention to the question of (I) *Access and usability*, which refers to the legal status of the digital euro (whether it is legal tender) and the level of adoption targeted by the ECB. We will explain the problems presented by CBDCs to (II) *Financial stability and credit provision* and explain how this is addressed in the digital euro. We will delve into the (III) *Distribution of tasks and responsibilities between the Eurosystem and the private sector*, followed by a brief presentation of the (IV) *Compensation model* proposed by the ECB. We will see how the ECB proposes to answer the important question of (V) *Privacy and data protection* and finally, we will briefly touch upon the issue of (VI) *Cross-border functionality* of the digital euro, and how the ECB is approaching this feature.

### 1) Access and Usability

Legal tender status entails that the means of payment cannot be refused by the creditor of an obligation (unless otherwise agreed by the parties). It must be accepted at full face value and, therefore, the legal tender currency has the power to discharge from payment obligations.

Currently, cash is the only legal tender in the system and, in as much as the ECB's goal is to prolong the two-tier system in the digital future, it is key that the CBDC is granted the same status. (Ahnert et al. 2023 and ECB, 2023c).

As we said before, for the ECB it is important that public money is used. The goal is ensuring that the CBDC is available and accepted in the digital age, and the option of issuing the digital euro without legal tender was promptly discarded because it would not guarantee the achievement of that goal. Considering the development of the existing solutions, with which the digital euro would have to compete, it would be very difficult for the digital euro to achieve wide use without being

privileged as legal tender, which is a great enabler for network effects (European Commission, 2023).

The ECB has not set an exact goal for level of adoption. However, it has said that it is not expected to be the dominant digital means of payment. It has also said that it is preferred that a large proportion of the population uses the CBDC for a small number of transactions than the reverse, and that the desired level of use might vary per sector, depending on factors like, inter alia, the prevalence of cash in that sector (Bindseil, U. et al., 2021).

The objective is to **strike the right balance** between too much adoption, which could negatively affect credit supply and financial stability, and too little, which would diminish the ability of CBDC to act as a public anchor for the monetary system and lead to the perception of failure, in turn reducing confidence in the central bank (Ahnert et al. 2023).

## II) Financial stability and credit provision

From the very beginning, there has been concern regarding the effect of CBDCs on bank intermediation. As other forms of money, it was suggested that CBDCs should be both a means of payments and store of value. In as much as it works as store of value, CBDC gives users an alternative to bank deposits, which would force banks to make their deposits more attractive by **increasing rates**, therefore incurring in higher costs in their funding. These higher costs would adversely affect bank's ability to provide credit and invest, to a greater or lesser extent depending on the competitive landscape. From the asset side, the decline in interest margins could incentivize **risk taking** by banks, which would also have a negative impact on financial stability. Simultaneously, a CBDC could destabilize the financial system by increasing the likelihood, scale and speed of **bank runs** relative to an economy where cash is the only alternative to deposits (Auer et al., 2021 and Ahnert et al. 2023).

To tackle these problems, different design features were investigated, including CBDC **remuneration** and **holding limits**.

Ahnert T., et al. (2023) argued that CBDC remuneration had two opposite effects on the probability of a bank run. On one hand, a higher CBDC remuneration increases the incentives to run to the CBDC. But simultaneously, as banks rise their rates to compete, incentives to withdraw from the

deposit decrease. Their research supports that, at a specific equilibrium rate, the financial system can achieve greater stability than it would in an economy in which there is only cash.

Holding limits entail that the user can only withdraw a fraction of his deposits into a CBDC wallet, effectively eliminating the store of value feature of the CBDC, which in turn limits the disintermediation effect.

As things stand at the time of writing this paper, the ECB has determined that the digital euro would not be remunerated and would carry holding limits, the exact amount of which would be calibrated in the future, to ensure a correct balance between the right to hold and pay with digital euro and the need to limit bank disintermediation (Cipollone, P., 2024b).

### III) Distribution of tasks and responsibilities between the Eurosystem and the private sector

The ECB underscores the public-private collaboration to create a successful system for the digital euro. According to the last report (ECB, 2023c):

- The **Eurosystem** is tasked with the issuance and **settlement** of transactions with the digital euro, ensuring its safety and stability as a central bank liability. To do this, “*the Eurosystem maintains the ledger*” that records the digital euro “*root of title*” and executes instant settlement of transactions, avoiding any undue creation of central bank money. How exactly this ledger will be, is yet undetermined. However, the ECB recently carried out a prototyping exercise where it experimented with a potential back-end solution to perform its settlement obligations (multiple front-end solutions were also tested). The mechanism developed consisted of “*a centralised settlement engine (N€XT), based on an unspent transaction output (UTXO) data model commonly used for transactions with digital currencies*” which would have allowed for fast and efficient settlement of transactions while also protecting user privacy (ECB, 2023d, pg. 1).

It will develop and manage the **digital euro scheme**, creating a rulebook that sets standards and procedures for a harmonized user experience across the euro area. **Additional support services** provided include a dispute management platform, fraud and risk management

services (to coordinate PSPs, produce statistics and more), an alias lookup component (to create the digital euro account number and track it to the responsible PSP), and a digital euro app to facilitate user interaction with PSPs. Furthermore, the Eurosystem will offer central services for offline digital euro provision and support the future and hypothetical integration of the digital euro into multi-CBDC schemes.

- **Payment Service Providers (PSPs)** will handle user onboarding, conduct necessary KYC (Know Your Customer) checks, and manage user accounts, including linking them to commercial bank accounts for funding. PSPs are responsible for payment initiation, user authentication, and transaction processing, ensuring compliance with AML/CFT regulations and conducting fraud checks. They will manage liquidity by enabling users to fund and defund their digital euro accounts, implementing waterfall and reverse waterfall functionalities to seamlessly implement the holding limits. PSPs will also offer customer support and manage disputes related to digital euro transactions, facilitating pre-dispute clarifications, dispute resolution, and arbitration when necessary. Beyond these roles, PSPs will ensure the availability of digital euro services through various channels, such as mobile apps and physical cards, and will provide offline functionality for digital euro transactions, ensuring users can make payments even without an internet connection.

In sum, it looks like the ECB's plans for the digital euro would fit best under the category of hybrid CBDCs, where intermediaries (PSPs) handle retail payments made with a digital euro that represents a direct claim on the ECB, which also keeps its own ledger of transactions (Auer et al. 2020b).

#### IV) Compensation model

With the objective of balancing the provision of a free and accessible public good with the need to incentivize PSPs to offer digital euro services and ensure the long-term viability of the digital euro ecosystem, the ECB contemplates a compensation model for the different entities that participate in making transactions possible (ECB, 2023c).

On one hand, the ECB states that the distribution of the digital euro should follow the same economic incentives as the distribution of current forms of electronic payments. It therefore contemplates a fee paid by the merchant to the acquiring PSP, as well as an inter-fee to compensate

the distributing PSP, which offers the basic services to the end user for free. The Eurosystem would not charge a fee for the use of the technical infrastructure that it undertakes to build (ECB, 2023c).

Additionally, the ECB considers that the PSPs will find economic incentives in that, in distributing digital euro services through the “European rails”, they would achieve European scale and access to hundreds of millions of potential users (Cipollone, P., 2024b).

#### V) Privacy and data protection

The ECB prioritizes user privacy and data protection, recognizing them as fundamental rights that are essential for fostering public trust in the system. To achieve this, the Eurosystem will implement a strong privacy framework that includes rigorous data protection standards, transparency on how user data is used, and user control over their data (ECB, 2023c). The ECB also promises to develop innovative privacy enhancing techniques to foster higher privacy standards (Cipollone, P., 2024b). However, as we have said before, privacy and data protection must be balanced with other public policy objectives, like AML/CFT and tax evasion prevention.

All this in mind, the idea with the digital euro is that users will have to identify themselves with their PSP (onboarding) to access a digital euro wallet, as for any other electronic payment service. This way, the PSP can perform its KYC obligations, and the holding limit can be effectively implemented (ECB, 2023).

Once the user has an account, there would be to modes of use that offer different privacy levels (ECB, 2023).

- **Offline:** Offers a higher privacy level for low-value, proximity transactions, similar to cash. No transaction data is shared with PSPs, the Eurosystem, or supporting service providers (except for anti-forgery measures). This is comparable to a cash-like experience and is consistent with the lower risk profile of this transactions, which could allow to release these payments from certain AML/CFT obligations. This should be determined in the regulation.
- **Online:** Data treatment adheres to data protection, privacy, and AML/CFT rules, aligning with existing regulations for electronic payments. The amount of data accessible to PSPs is limited to what's necessary for basic services and regulatory compliance (GDPR).

Additionally, the digital euro would offer users control over their data by establishing an opt-in mechanism to allow PSPs to process user data for commercial purposes and ensuring that the refusal to opt in does not translate into limitations in the access to basic digital euro services (ECB, 2023c).

#### VI) Cross-border functionality

The ECB envisions a robust and efficient framework for cross-currency functionalities within the digital euro, addressing the inefficiencies and opacities currently plaguing cross-currency retail payments. These transactions, vital for international trade and remittances, often rely on a long chain of intermediaries, making the process cumbersome and risky. To remedy this, the G20 has proposed using CBDCs as a solution to enhance transparency and efficiency, and the ECB is actively participating in these international efforts (ECB, 2023a).

However, for now, the primary focus of the Eurosystem is to ensure the successful introduction of the digital euro within the euro area. Once established, the ECB foresees the addition of cross-currency functionalities in collaboration with other monetary jurisdictions that share mutual interests. The most viable method for advanced economies is the **interlinking model**, which connects the digital euro with another CBDC system through a combination of contractual agreements, technical links, standards, and operational components. This model allows participants to transact across different systems without the need to be part of both, promoting efficiency and reducing complexity (ECB, 2023a).

Regionally, within the European Economic Area (EEA), the ECB is considering a **single-system approach**. This would involve a common technical infrastructure capable of hosting multiple CBDCs issued by various entities, necessitating the development of multi-currency capabilities within the digital euro's back-end (ECB, 2023a).

This collaborative effort is crucial to creating a cohesive and efficient cross-currency payment system that meets the needs of diverse jurisdictions (BIS, 2021).

## Conclusions

The ongoing digital transformation of the monetary system, driven by the decline in cash usage and the proliferation of private digital currencies, has compelled central banks worldwide to consider the issuance of CBDCs. This paper focused on the European Central Bank's (ECB) exploration of a digital euro, studying the motivations, potential design, and implications of a project which, in addition to the creation of a CBDC, would establish a pan-European payments infrastructure.

### **Necessity and objectives**

The necessity of a digital euro is argued from multiple angles, none of which is exempt from a certain degree of uncertainty and doubt. Deployment scenarios could never materialize or might not necessarily benefit from a CBDC, or one with the design features currently advocated. Indeed, as we have showed, opinions diverge on the potential necessity and effects of deployment in the existing industry, even challenging the main scenario of a cashless economy necessitating a public digital form of money.

### **Financial Stability and Strategic Autonomy**

The ECB's primary motivation is to perpetuate public money in the digital era, ensuring financial stability. The digital euro aims to reinforce the euro's monetary anchor, responding to declining cash usage and the potential destabilization from private digital currencies. Additionally, the project aligns with the EU's strategic autonomy goals, seeking to enhance the euro's international role and reduce dependency on foreign payment service providers.

### **Design and Trade-offs**

The design of the digital euro involves critical trade-offs, balancing privacy, financial stability, and usability. The ECB plans to issue a non-remunerated digital euro with holding limits to mitigate disintermediation risks. The public-private partnership model envisions the Eurosystem handling issuance and settlement, while Payment Service Providers (PSPs) manage user onboarding, transaction processing, and customer support. Privacy measures will be stringent, with different levels of data protection for offline and online transactions.

**Market Competition and Innovation**

The digital euro is intended to spur competition and innovation by providing an alternative to bank deposits and existing payment services. It aims to enhance payment efficiency, particularly in cross-border transactions, and support financial inclusion, although its impact in this last area might be limited in developed economies with low unbanked populations. The industry watches closely for threats and opportunities and is involved in the development of the project.

**Policy Implications and Next Steps**

Aware of the uncertainty of the future, the ECB charges ahead as if with complete certainty in that the digital euro will be deployed. The next steps include selecting service providers, learning through experimentation, and diving into technical aspects, with a potential rollout by November 2025. Thus, the project remains fluid and controversial, driven by the need to prepare for future contingencies without certainty that a digital euro is the optimal solution.

**Final Thoughts**

Europe's monetary, financial, and payments systems are at a crossroads. The decision to deploy the digital euro, along with its specific characteristics and features, will fundamentally shape the economic system. The project's success hinges on careful calibration of its design to balance financial stability, privacy, and usability, while responding to evolving market dynamics and strategic imperatives

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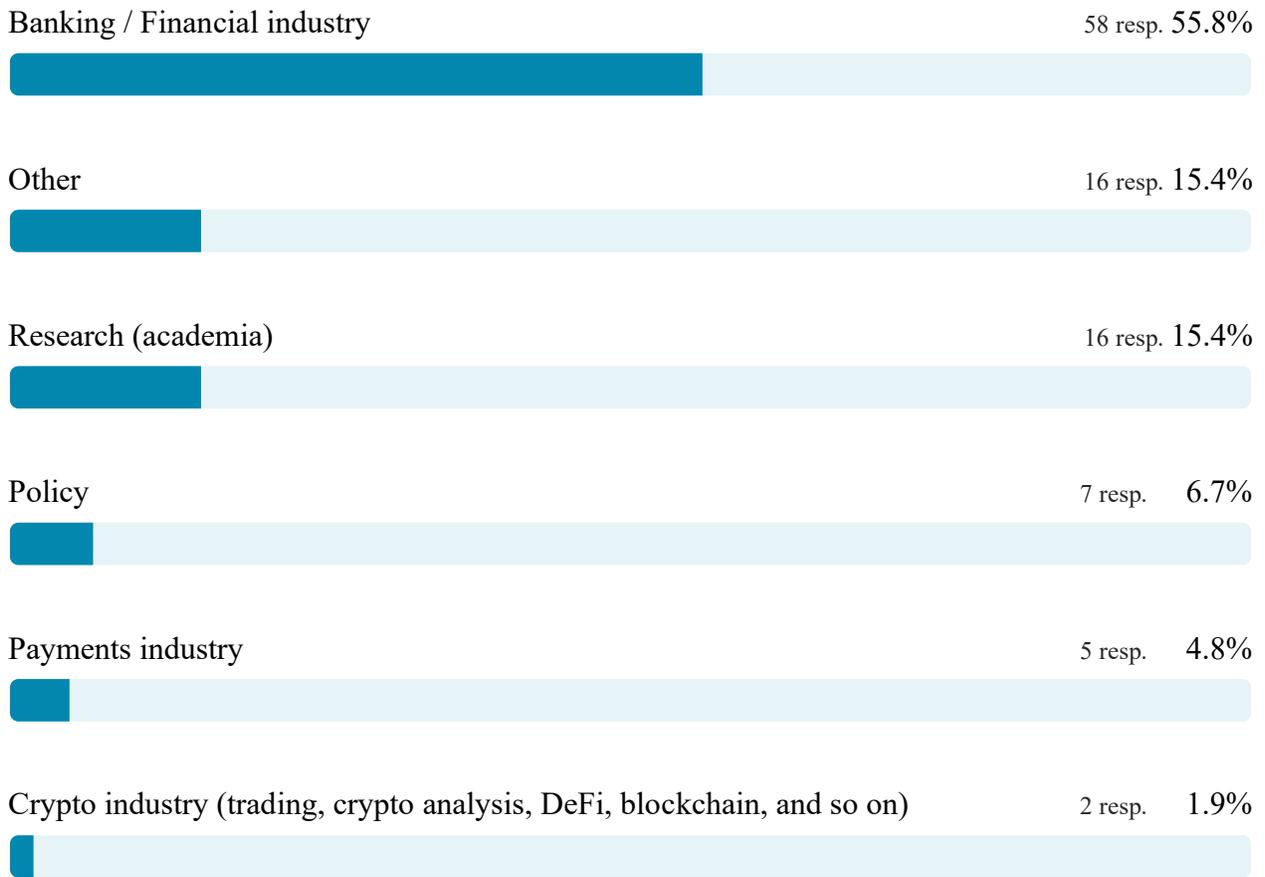
ANNEX I. SURVEY

# Digital Euro Survey

104 responses

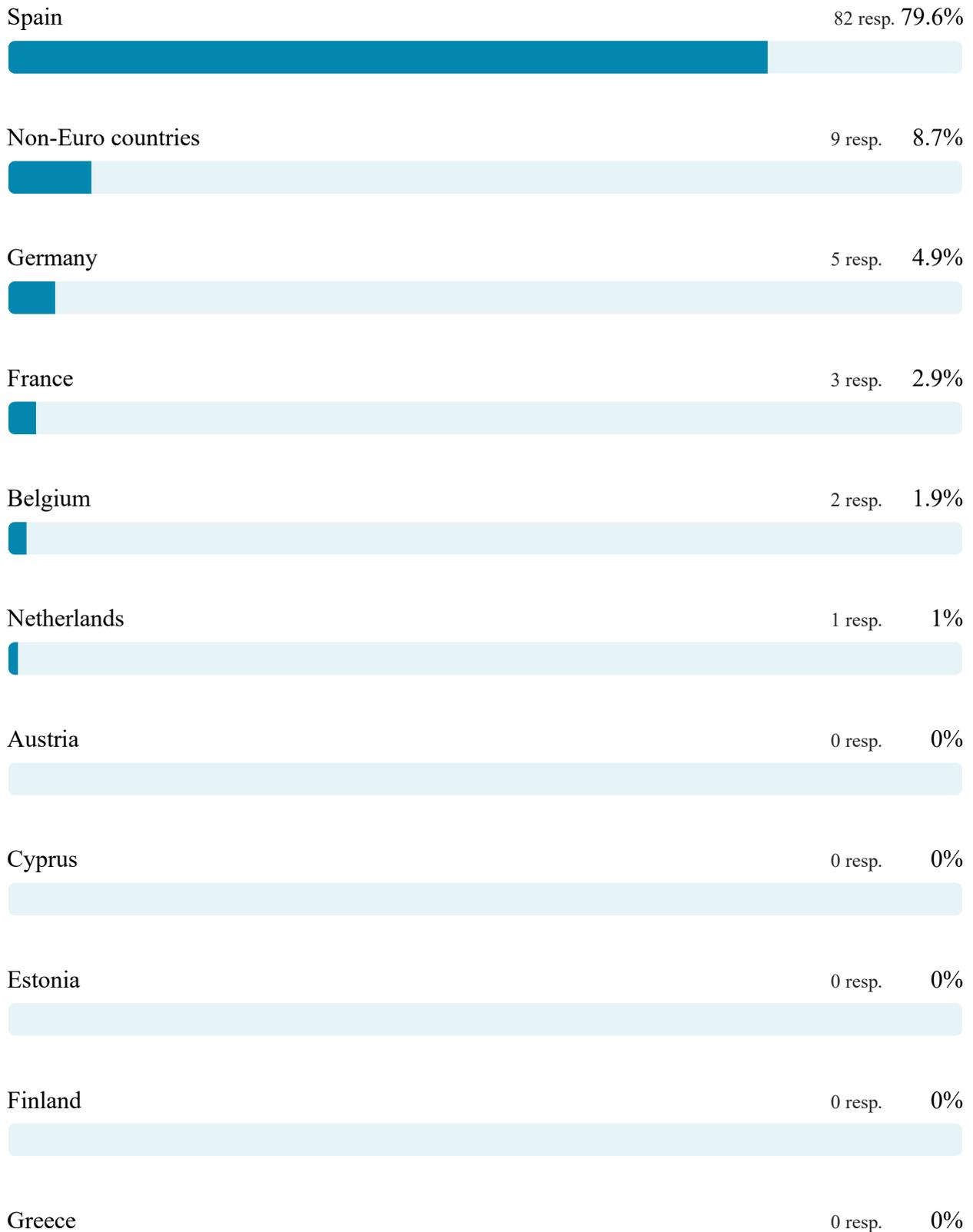
**General background.**

104 out of 104 answered



**Country of habitual residence**

103 out of 104 answered



Ireland 0 resp. 0%

Italy 0 resp. 0%

Latvia 0 resp. 0%

Lithuania 0 resp. 0%

Luxembourg 0 resp. 0%

Malta 0 resp. 0%

Portugal 0 resp. 0%

Slovakia 0 resp. 0%

Slovenia 0 resp. 0%

**Gender**

103 out of 104 answered

Male 72 resp. 69.9%



Female 28 resp. 27.2%



Rather not say 3 resp. 2.9%



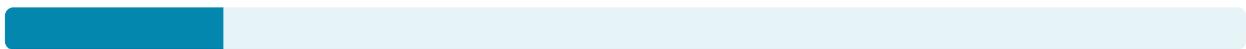
**Age**

102 out of 104 answered

51-55 19 resp. 18.6%



56-60 18 resp. 17.6%



25-30 14 resp. 13.7%



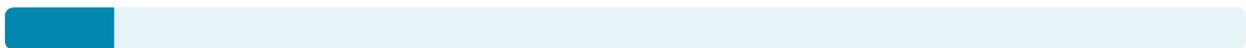
46-50 14 resp. 13.7%

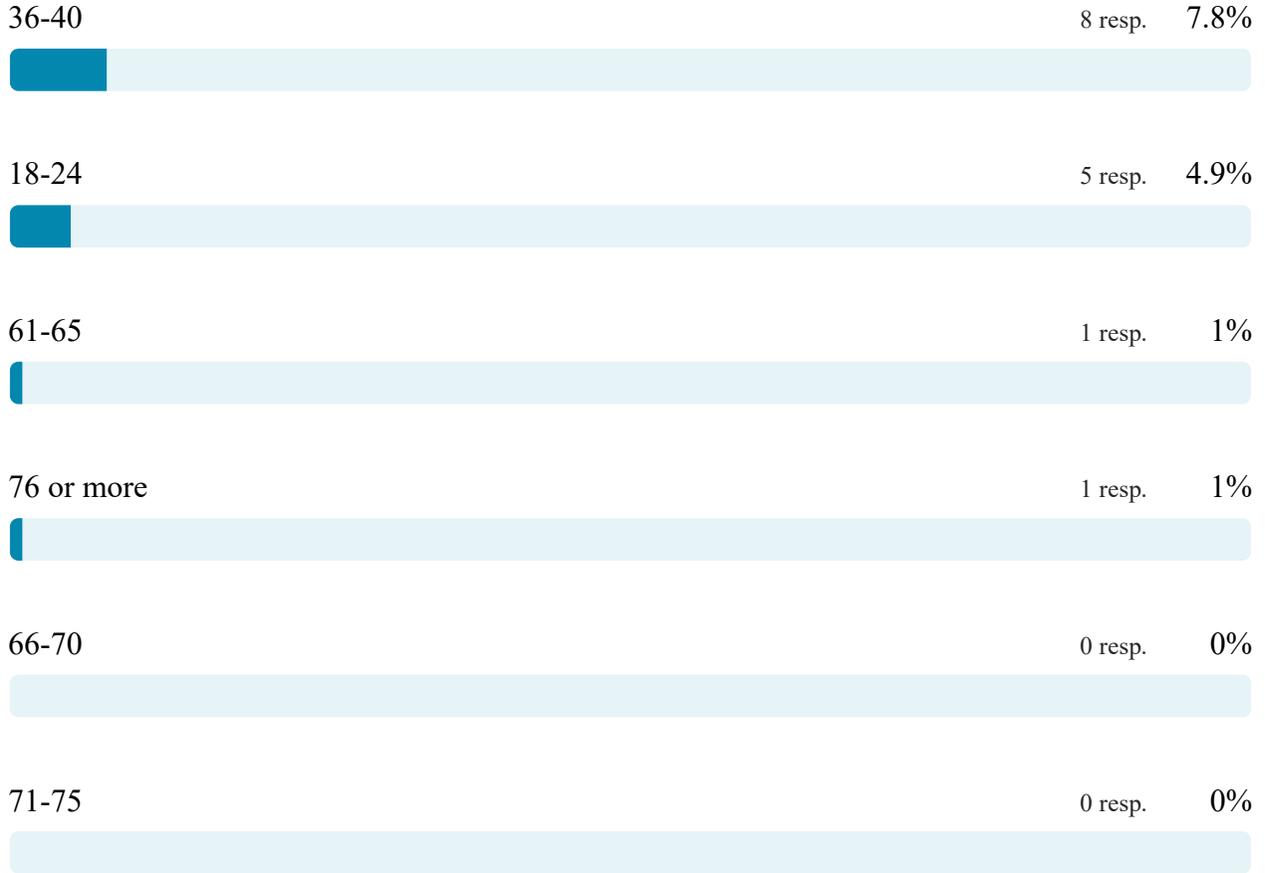


41-45 13 resp. 12.7%



31-35 9 resp. 8.8%

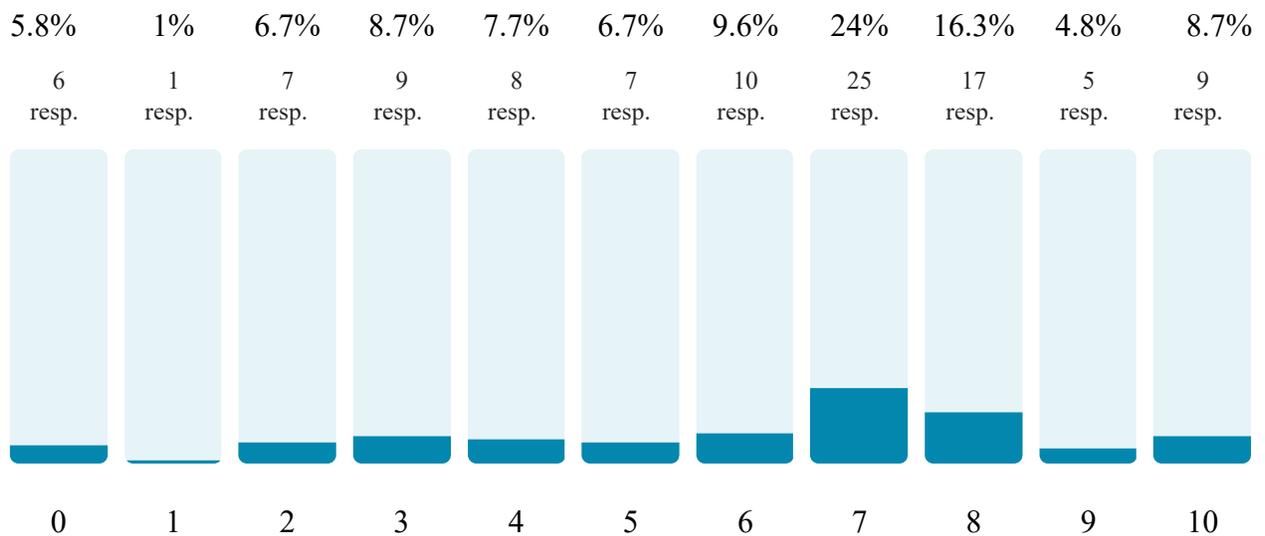




How serious is the threat of private **stablecoins** for the status quo of the financial system?

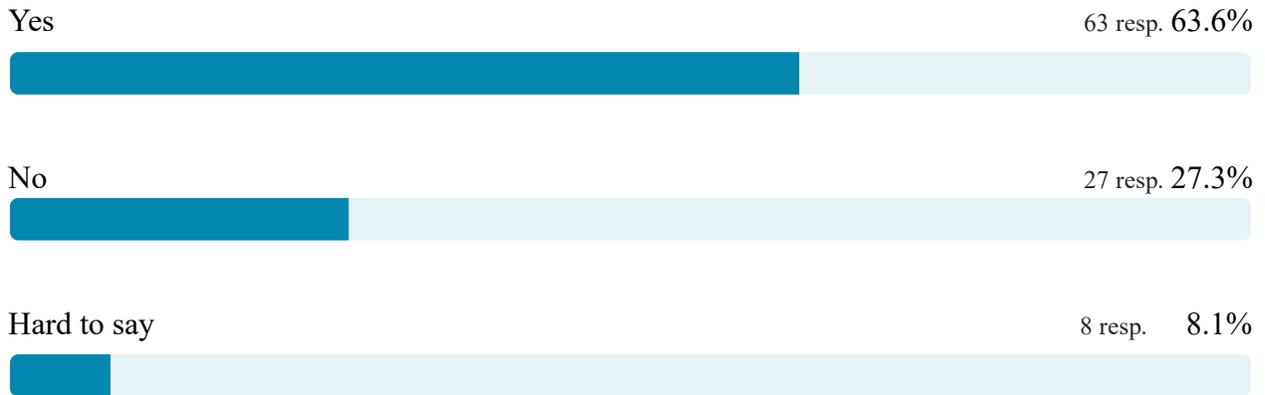
104 out of 104 answered

5.9 Average rating



Could the financial system work with **no** (or very low) usage of **cash**?

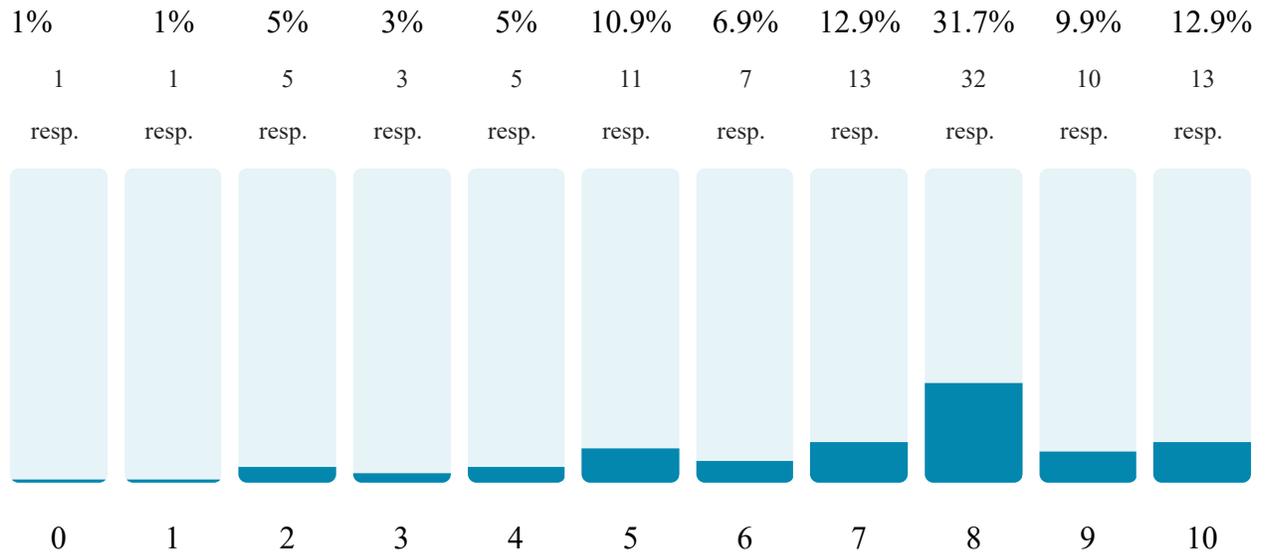
99 out of 104 answered



How urgent is it to achieve **strategic autonomy** in payments infrastructure?

101 out of 104 answered

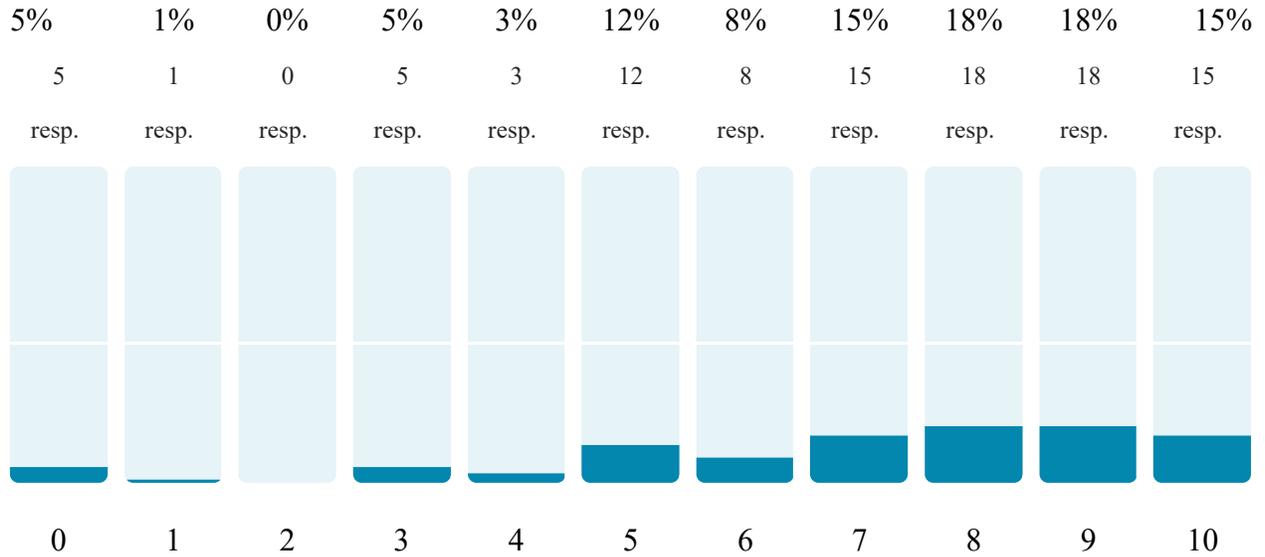
7.0 Average rating



Do you find a relevant justification in the need to **integrate payments** within the EMU?

100 out of 104 answered

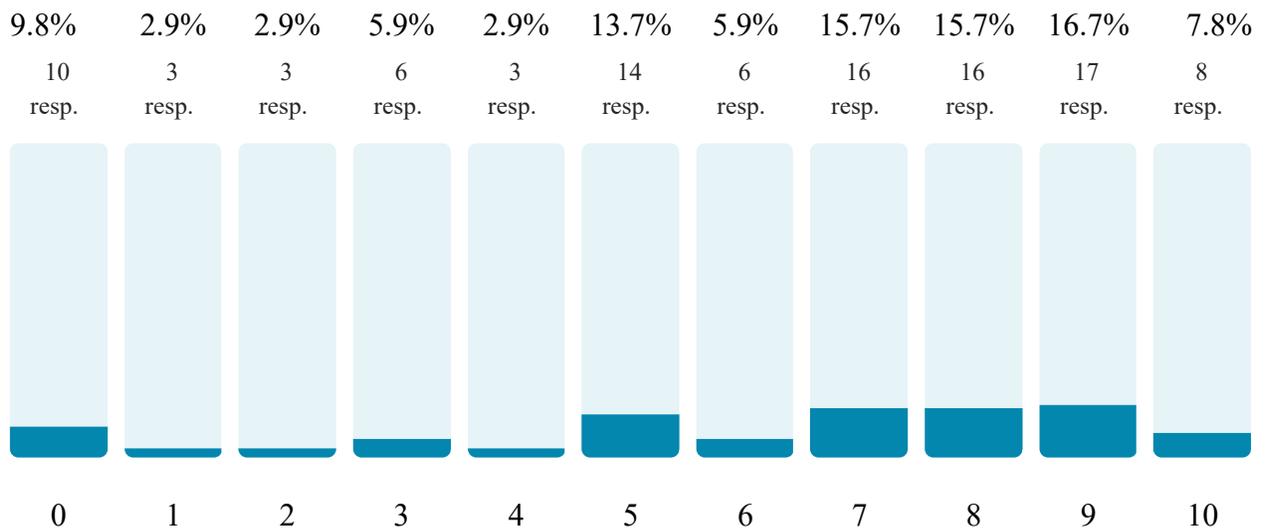
7.0 Average rating



How necessary is the Digital Euro to increase **efficiency** in payments and enhance **innovation**?

102 out of 104 answered

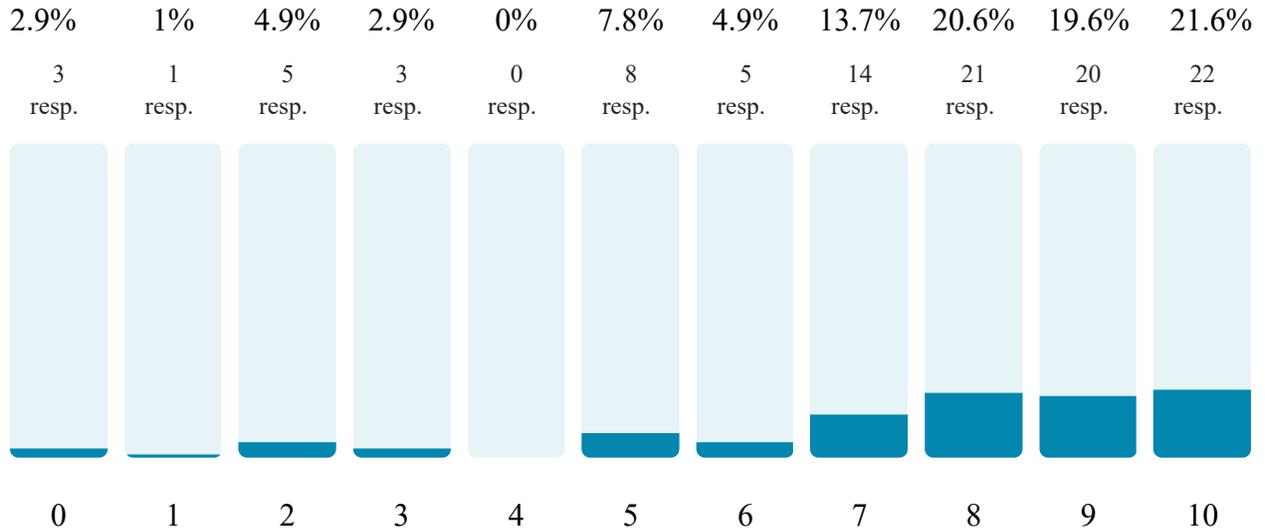
6.1 Average rating



Do you find a relevant justification in the need to preserve the **international role of the euro**?

102 out of 104 answered

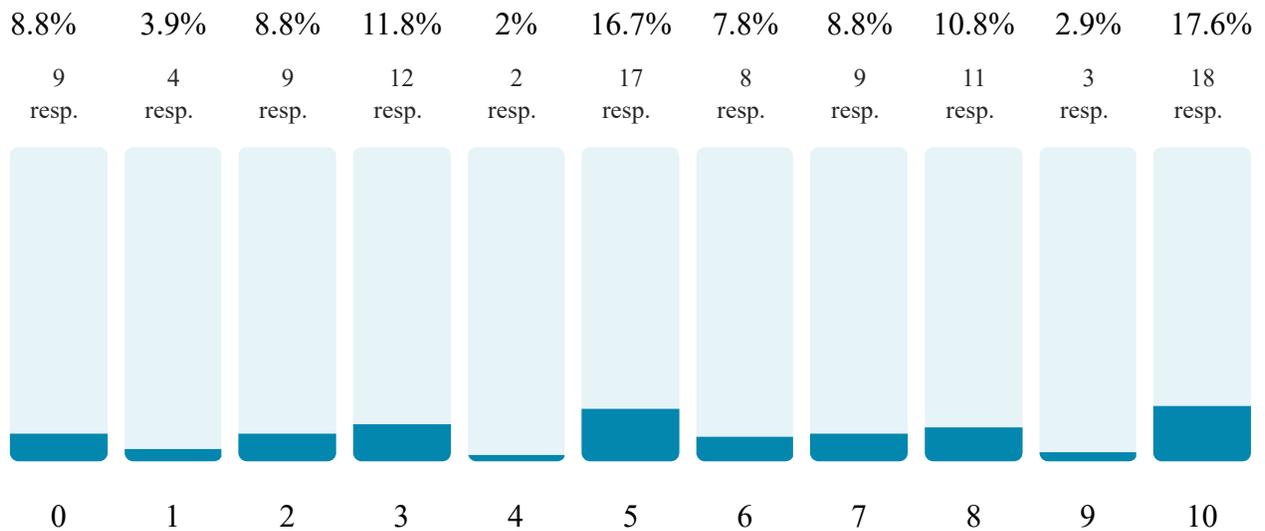
7.4 Average rating



Do you think that the digital euro can be a **threat to privacy** among European consumers?

102 out of 104 answered

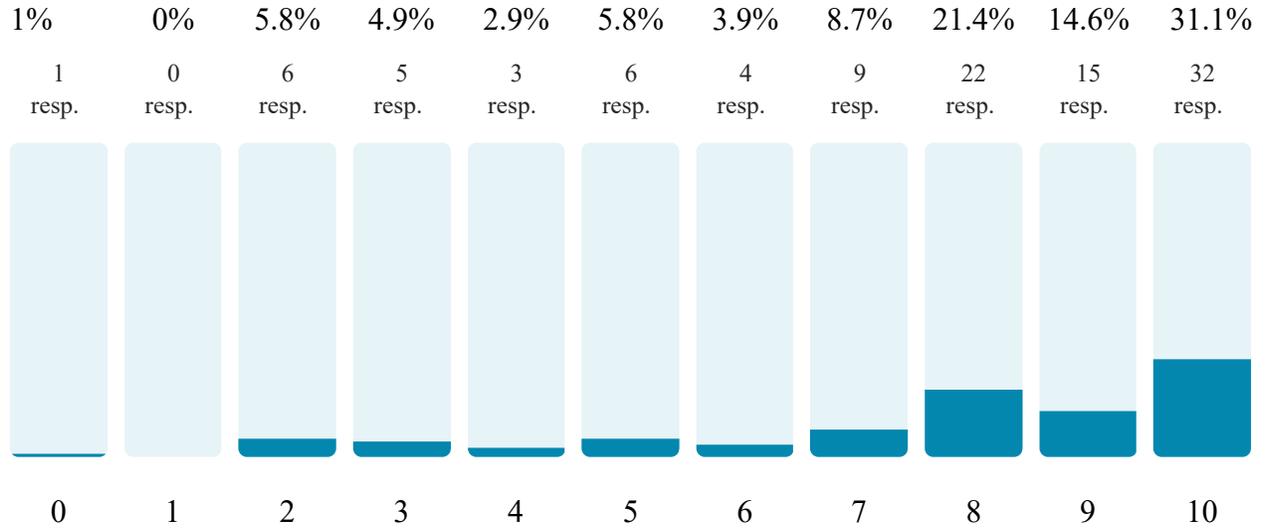
5.5 Average rating



Do you think **cyber-security risk** is a mayor concern for the digital euro?

103 out of 104 answered

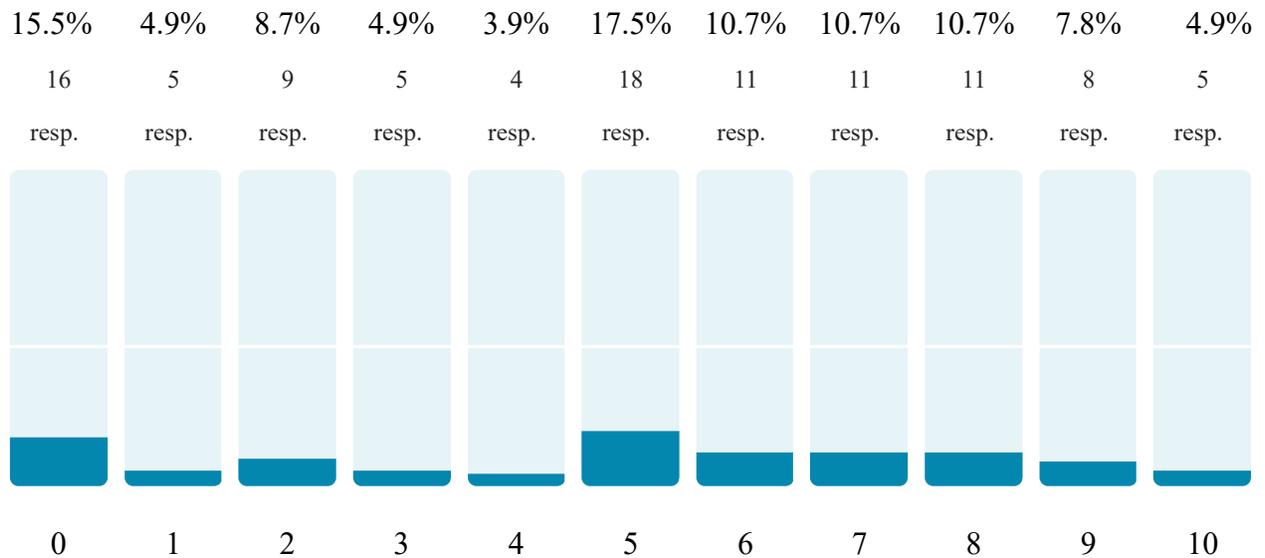
7.6 Average rating



How **necessary** is the Digital Euro to enhance **financial inclusion**?

103 out of 104 answered

4.8 Average rating



**Overall.** Necessity of a Digital Euro.

101 out of 104 answered

The digital euro is necessary 48 resp. 47.5%



Hard to say 30 resp. 29.7%

The digital euro is **not** necessary 23 resp. 22.8%

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2. **Referencias:** Usado conjuntamente con otras herramientas, como Science, para identificar referencias preliminares que luego he contrastado y validado.
3. **Estudios multidisciplinares:** Para comprender perspectivas de otras comunidades sobre temas de naturaleza multidisciplinar.
4. **Constructor de plantillas:** Para diseñar formatos específicos para secciones del trabajo.
5. **Corrector de estilo literario y de lenguaje:** Para mejorar la calidad lingüística y estilística del texto.
6. **Sintetizador y divulgador de libros complicados:** Para resumir y comprender literatura compleja.
7. **Revisor:** Para recibir sugerencias sobre cómo mejorar y perfeccionar el trabajo con diferentes niveles de exigencia.
8. **Generador de encuestas:** Para diseñar cuestionarios preliminares.
9. **Traductor:** Para traducir textos de un lenguaje a otro.

Afirmo que toda la información y contenido presentados en este trabajo son producto de mi investigación y esfuerzo individual, excepto donde se ha indicado lo contrario y se han dado los créditos correspondientes (he incluido las referencias adecuadas en el TFG y he explicitado para que se ha usado ChatGPT u otras herramientas similares). Soy consciente de las implicaciones académicas y éticas de presentar un trabajo no original y acepto las consecuencias de cualquier violación a esta declaración.

Fecha: 5 de junio de 2024

Firma: 