



From Euro to Digital Euro: A Survey of Literature

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Abstract: Over the last decade, discussions about digital currencies have attracted an increasing number of researchers, financial institutions, and central banks. Later, the central bank digital currency became a hot topic, with major central banks investigating and even designing pilot projects in the field. More recently, the European Central Bank has become increasingly interested in a digital euro. The paper investigates the relevant literature on digital currencies, focusing on the digital euro, particularly from the European Central Bank's perspective, and analyses the implications for monetary policy, the payment system, the banking system, and related areas. Drawing on a bibliometric analysis based on the Web of Science database, using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol and VOSviewer software, the paper sheds light on the main trends, concerns, and areas of investigation related to the possible adoption of a digital euro.

Keywords: euro; digital euro; European Central Bank; central bank digital currency; bibliometric analysis.

JEL classification: E42; E58; N24.

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1. INTRODUCTION

Following the creation of the first cryptocurrency, Bitcoin, in 2008, others began modifying its open-source code in order to create their own currencies. Therefore, all crypto coins issued after Bitcoin are classified as altcoins. Well-known alternatives include Ethereum, Solana, Dogecoin, and Cardano; nonetheless, Bitcoin continues to dominate as the market leader, accounting for 60% of global market capitalization. Because of the significant volatility of these digital currencies, it appeared the stablecoins, i.e., new types of cryptocurrencies designed to maintain a steady value, pegged to an existing (fiat) currency, like the US dollar. Later, were developed alternatives such as commodity-backed stablecoins (collateralized with precious metals - PAXG PAX Gold), crypto-backed (based on a reserve of other cryptocurrencies, like MakerDAO's DAI), or algorithm-backed stablecoins (collateralized by smart contracts that react to the supply and demand of the market, like Terra – UST).

According to www.coingecko.com, the global cryptocurrency market capitalization exceeded 3 trillion USD in 2025, with 18,415 cryptocurrencies tracked across 1,437 exchanges. In this context, more than a decade ago, central banks started to investigate the idea of a central bank digital currency. The international landscape is quite diverse in the field. While most central banks are interested in developing a Central Bank Digital Currency (CBDC), the practicalities (i.e., technical approaches) differ, as do the time frames for potential adoption.

In the USA, in early 2025, President Donald Trump issued an executive order on digital financial technologies titled “Strengthening American Leadership in Digital Financial Technology”¹. While recognizing the digital assets industry role in innovation and economic development of the US, a potential digital dollar was no longer under consideration: “taking measures to protect Americans from the risks of Central Bank Digital Currencies (CBDCs), which threaten the stability of the financial system, individual privacy, and the sovereignty of the United States, including by prohibiting the establishment, issuance, circulation, and use of a CBDC within the jurisdiction of the United States.” In addition, in July 2025, the “GENIUS Act” (Guiding and Establishing National Innovation for US Stablecoins Act), created the first comprehensive regulatory framework for payment stablecoins in the US. More recently, the South African Central Bank stated that there is no strong immediate need for a retail CBDC, though deploying one is technically feasible ([SARB, 2025](#)).

The European Central Bank (ECB) initiated discussions on the possibility of introducing a digital version of the euro in October 2020, nearly twenty years after the establishment of the single currency. At that moment, the literature as well as pilot projects on central bank digital currencies had already evolved. In its report ([European Central Bank, 2020](#)), the institution emphasizes that “a digital euro would create synergies with private payment solutions and contribute to a more innovative, competitive and resilient European payment system.” The artisan of the report, the High-Level Task Force on Central Bank Digital Currency (HLTF-CBDC) was established in January 2020 under the aegis of the Governing Council of the European Central Bank, gathering experts from the ECB and the 19 national central banks of the euro area at the time. After one year, the ECB initiated the investigation phase regarding the possible introduction of a digital euro, which took place from October 2021 to October 2023. From November 2023 to October 2025, the digital euro was in its preparation phase. It is expected that EU lawmakers adopt the regulation during 2026, and this will make possible the first issue of the digital euro in the course of 2029. According to the [European Central Bank \(2025\)](#), “the digital euro would be an electronic means of payment available free of charge for anyone to use”.

The primary objective of this paper is to examine the evolution of research in the field of the digital euro, uncover the most influential authors and journals, outline the research topics explored, and detect research gaps to propose future research avenues. According to Bradford's law (Bradford, 1934), a core set of scientific journals accounts for a substantial share of the literature in a specific domain. Within the bibliometric framework, this allows the reader to concentrate on the most relevant and influential journals in the field. Because bibliometrics can effectively link publications, authors or journals, identify research trends, and generate maps of published research (Zupic and Čater, 2015), it is currently employed across various fields of research and is gaining popularity in economics and business studies (Bota-Avram, 2023).

As a result, in the first phase of our study, we employed a bibliometric approach, using data retrieved from Web of Science for the period 2018 to 2025. This approach provided a comprehensive overview of research dynamics and trends within the field. In the second phase, we used the VOSviewer software to analyze the co-occurrence of keywords and visualize the resulting networks, thereby identifying dominant topics and emerging trends in the research. In the third step, the main papers in the field were discussed, organized by the main research directions concerning the digital euro.

The remainder of the paper is organized as follows: Section 2 presents the data and the methodology, Section 3 outlines the Results and discussion, and Section 4 concludes the study, highlights its limitations, and proposes future research directions.

2. DATA AND METHODOLOGY

This article provides a systematic literature review focused on the digital euro. A systematic literature review is a methodologically rigorous approach to reviewing research results (Kitchenham *et al.*, 2009), that can enhance the quality, replicability, reliability, and validity of the reviews (Xiao and Watson, 2017) and enables a comprehensive understanding of existing research in a specific field by analyzing and synthesizing empirical evidence from previous studies to address general research questions (Salas-Pilco and Yang, 2022).

In the initial query, following the approach of Cotugno *et al.* (2024), we search for documents that contain the terms “digital euro” or “central bank digital currency” in the keywords, title, or summary, and retrieve 1052 documents. The following inclusion criteria were used to select articles from the database, resulting a total of 316 documents: publication date starting between 2018 and 2025; published in English, Spanish, French, or Italian; published in a peer-reviewed journal indexed in the Social Science Citation Index (SSCI)²; journals fell in one of the following categories: Economics, Business Finance, Law, Computer science Information systems, Business, Management, Communication, Environment sciences, Multidisciplinary sciences, Information science, Telecommunications, Environment studies, Ecology, Mathematics interdisciplinary applications, Computer science artificial intelligence, Computer science software engineering, Social issues, and Demography.

Bibliographic information on the 316 documents was exported from Web of Science for data analysis. The data stored for analysis included the full record available, i.e., article title, article type, language, author(s) names, author institutional affiliations, keywords, abstract, number of citations, journal name, publisher name and address, publication year, volume, issue number, pages, and a list of cited references.

To provide an initial overview of the main research topics based on keywords, VOSviewer 1.6.20, created by van Eck and Waltman (2010), was employed to analyze the

co-occurrence of keywords and link them via clusters. Co-word analysis is a content investigation that reveals connections between concepts that co-occur in the selected documents' titles, keywords or abstracts (Zupic and Čater, 2015); it can also be used to forecast future research in the field (Donthu *et al.*, 2021).

When extracting terms from text (titles, keywords, and abstracts), VOSviewer calculates a relevance score to filter out general terms. Prior bibliometric research emphasizes that there is no universally accepted standard for setting minimum occurrence thresholds in co-word analysis; instead, thresholds should be adjusted according to dataset size, the novelty of the field under investigation, and analytical objectives. Thus, for instance, Khan *et al.* (2022) used a minimum threshold of two for the occurrences of a particular keyword to be included in the analysis, Prodan *et al.* (2024) used a frequency of 5, while Cicea and Marinescu (2021) used a threshold of 100.

For the keyword co-occurrence analysis based on all keywords (author keywords and Keywords Plus), a minimum threshold of six occurrences was applied, meaning that it appeared more than six times in the Web of Science (WoS) core collection database. This threshold was chosen to balance thematic coverage and network interpretability within a medium-sized dataset of 316 articles, in line with established bibliometric guidelines (Cotugno *et al.*, 2024).

Of the 1437 keywords, only 54 met the threshold. A keyword co-occurrence network reveals specific associations between authors' provided keywords; it refers to the statistical correlations between keywords that appear in the same document. The proximity of keywords on the map indicates greater relevance. Closely positioned keywords form clusters that define central research issues (Huang *et al.*, 2020). The results are presented in Figure no. 1.

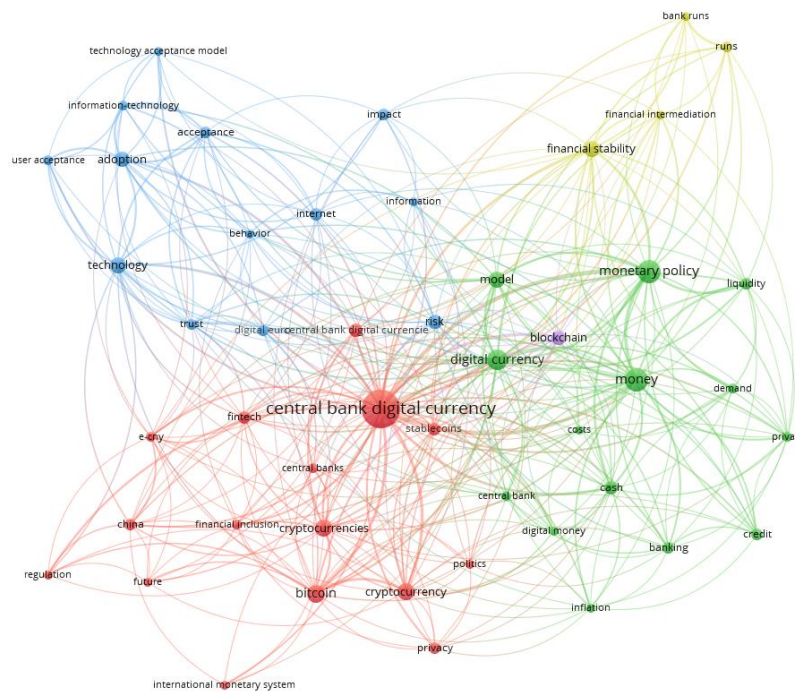


Figure no. 1 – Keyword co-occurrence network visualization using VOSviewer identified in articles addressing issues related to central bank digital currencies, including the digital euro

As one might expect, the term “central bank digital currency” appears at the center, connected to terms such as “digital currency”, “bitcoin”, “cryptocurrencies”, or “stablecoins”. Key themes identified include “monetary policy”, “financial stability”, “financial intermediation”, “technology” and “fintech”, “adoption”, “(user) acceptance”, and “trust”. Additional keywords indicating areas of concern include “liquidity”, “risk”, “trust”, “inflation”, or “bank runs”.

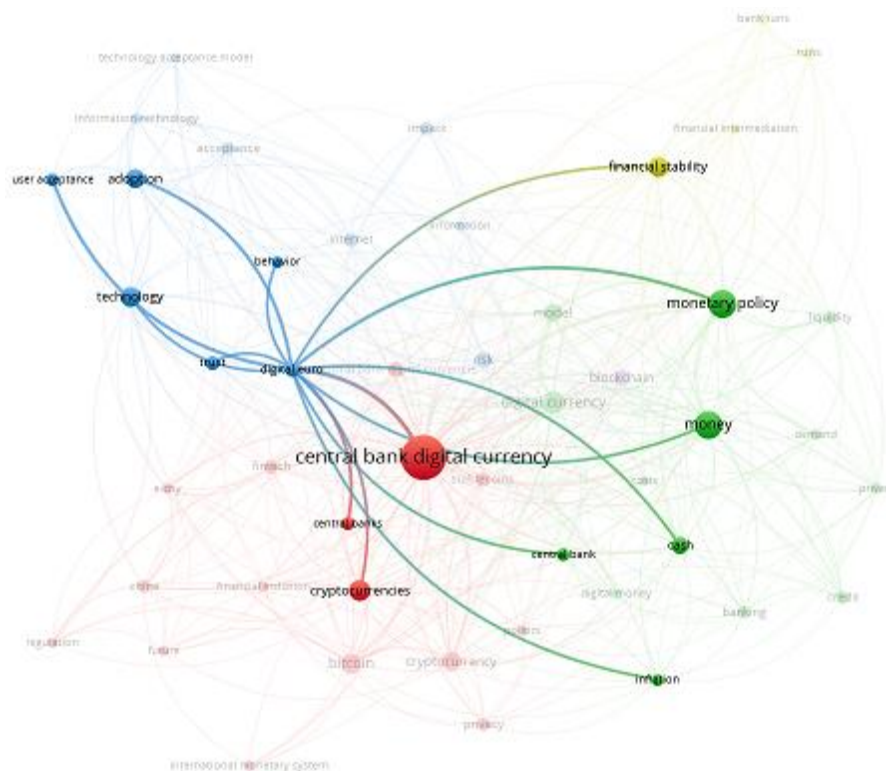


Figure no. 2 – Main connections between keywords centered on the digital euro - network visualization using VOSviewer

Figure no. 2 suggests the main connections between the “digital euro” and the “central bank digital currency”, but also “central bank”, “monetary policy”, “financial stability”, “inflation”, “technology”, “adoption”, and “acceptance”.

To focus on a more specific research area, an additional query was conducted in the Web of Science Core Collection using the keywords “digital euro” and “European Central Bank” or “ECB,” resulting in 40 papers. These were refined by “Type” (Article), reducing the number to 33, and then by “Language” (English), leaving 27 papers. To enhance clarity prior to using VOSviewer, the abbreviation “ECB” was replaced with “European Central Bank,” and “CBDC” was replaced with “Central Bank Digital Currency”. The results are presented in Figure no. 3.

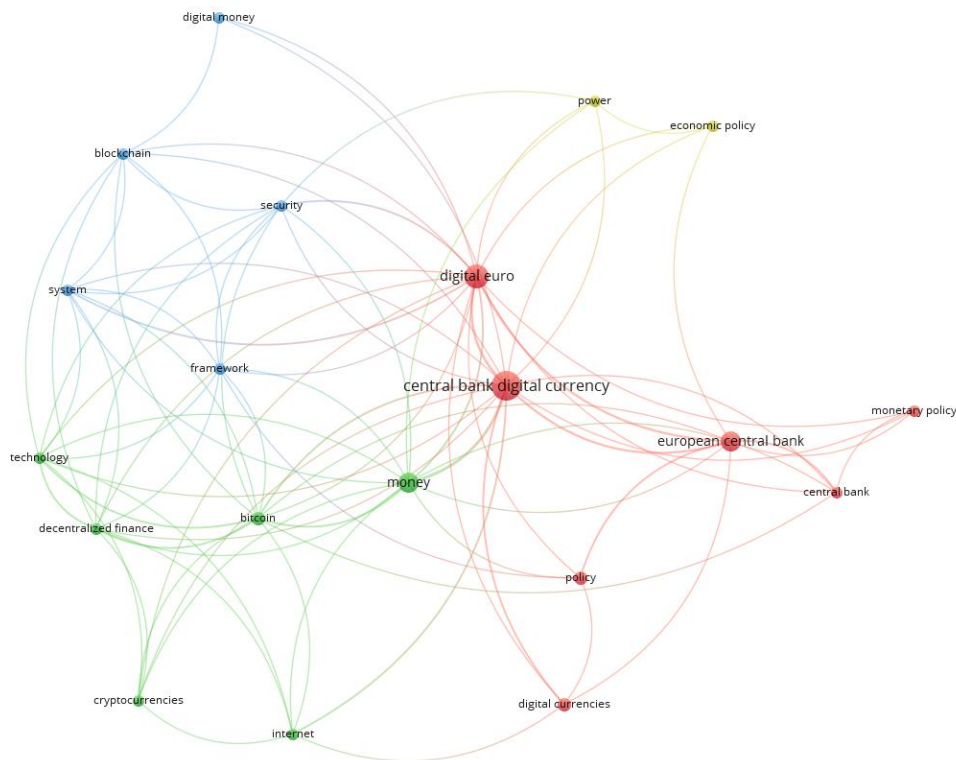


Figure no. 3 – Keywords network visualization for “digital euro” and “European Central Bank”, generated with VOSviewer

Three primary clusters are identified. The first cluster links the “digital euro” with “central bank digital currency”, the “European Central Bank”, “monetary policy”, and “digital currencies”. The second cluster connects “digital euro” with “digital money”, “blockchain”, “security”, “frameworks”, and “systems”. The third cluster associates “digital euro” with “money”, “Bitcoin”, “decentralized finance”, “technology”, “cryptocurrencies”, as well as the “Internet”. Additionally, a less prominent cluster relates “digital euro” to “power” and “economic policy”.

3. RESULTS AND DISCUSSION

At this stage, top-cited review papers on central bank digital currencies were surveyed to identify the primary topics and research areas, in order to connect them with the main research directions concerning the digital euro. The central bank digital currency is a complex and challenging topic that has attracted increasing scholarly interest. In the literature, we identified a large number of studies on central bank digital currencies, and the most important aspect to highlight is that this number increased significantly over the last six years (2020-2025). The primary research themes in the CBDC literature (Ozili, 2023) include: definitions of CBDCs; the design of CBDCs; CBDCs adoption and development; CBDCs and monetary policy; CBDCs and the functions and objectives of central banks; CBDCs and government bonds; CBDCs and commercial banks, with a focus on the impact of CBDCs on commercial banks' profitability; CBDCs and financial inclusion; CBDCs and macroeconomic and financial stability; CBDCs opportunities and challenges. To enable a systematic comparison of the main themes examined in relation to central bank digital currencies and those addressed in the context of the digital euro, the topics were aligned, where possible, to cover the same broad categories.

The introduction of a digital euro could significantly change the financial landscape and public access to money. As a result, the digital euro project raised questions among academics, first regarding the concept of the digital euro. There is agreement on the fact that digital euro as a central bank digital currency is a form of central bank money offered in digital form for use by citizens and businesses for their retail payments (Scarcella, 2021), accomplishing its functions as a medium of exchange and as a store of value; moreover, a digital euro must be a liability of the ECB and within the control of the Eurosystem (Jozipovic *et al.*, 2022). In addition, both studies examined the implications of adopting a European CBDC from a tax policy perspective. The introduction of the digital euro will increase tax compliance (Jozipovic *et al.*, 2022) and may reduce tax evasion and fraud by making transactions traceable (Scarcella, 2021). Grünewald *et al.* (2021) argue that the digital euro issued by the Eurosystem, which can be used by the public in daily life, would be a digital equivalent of euro banknotes.

In the literature, we have identified several motivations for introducing the digital euro. Ozili (2023) highlighted the motivations for issuing a central bank digital currency and noted that a CBDC can improve the conduct of monetary policy, enhance the efficiency of digital payments, and increase financial inclusion. For the digital euro, the literature emphasized its role to "enhance strategic sovereignty" and "ensure Europe's independence in managing its financial systems" (Benlemlih *et al.*, 2024), being "a matter of national security" (Warren, 2023), even more in the context of current geopolitical tensions (Westermeier, 2024), which require "the protection of the strategic autonomy of the retail payment system in Europe" (Quaglia and Verdun, 2025). A digital euro can reduce Europe's dependence on non-European payment providers and strengthen resilience during geopolitical uncertainty (Westermeier, 2024). The digital euro will address the consequences of a decline in cash (Maté and Brizar, 2024), meeting future digital payment needs and ensuring payments continuity during crisis (Westermeier, 2024). Additional benefits are enabling offline payments, improving cross-border payments, supporting the central bank's objectives of maintaining monetary and financial stability, and facilitating smoother transactions in a fragmented EU market (Oehler-Sincai, 2022; Duță and Oprea, 2023; Benlemlih *et al.*, 2024).

Another strand of literature was interested in digital euro's design features, specifically value-based versus account-based, wholesale versus retail-oriented, interest-bearing versus non-interest-bearing (Nabilou, 2020). An important characteristic of the design highlighted in the literature is that it would allow access for those currently unbanked (Mooij, 2023). To achieve this, a centralized system seems feasible for operating the digital euro, which would facilitate peer-to-peer payments and high-volume transactions (Mooij, 2023; Westermeier, 2024). Westermeier (2024) underlined an important feature of CBDCs, which is also true for the digital euro: it is not simply issued; it is designed. Design is important because it determines how digital currency can be used and how it enables and disables financial relations. In this context, the architecture of the digital euro infrastructure becomes important. Between a one-tier model, in which the central bank handles all payments and provides services to end users, and a two-tier model or a hybrid CBDC model, the ECB prefers a hybrid model in which the private sector intermediates the digital euro.

The adoption and development of the digital euro is another major research theme addressed in the literature. The adoption of a digital currency by the ECB and the national central banks of the Eurosystem is considered part of European security efforts (Westermeier, 2024). Grünewald *et al.* (2021) and Jožipović *et al.* (2022) focused on the legislative framework required by the adoption of the digital euro. They tried to clarify whether the Eurosystem is exclusively competent to issue a digital euro. If digital euro is seen as "banknotes", they argue, based on Article 128(2) of the Treaty on the Functioning of the European Union (TFEU) and considering the need to preserve the singleness of the euro, that the Eurosystem's competence to issue a digital euro is necessarily exclusive. Jožipović *et al.* (2022) focused particularly on the protection of the user's privacy (anonymity). Depending on the mechanism of transactions, based on an online or offline system, users could have a lower, respectively a higher level of privacy. But the digital euro might not allow for full anonymity in electronic payments due to regulatory policies, particularly related to anti-money laundering.

The literature has identified the potential risks associated with introducing a digital euro that need to be considered when designing a digital currency. Thus, ensuring user privacy is one of the challenges for the digital euro, as highlighted in the literature. Scarcella (2021) raised concerns about data protection, considering that a digital euro could allow the monitoring of each transaction involving this type of payment. Pelagidis and Kostika (2022) pointed out that privacy is "the most important concern for both citizens and professionals". Security issues, usability across the euro area, the absence of additional costs, and offline usability represent other concerns raised by the adoption of the digital euro. Scarcella (2021) also considers digital divide concerns and shows that it can arise primarily in relation to the level of connectivity and digital literacy.

Despite the challenges posed by a digital euro, this project of the ECB is supported by the opportunities it could create. A digital euro could increase financial inclusion (Mnohohitnei *et al.*, 2021; Buldas *et al.*, 2022) and could support macroeconomic and financial stability (Nabilou, 2020; Mnohohitnei *et al.*, 2021). In their study, Mnohohitnei *et al.* (2021) demonstrated that a euro-denominated CBDC in Central and Eastern European countries could support financial stability by accelerating the adoption of digital payments, improving anti-money laundering, and thus strengthening banks' ability to finance the economy. The empirical analysis conducted on non-Euro CEE countries (Romania, Hungary, Czech Republic, and Poland) revealed that these countries would benefit the most from the introduction of a digital euro.

Regarding the impact of the digital euro on bank profitability, the results are mixed. [Bellia and Calès \(2025\)](#) conducted an investigation for the period 2007-2021 on 398 banks operating in the euro area to assess the potential impact of introducing a digital euro. Using quantile regressions, they obtained that the adoption of a digital euro can reduce the profitability of banks, especially for large banks and for small banks that mostly rely on deposits as a source of funding, and if CBDC substitutes the deposits. Contrary to their results, [Mnohoghitei et al. \(2021\)](#) found that the adoption of a digital euro would have a smaller effect on bank profitability than a change in interest rates.

Moving to the macroeconomic level of the implications of implementing a digital euro, it is crucial to examine the literature investigating the effects of introducing the digital euro on the functions and objectives of the ECB. It is clear that the European Central Bank will assume the role of the architect ([Donnelly, 2025](#)), constructing a financial system that uses digital currency in addition to existing forms of money (cash, banknotes, etc.). However, there are also opinions that engaging in a digital currency project may affect the ECB's traditional mandate and core functions, thereby undermining its objectives of preserving price stability and promoting financial stability ([Quaglia and Verdun, 2025](#)). This is sustained also by [Grünwald et al. \(2021\)](#), who emphasized how issuing a digital euro would help achieve two key policy objectives: 1. a digital euro would help satisfy the continuing need for a form of public money that exhibits the unique features of cash; 2. a digital euro would offer an alternative to the use of "stablecoins" for European retail payments, thereby forestalling massive migration into private digital currencies. Therefore, a digital euro could contribute to the monetary transmission mechanism and thus to the ECB's control over monetary policy.

With reference to the ECB monetary policy, the Treaty on the Functioning of the European Union (TFEU) mandated the Eurosystem to maintain price stability. The objective of the ECB's monetary policy is to keep price stability, but, in the case of a digital currency, [Zellweger-Gutknecht et al. \(2021\)](#) explained that neither cash nor a digital euro can simultaneously be used as instruments in themselves to maintain price stability. [van Egmond and de Vries \(2024\)](#) evaluate the Eurozone's financial system and recommend reforms to improve stability and price control. They specifically propose implementing a fully central bank digital currency to stabilize the system. [Pirgmann and Wawrosz \(2024\)](#) examine the potential effects of the digital euro on the ECB's monetary policy flexibility, the effective lower bound, and negative interest rate policies. Using both theoretical modeling and surveys among EU citizens, they conclude that the implementation of a digital euro may result in more constrained on the negative interest rate policies.

In addition to widely discussed topics, several less-explored areas concerning central bank digital currencies, including the digital euro, warrant further investigation. Such areas include CBDC cross-border interoperability and related benefits ([Khawaja, 2025](#)), CBDC and competition between currencies ([Mayer, 2019](#); [Au, 2025](#)); the effects on bank competition ([Bellia and Calès, 2025](#); [Haan and Amtenbrink, 2025](#)), the connection between CBDC and climate change (specifically energy targets) ([Mooij, 2022](#)), and the influence of CBDC on tax policy ([Scarcella, 2021](#); [Jozipovic et al., 2022](#)). Notably, only a limited number of studies have examined the relationship between the digital euro and financial markets ([Pelagidis and Kostika, 2022](#)).

The impact of the digital euro on financial integration within the European Union remains largely unexplored in the existing literature. [Lane \(2025\)](#), a member of the European Central Bank executive board, suggests that the digital euro could enhance financial

integration by unifying the currently fragmented markets. Though in the political discourse of ECB staff the potential contribution of a digital currency to the financial integration in the euro area is mentioned, there is a lack of both theoretical and empirical studies on this topic. In the context of ongoing digitalization and geopolitical tensions, the digital euro may represent a strategic response to these transformations of the financial system and support the advancement of the financial integration.

While the majority of research papers are theoretical, a few empirical studies have also been conducted (Mnohohitnei *et al.*, 2021; Pelagidis and Kostika, 2022; Maté and Brizar, 2024; Au, 2025; Bellia and Calès, 2025). The empirical works include proposals for introducing the digital euro in Central and European Countries (Mnohohitnei *et al.*, 2021); provided evidence (Pelagidis and Kostika, 2022) on the existence of cointegration between selected cryptocurrencies (Bitcoin, Ethereum and XRP), stablecoins (Tether) and traditional financial assets (Dow Jones Industrial Average, S&P500, Eurostoxx 50, FTSE 100 Index and the MSCI World Equity Index; the EUR/USD exchange rate); analyzed the trends and determinants of cash usage in eight non-euro zone European Union countries between 2013 and 2021 to offer arguments that support the European Central Bank plans for introduction of digital euro, as a central bank digital currency, issued for the general public (Maté and Brizar, 2024). Additional studies have used content analysis of ECB documents related to crypto-assets and the digital euro, to illustrate the evolution of the ECB's position, shifting from hostile attitude to neutrality and eventually to cooptation in a period when the public had interest and positive sentiment toward cryptocurrencies (Au, 2025). Furthermore, quantile regressions have been employed to estimate the potential effects of introducing a CBDC in the European context (Bellia and Calès, 2025).

4. CONCLUSIONS

This study provides a systematic examination of the literature focusing on the digital euro, highlighting its potential implications for payment system efficiency, macroeconomic and financial stability, and financial inclusion in the euro area. According to the research, a well-designed digital euro could complement cash and existing electronic payment instruments, and strengthen the resilience and autonomy of the European monetary system in an increasingly digitalized world. At the same time, the investigation underscores critical challenges for the digital euro project, related to privacy protection, supporting financial intermediation, with a possible impact on the banking industry. The successful implementation of the digital euro project will depend on careful policy calibration, a strong technological infrastructure, and close cooperation between the European Central Bank, the national central banks (Eurosystem), and financial institutions.

The publications examined in this study were obtained from WoS, and the information was thoroughly and objectively examined. However, certain limitations of this study are still unavoidable. Only a subset of the new research papers that are added to the WoS can be indexed in the core database, specifically the Social Science Citation Index in this case. Additionally, papers written in languages other than English, French, Spanish, or Italian were excluded.

Identifying avenues for future research is essential in academic studies. The scope of analysis could be broadened to include Scopus indexed papers, as well as those from the Web of Science that are listed in the Science Citation Index Expanded, Emerging Sources Citation Index, Conference Proceedings Citation Index, or Book Citation Index – Social Sciences &

Humanities. Within the literature, particularly regarding the design as a research theme, there is no consensus on the optimal design of the digital euro, indicating a need for further investigation. The predominance of theoretical studies in the literature on the digital euro underscores the necessity for empirical studies to more thoroughly examine its effects, thereby helping to fill the gap in the literature. In the context of the European Union, future research could focus on the impact of the digital euro on financial integration and its potential to enhance integration.

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Notes

¹ <https://www.whitehouse.gov/presidential-actions/2025/01/strengthening-american-leadership-in-digital-financial-technology/>.

² As Zupic and Čater (2015) note, the Social Science Citation Index is by far the most common source of bibliographic data.