

BANKING DIGITIZATION AND CENTRAL BANK DIGITAL CURRENCY PROJECTS, IMPLICATIONS FOR MONETARY POLICY AND FINANCIAL STABILITY

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Abstract

The accelerated digital transformations of the last decade have prompted central banks to rethink their role in the modern economy, leading to the development of digital currencies (CBDCs). This paper analyzes how CBDC projects contribute to reshaping the traditional functions of central banks, with a focus on monetary policy and financial stability. In the context of mounting pressures from cryptocurrencies, declining cash usage, and the need to modernize payment infrastructure, central bank digital currencies (CBDCs) are regarded as a strategic solution for strengthening monetary sovereignty and enhancing the efficacy of monetary policy transmission. The primary objective of this paper is to provide a comparative analysis of CBDC projects that are in advanced stages of development in China, Japan, the United States, the eurozone, and the United Kingdom. The analysis will emphasize the differences in approach, the anticipated impact on the financial system, and the geopolitical implications. The research is grounded in a qualitative method, employing case studies and comparative analysis, with data collected from secondary sources, including academic articles and official central bank documents. The findings indicate that, despite the shared objectives of the projects—namely, modernizing the payment system, supporting financial inclusion, and strengthening monetary policy—the architecture, degree of centralization, and pace of implementation vary across economies. The paper adds value by linking the technological design of CBDCs to their impact on financial intermediation and macroeconomic stability, providing a clear perspective on the implications of these monetary innovations at the global level.

Keywords: *Central bank digital currency (CBDC), Monetary policy, Financial stability, Financial innovation, Banking intermediation*

1. Introduction

The profound changes brought about by digitalization in the economy and society have created an urgent need for financial institutions to adapt to these new realities. Technological progress fueled by the growth of the internet and the widespread use of smart mobile devices and digital applications has stimulated innovation in all economic sectors, including finance (Oprea & Draghici, 2024). Additionally, research highlights how the widespread adoption of digital financial

services as fintech and robo-advisory platforms has reshaped consumer behavior and engagement in the hybrid digital economy, setting the stage for innovations like CBDCs (Enachescu, 2025).

In this context, digital currencies issued by central banks (CBDCs) have emerged as an innovation in the global financial architecture. These currencies are perceived as a strategic response to the challenges posed by the digitization of payments, the decline in cash use, the emergence of private cryptocurrencies, and the need to modernize payment infrastructure. CBDCs are digital forms of money issued and guaranteed by central banks, combining the advantages of monetary stability with the technological efficiency of modern payment solutions (Ward & Rochemont, 2019). In light of the growing prevalence of digital currency and financial transactions, central banks worldwide have come to the realization that they must either provide a public alternative or risk being left behind in the evolution of monetary technologies (Atlantic Council, 2025).

The Atlantic Council (2025) posits that there exist myriad reasons for exploring digital currencies. The motivation of each country for issuing a central bank digital currency (CBDC) is contingent upon its specific economic situation. The underlying rationales encompass a range of factors, including the promotion of financial inclusion by facilitating safer and more accessible financial services for populations that are unbanked or underbanked; the stimulation of competition and resilience within the domestic payments market to promote more affordable and efficient access to financial resources; the enhancement of payment efficiency and the reduction of transaction costs; the development of programmable money and the enhancement of the transparency of financial flows; and the facilitation of the seamless implementation of monetary and fiscal policies. To date, three countries—the Bahamas, Jamaica, and Nigeria—have successfully implemented a Central Bank Digital Currency (CBDC). On a global scale, 44 CBDC pilot projects are currently underway, including the digital euro. European countries, both within and outside the euro area, are increasingly testing CBDCs both domestically and across borders (Atlantic Council, 2025).

The concept of CBDC is situated at the intersection of technological innovation and monetary policy. In the contemporary economic landscape, characterized by the ongoing digital transformation, the traditional relationship between citizens and money is undergoing a paradigm shift. In response to these evolving dynamics, central banks worldwide are undertaking initiatives to explore novel forms of sovereign currency that are designed to align with the demands of the modern economy. As noted by Răboțu and Babucea (2022), the digital era fundamentally reshapes the provision of services across all sectors, including banking, offering unprecedented opportunities for efficiency and innovation, yet also raising challenges related to privacy, workforce adaptation, and service delivery models.

The global implementation of CBDCs has the potential to exert a profound influence on the realm of monetary sovereignty and the international financial stability. In the context of financial interrelations among nations, countries with currencies of lesser strength may encounter heightened risks of currency substitution if the domestic acceptance of foreign Central Bank Digital Currencies (CBDCs) becomes pervasive. The absence of standardization and interoperability among CBDCs has the potential to impede their efficacy in enabling cross-border transactions, underscoring the necessity for international coordination and collaboration (Mancini-Griffoli et al., 2018). In addition, research on Romanian consumers highlights that trust in the bank and the level of technology are critical determinants of satisfaction with digital banking services, emphasizing the importance of user-centric approaches in designing digital financial tools (Cristina & Andreea-Daniela 2024).

Furthermore, CBDCs furnish central banks with novel instruments for executing monetary policy. The issuance of programmable money by central banks could facilitate the implementation of innovative policies, such as targeted fiscal transfers or interest-bearing digital currencies, thereby enabling more effective responses to economic challenges (Kumhof & Noone, 2018). These novel

capabilities have the potential to enhance central banks' capacity to stabilize economies during periods of crisis and promote long-term economic growth.

In this sense, Ciurlău (2021) observes that the digital economy transforms the interaction between supply and demand, enhances consumer participation, and fosters sustainability and competitiveness, especially in the context of the health crisis. Against this backdrop, CBDCs have emerged as a response to these changes, offering potential benefits for financial inclusion, monetary sovereignty, and payment modernization. Recent research also underscores the broader role of the digital economy in fostering economic recovery, employment, and industrial modernization in the post-COVID-19 era, particularly in the context of global initiatives such as the “Belt and Road” (Lascău, 2021; Cernăianu, 2023).

The introduction of central bank digital currencies (CBDCs) necessitates meticulous examination. A salient concern pertains to the ramifications on financial stability. In the event that CBDCs were to compete directly with commercial bank deposits, they could potentially diminish banks' capacity to provide loans, which could result in a reduction in credit availability and consequent impact on overall economic activity (Iwańczuk-Kaliska, 2024). This risk underscores the necessity of designing CBDCs to complement existing banking systems rather than to cause disruption. Additional risks may encompass the potential loss of banking intermediation, the migration of deposits to the central bank during periods of economic distress, cybersecurity concerns, and the ethical challenges posed by privacy and personal data protection (Dionysopoulos et al., 2024); (Ozili & Náñez, 2024). With regard to the aforementioned issue, the digital nature of CBDCs renders them vulnerable to cyberattacks, which could erode confidence in the financial system and precipitate economic downturns. The implementation of central bank digital currencies (CBDCs) has given rise to concerns regarding data privacy. The potential for increased transparency and traceability in CBDCs could conflict with individuals' rights to financial anonymity (Sethaput & Innet, 2023).

The emergence of CBDC projects in Asia, the euro area, and the US mirrors a global inclination towards experimentation and, in select instances, practical implementation of CBDCs for diverse objectives, including financial inclusion, efficiency, safety, sovereignty, and economic resilience (Auer et al., 2022). Furthermore, the digital revolution is increasingly recognized as a crucial driver of sustainable economic development, fostering innovation, efficiency, and reduced regional economic disparities, as highlighted by Mungiu-Pupăzan (2023).

In light of these developments, the primary objective of this paper is to conduct a thorough analysis of the ongoing implementation of the projects of central bank digital currencies (CBDCs) in various economic systems. The study aims to identify common issues, draw lessons from past experiences, and explore the implications for monetary policy, financial stability, and monetary autonomy. The objective of this paper is to provide an analytical and comparative perspective on how various central banks are approaching the transition to digital currency, in terms of technology, institutions, and geopolitics. In accordance with this objective, the following research question has been formulated: To what extent do central bank digital currency (CBDC) implementation projects contribute to the transformation of traditional central bank functions and the reshaping of the international monetary system?

The present study will analyze the motivations, technological architectures, risks, and impact of CBDCs in key economies. The following currencies are considered to be digital currencies: the digital yuan, the digital euro, the digital yen, the digital dollar, and other relevant initiatives.

2. Literature review

Central bank digital currencies (CBDCs) signify a revolutionary development in the financial sector, amalgamating the benefits of digital payment technologies with the authority of government-issued currencies. Given the ubiquity of digitization in the contemporary economy, extant literature has extensively addressed the topic of CBDCs, emphasizing both their potential to

transform payment systems and the technical, regulatory, and security issues associated with their implementation. CBDCs have become a focus for central banks and researchers amid the rapid digital transformation in payments and monetary systems. Recent literature explores their design, economic rationale, financial stability implications, user adoption, regulatory challenges, and their broader role in maintaining monetary sovereignty (Skinner, 2023; ECB, 2023).

From an economic and policy perspective, CBDCs are primarily motivated by the need to modernize payment systems, preserve monetary sovereignty, and respond to the rise of private cryptocurrencies and stablecoins (Skinner, 2023). Central banks aim to maintain control over money supply and ensure the efficiency and security of digital payments while bolstering the strategic autonomy of currency areas and the global status of reserve currencies (ECB, 2023). Qian (2019) posits that the success of a CBDC project depends on meticulous design, transparency, and strategic execution, underscoring the necessity of a two-tier system that balances public accessibility with private sector involvement and protects privacy and trust.

Design and adoption considerations are also at the center of academic inquiry. The ECB (2023) emphasizes the importance of communication strategies by central banks to influence consumer attitudes and adoption rates. Consumer behavior studies reveal that adoption of digital banking technologies depends significantly on perceived benefits, trust in digital security, perceived risks, and digital literacy, which are equally applicable to CBDC adoption (Nioata, 2024). Well-designed information campaigns can increase willingness to adopt CBDCs and shape how consumers allocate funds between CBDCs and traditional financial assets. Design features such as holding limits are also critical for managing financial stability risks (ECB, 2023). Auer et al. (2020) and Kiff et al. (2020) additionally note that CBDCs promote financial inclusion by facilitating access to formal financial services for unbanked populations and enhancing payment efficiency through real-time settlements. Moreover, programmable money enables innovative monetary policies, such as targeted fiscal transfers and automatic interest rate adjustments, strengthening economic stabilization during crises (Auer et al., 2020; Kiff et al., 2020).

However, the integration of CBDCs is not without challenges. Financial stability and monetary policy implications are significant, with CBDCs presenting both opportunities and risks. They can improve efficiency and reduce reliance on private digital currencies but may cause bank disintermediation and systemic risk if poorly designed (Chen & Siklos, 2024). Empirical research using bank-level data suggests nuanced impacts on banks, highlighting the need for robust regulatory frameworks (Chen & Siklos, 2024). Zhou (2024) explores how CBDCs can provide central banks with new tools for liquidity management and prompt economic intervention, enhancing macroeconomic policy effectiveness and enabling a swift response to crises.

Recent research has demonstrated that digitalization in the public sector improves transparency, reduces corruption, and fosters trust by automating processes and providing real-time access to information (Gabriela et al, 2024). Building on these findings, CBDCs can be seen as a natural extension of digital transformation into the monetary system, aiming to enhance transparency and trust in financial transactions.

Technological and regulatory challenges also figure prominently in the literature. Zhang and Huang (2022) identify key technical obstacles, including blockchain scalability, interoperability across digital platforms, and cybersecurity risks, which demand resilient infrastructures and advanced protections. Similarly, privacy concerns are central to CBDC debates: Attarde et al. (2024) underscore the importance of safeguarding personal data in systems that inherently exhibit high transaction traceability, which must also comply with regulations like the GDPR. Balancing user privacy with anti-money laundering (AML) and know-your-customer (KYC) obligations remains a core challenge. CBDCs also need to ensure security, resilience, and cross-border interoperability to function effectively at an international level (Poche & Veneris, 2021).

Additionally, Rizwan et al. (2025) highlight that concerns about currency substitution and exchange rate impacts warrant further investigation. Duta and Oprea (2023) further analyze the legal and

economic implications of a European CBDC, noting challenges in harmonizing EU legislation, maintaining financial stability, and reassessing interactions between commercial banks, monetary policies, and macroeconomic stability.

Empirical studies complement these theoretical insights. Research by Shakina et al. (2024) and Xiao et al. (2024) suggests that CBDCs improve transaction efficiency but may prompt fund migration away from traditional banks toward digital wallets, with potential risks to financial stability. The findings of Oprea (2025) highlight how CBDCs contribute to advancing financial inclusion and modernizing payment systems, while also drawing attention to persistent challenges related to privacy, security, and user acceptance. The study concludes that, although CBDCs hold the potential to transform global financial systems, achieving this requires innovative designs, international cooperation, and robust strategies to mitigate risks and fully realize their benefits.

Overall, the literature acknowledges that while CBDCs offer significant promise in terms of efficiency, inclusion, and monetary control, their successful implementation hinges on thoughtful design, clear communication strategies, and the capacity to address technical, regulatory, and systemic risks.

3. Methodology

The objective of this research is to analyze central bank digital currency (CBDC) implementation projects through a qualitative approach, with a focus on case studies and comparative analysis. The study is predicated on an analysis of five case studies representing different regions and currencies: the digital yuan (China), the digital yen (Japan), the digital euro (eurozone), the digital dollar (U.S.), and the digital pound (U.K.). The selection of these currencies was determined by their advanced stage of testing or public consultation, as well as by geopolitical, economic, and institutional relevance. The case study enables a thorough examination of each initiative, encompassing an assessment of the technological framework, the objectives pursued, and the anticipated impact on monetary policy and the financial system. The data utilized in the analysis was obtained from secondary sources, including academic publications accessed through databases such as Google Scholar and Web of Science, as well as official documents published by central banks involved in the development of CBDCs. The analysis incorporates reports and briefing notes issued by international institutions, such as the Bank for International Settlements (BIS), as well as gray literature sources, including conference papers, public consultations, and progress reports prepared by monetary authorities.

The analytical framework of the research is structured around four dimensions: the implementation stage of each project (pilot, testing, consultation, launch), the objectives pursued by each central bank (e.g., financial inclusion, modernization of payment infrastructure, or defense of monetary sovereignty), the main issues encountered (related to security, confidentiality, impact on the banking sector), and the anticipated benefits (e.g., efficiency, transaction traceability and monetary policy reinforcement).

The employment of case studies facilitated a comprehensive examination of each project, incorporating considerations of institutional, economic, and technological particularities inherent to each nation. The integration of comparative analysis with the aforementioned method enabled the identification of both commonalities and divergences in the approaches adopted by central banks. Consequently, the research captures the dynamics of each individual project and facilitates the drawing of general conclusions regarding international trends in the adoption of CBDCs.

4. Results and discussions

4.1. CBDC projects under implementation

4.1.1 Digital Yuan

The People's Bank of China (PBOC) initiated the development of a central bank digital currency (CBDC), referred to as the digital yuan or e-CNY, in 2014. This endeavor was marked by the establishment of a research team tasked with investigating the theoretical underpinnings and practical applications of digital currency. The objective of this initiative was to modernize the monetary system, enhance payment efficiency, and improve financial supervision (PBOC, 2014). The digital yuan has evolved into a multifaceted instrument intended to address a variety of opportunities within the Chinese financial system.

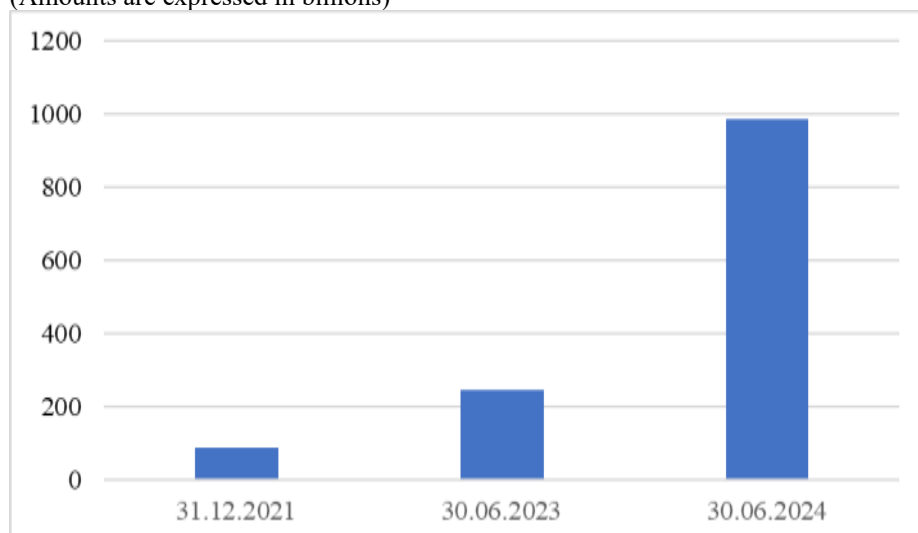
The impetus behind the development of the digital yuan is multifaceted. The currency has been designed with the objective of increasing financial inclusion by providing access to digital financial services for populations that do not have access to banking services, particularly in rural areas. The People's Bank of China (PBOC) is seeking to exercise greater control over the money supply, thereby mitigating the risks associated with private cryptocurrencies and promoting regulatory oversight (ADB, 2023). The digital yuan is regarded as a strategic instrument for augmenting the international utilization of the renminbi, thereby potentially mitigating reliance on the US dollar in global trade (Carnegie Endowment, 2021).

The digital yuan employs a two-tier system, wherein the PBOC issues the currency to commercial banks, which subsequently distribute it to the public. This system ensures direct government oversight while maintaining a degree of separation from traditional banking operations (King's College London, 2021). In April 2020, the People's Bank of China (PBOC) initiated a pilot program in Shenzhen, Suzhou, Chengdu, and Xiong'an to assess the currency's reliability and the user experience through transactions with merchants such as Starbucks and McDonald's (PYMNTS, 2020).

The digital yuan has been designed to support a variety of payment methods, including barcodes, tap-and-go transactions, and offline transactions. This feature serves to enhance the accessibility of the digital yuan in regions with limited internet connectivity (Cheng, 2024). Its integration into public services, such as tax and utility bill payments, has further encouraged adoption, particularly in rural areas (Made in China Journal, 2023). The digital yuan has been demonstrated to enhance financial inclusion within China. It has been demonstrated that users can create digital wallets without traditional bank accounts, thereby facilitating access to financial services for individuals who do not possess a bank account (Sanction Scanner, 2024). Collaboration with prominent fintech companies, such as Alibaba and Tencent, has enabled the integration of the digital yuan into widely used platforms, including Alipay and WeChat Pay, thereby enhancing its accessibility (Made in China Journal, 2023). State-owned banks are beginning to offer digital yuan-based financial products and services, such as loans and salary payments, further integrating marginalized groups into the formal financial system (Sanction Scanner, 2024).

According to Xinhua (2024), Lu Lei, the deputy governor of the People's Bank of China (PBOC), has stated that by mid-2024, the digital yuan had processed over 7 trillion yuan (\$986 billion) in 17 regions. The integration of the digital yuan into sectors such as healthcare, education, and tourism has been identified as a contributing factor to its growing acceptance (Xinhua, 2024). This figure marks a fourfold increase compared to June 2023. The People's Bank of China (PBOC) has not yet published official data for 2022, which hinders the assessment of the precise progress achieved during that year. The cross-border potential has been demonstrated by initiatives such as the mBridge Project, which facilitated transactions worth over \$22 million in collaboration with other central banks (BIS, 2022).

Chart 4: Digital yuan transactions
(Amounts are expressed in billions)



Source: author's representation based on Atlantic Council data (2024)

Notwithstanding these achievements, the digital yuan faces challenges. Privacy concerns are significant due to the centralized nature of the currency, which allows for extensive monitoring of transactions by the government (KCL, 2021). Competition from well-established payment platforms such as Alipay and WeChat Pay represents an additional challenge, as users may favor familiar systems over new alternatives (Made in China Journal, 2023). Furthermore, regulatory frameworks must be adapted to address the distinctive characteristics of digital currencies (KCL, 2021).

4.1.2. Digital Yen

Japan has been actively exploring the possible implementation of a CBDC since 2018, as the Bank of Japan recognized the need to adapt to the new and changing payment ecosystem driven by technological advances and the growing popularity of cryptocurrencies. In 2019, the Governor of the Bank of Japan, Haruhiko Kuroda, suggested that the central bank is monitoring global trends in digital currencies and considering the implications for Japan's monetary policy (Kuroda, 2019).

The Bank of Japan has initiated discussions on the launch of a digital yen, citing several motivations. Against the backdrop of declining cash usage and increasing cashless transactions, the Bank of Japan considers it necessary to ensure public access to a stable form of currency that does not depend on private payment systems (Bank of Japan, 2021). The digital yen could also increase financial inclusion by providing access to digital payment systems for people without bank accounts. At the same time, in the context of the rise of cryptocurrencies and other CBDCs globally, a digital yen could strengthen Japan's position in the international financial system, maintaining the country's economic influence.

In March 2021, the Bank of Japan initiated a public consultation to solicit feedback on the conceptual framework and functional characteristics of a digital yen. The objective of this consultation was to evaluate the public's interest and expectations regarding a digital currency. The Bank of Japan received numerous responses, indicating active public engagement on this topic (Bank of Japan, 2021). In April 2021, the Bank of Japan unveiled a plan to initiate a pilot program, with the objective of investigating and assessing diverse facets pertaining to the digital yen initiative. The objective of the pilot program was to evaluate the user experience, the security measures in place, and the degree of integration with existing financial systems. This phase was conceived to amass information to underpin subsequent advancements (Bank of Japan, 2021).

The digital yen pilot program formally commenced in April 2021, with a primary focus on the evaluation of critical functionalities, including payment processing, security protocols, and user interfaces. The Bank of Japan collaborated with several financial institutions to conduct these tests and collect data on how a digital currency might function within Japan's existing financial infrastructure (Kuroda, 2021).

By the conclusion of 2022, preliminary results from the pilot program suggested that the implementation of a digital yen could enhance payment efficiency and offer a secure alternative to cash. However, concerns regarding privacy, cybersecurity, and the potential impact on traditional banking models also emerged at this stage (Bank of Japan, 2022).

Since the beginning of 2023, the Bank of Japan has persisted in its exploration of the digital yen, concentrating on refining its design based on feedback from pilot tests. The central bank has prioritized pivotal design considerations, including privacy protection, technological infrastructure, and interoperability with prevailing payment systems (Bank of Japan, 2023).

In October 2023, officials from the Bank of Japan (BoJ) announced their intention to extend the testing phases and engage in discourse with international counterparts regarding optimal practices for the implementation of a central bank digital currency (CBDC). The Bank of Japan aims to ensure that any future launch of the digital yen aligns with global standards while responding to unique domestic needs (Kuroda, 2023). According to the most recent activity report on the digital yen (2024), the Bank of Japan has advanced its digital yen pilot project through system testing, thematic discussions, and the development of an API sandbox. For the year 2025, the following priorities have been identified: finalizing the architecture, improving data protection, and integrating user feedback. The Board of Governors' decision regarding the subsequent phase is expected to be finalized by the conclusion of 2025, subsequent to exhaustive consultations with relevant stakeholders (Bank of Japan, 2024).

A review of the extant research indicates several design issues for the successful implementation of the digital yen. User privacy and security represent a significant concern, necessitating a balance between data protection and the prevention of illicit activities to ensure public acceptance (Kaur, 2024). The importance of interoperability is paramount in the context of digital currency, as it is imperative that the digital yen be compatible with existing payment systems and international currencies to enable seamless cross-border transactions. Concurrently, the implementation of the digital yen could influence the execution of monetary policy, thereby affecting interest rates and liquidity management.

The extant literature on the subject of the digital yen has identified several potential impacts of its introduction. The efficacy of payment systems could be enhanced by reducing transaction costs and times, a development that would benefit both consumers and businesses. However, there are risks to financial stability, such as the possibility of triggering massive bank runs or destabilizing traditional banking systems if not managed properly. Concurrently, the implementation of a digital currency has the potential to catalyze innovation within the domain of financial services, thereby engendering novel products and services that will expand the array of consumer choices available.

The implementation of the digital yen is also encumbered by several challenges. The regulatory framework is a priority, but developing a robust system to manage the risks associated with digital currencies is a complex process. While public trust and acceptance are crucial factors, concerns regarding privacy, security, and government oversight may impede the adoption of these technologies. As with other central bank digital currencies (CBDCs), the technological infrastructure necessary to support a digital currency is a challenging task.

4.1.3. Digital US Dollar

The US Federal Reserve (Fed) has been actively exploring the possible implementation of a CBDC as the global financial system undergoes digital transformation.

One of the main motivations for a CBDC is to improve payment systems. Given the growing demand for faster and more secure digital payment methods, a CBDC could simplify transactions and reduce dependence on traditional banking infrastructure. This would enhance the efficiency of domestic and international payments (Board of Governors of the Federal Reserve System, 2022). A digital dollar could provide secure and accessible financial services to unbanked and underbanked populations in the US. By allowing people without traditional bank accounts to participate in the financial system, a Fed CBDC could reduce disparities and increase economic participation (Federal Reserve Bank of Boston, 2021).

The growing use of private cryptocurrencies poses risks to financial stability and consumer protection due to their volatility and limited regulatory oversight. A government-backed CBDC could offer a safer and more reliable alternative, ensuring public confidence in digital currencies while reducing the risks associated with private alternatives (Yellen, 2021).

The US Federal Reserve (Fed) has been actively exploring the possible implementation of a central bank digital currency (CBDC) as the global financial system undergoes digital transformation.

A primary rationale for the introduction of a central bank digital currency (CBDC) is to enhance the efficacy of existing payment systems. In light of the mounting demand for accelerated and fortified digital payment methods, the deployment of a Central Bank Digital Currency (CBDC) has the potential to streamline transactions and diminish reliance on conventional banking infrastructure. This would enhance the efficiency of domestic and international payments (Board of Governors of the Federal Reserve System, 2022). The implementation of a digital dollar could facilitate the provision of secure and accessible financial services to populations within the United States that are currently underbanked or unbanked. By enabling individuals lacking conventional bank accounts to engage in the financial system, a Fed CBDC has the potential to mitigate disparities and enhance economic participation (Federal Reserve Bank of Boston, 2021).

The increasing utilization of private cryptocurrencies introduces potential risks to financial stability and consumer protection. These risks are attributed to the inherent volatility of these digital assets and the current lack of comprehensive regulatory oversight. A central bank digital currency (CBDC) supported by the government could present a more secure and dependable option, thereby fostering public confidence in digital currencies while mitigating the risks associated with private alternatives (Yellen, 2021).

Private sector organizations, including the Digital Dollar Project, have published white papers and initiated pilot programs to explore the design and use of a digital dollar. For instance, in January 2023, the Digital Dollar Project published "White Paper 2.0," which revised the proposed model and encouraged further research in this area (Digital Dollar Project White Paper 2.0, 2023).

As of 2024, no formal pilot program has been initiated, reflecting the Federal Reserve's cautious approach to digital currency.

The development of a Fed CBDC is subject to a series of design and operational considerations. The Federal Reserve must determine the fundamental design elements of the Central Bank Digital Currency (CBDC), including the decision between an account-based or a token-based model, the distribution mechanism, and the incorporation of privacy features. These choices will influence user adoption, security, and regulatory compliance (Board of Governors of the Federal Reserve System, 2022). The creation of a secure, scalable, and efficient technological framework is of the utmost importance. This infrastructure must support high transaction volumes, ensure resilience to cyber threats, and integrate seamlessly with existing financial systems (Federal Reserve Bank of Boston, 2021).

The implementation of a central bank digital currency (CBDC) necessitates the establishment of a comprehensive regulatory framework that addresses consumer protection concerns, anti-money laundering (AML), and countering the financing of terrorism (CFT). This will necessitate a collaborative effort among regulators to establish comprehensive guidelines (Yellen, 2021).

The introduction of a digital dollar would precipitate a multitude of advantages, profoundly altering the functioning of payment ecosystems and the broader economic structure. Firstly, the implementation of this system would expedite and reduce the cost of transactions for both consumers and businesses. This would result in a reduction of reliance on conventional payment infrastructure and an enhancement in the efficiency of domestic and cross-border payments (Board of Governors of the Federal Reserve System, 2022).

Secondly, the digital dollar has the potential to enhance financial inclusion by providing unbanked populations with secure access to digital financial services, thereby obviating the necessity of a traditional bank account. This approach has the potential to mitigate economic disparities and facilitate the integration of these groups into the formal economic structure (Federal Reserve Bank of Boston, 2021). But there is also the issue of the lack of digital skills. There are needed measures in order these to be considered priority in higher education (Rabontu & Babucea, 2020).

Another significant benefit of the digital dollar is its capacity to mitigate the risks associated with volatile and unregulated cryptocurrencies by offering a stable, government-backed alternative. This could potentially enhance trust in digital financial systems (Yellen, 2021). A central bank digital currency (CBDC) has the potential to serve as a valuable instrument for monetary policy, facilitating measures such as direct stimulus distribution and programmable interest rate adjustments. This would enhance the Federal Reserve's capacity to respond promptly and effectively to economic challenges (Gust et al., 2023).

The implementation of a digital dollar poses significant challenges. Initially, data privacy and regulatory oversight are salient issues. The efficacy of the Federal Reserve's efforts in safeguarding data security and preventing the misuse of transaction information for surveillance purposes is a critical factor in maintaining public trust (Board of Governors of the Federal Reserve System, 2022).

Moreover, the implementation of a central bank digital currency (CBDC) has the potential to impact conventional banking models by diminishing bank deposits, as users may opt for digital wallets. This shift could impede banks' capacity to provide loans, thereby compromising financial stability (Federal Reserve Bank of Boston, 2021).

As a digital system, a CBDC is vulnerable to cybersecurity risks, and the implementation of robust cybersecurity measures will be crucial to protect user funds and maintain the integrity of the financial system (Yellen, 2021). Concurrently, the implementation of a central bank digital currency (CBDC) entails regulatory intricacy, necessitating the establishment of novel frameworks for anti-money laundering (AML) and counter-terrorist financing (CFT), in addition to close coordination among government agencies.

The introduction of a central bank digital currency (CBDC) issued by the Federal Reserve System would have profound implications for the financial system, both domestically and globally. The implementation of a digital dollar would effect a radical transformation of existing payment systems, thereby promoting innovation and reducing costs for consumers and businesses. This would also reduce dependence on cash, contributing to a more efficient economy.

The implementation of a digital dollar on an international scale has the potential to bolster the United States' global financial competitiveness, thereby reinforcing the dollar's status as the predominant reserve currency. As other countries, such as China, advance in the development of their own central bank digital currencies (CBDCs), a digital dollar is highly relevant for maintaining global financial leadership.

Concurrently, the issuance of a CBDC by the Fed would fortify the monetary sovereignty of the United States, offering an alternative to foreign digital currencies that could potentially compromise the nation's economic interests (Wenker, 2022).

The implementation of this system would necessitate updates to the regulatory framework, with the aim of addressing the unique characteristics of digital currencies and maintaining confidence in the financial system (Yellen, 2021).

4.1.4. Digital Euro

The concept of a digital euro, as proposed by the European Central Bank (ECB), aims to modernize payment systems in the euro area and ensure the sovereignty of its financial ecosystem. This initiative is consistent with the growing global importance of central bank digital currencies (CBDCs) and the increasing adoption of digital payment methods.

The European Central Bank (ECB) initiated the digital euro project with the objective of providing citizens with a secure, efficient, and universally accepted digital payment method. The report on a digital euro (2020) delineated its framework, emphasizing that the digital euro would complement cash, not replace it. The utilization of blockchain technology in the digital euro would ensure secure and transparent transactions, while complementing the efficiency of payments in the euro area.

The discourse on the digital euro commenced in 2018, propelled by the escalating prevalence of digital payments and cryptocurrencies. The European Central Bank (ECB) has acknowledged the necessity to investigate the potential of a digital euro, a move that is seen as a strategy to maintain the currency's relevance in the face of shifting financial dynamics. In 2019, the President of the European Central Bank (ECB), Mario Draghi, underscored the significance of digital currencies in a speech, asserting that central banks must reevaluate their role in this emerging paradigm (Draghi, 2019).

In October 2020, the ECB initiated a public consultation to solicit feedback on the conceptual framework and functional characteristics of a digital euro. The objective of this consultation was to evaluate the public's interest and expectations regarding a digital currency. The ECB received over 8,000 responses, indicating a high level of public engagement on this topic (ECB, 2021). Subsequent to this consultation, the ECB published a report in January 2021 that presented the primary findings and considerations for the Digital Euro project. The report emphasized objectives such as enhancing payment efficiency, ensuring financial inclusion, and mitigating the risks posed by private cryptocurrencies (ECB, 2021).

In July 2021, the ECB declared its intent to initiate a two-year investigation into the digital euro. This phase centered on the exploration of design alternatives, encompassing privacy provisions, technological infrastructure, and the capacity for interoperability with prevailing payment systems (ECB, 2021). During this period, various pilot projects were initiated to assess the functionality and viability of the digital euro. The objective of these pilot projects was to assess user experience, security measures, and integration with existing financial systems. The ECB collaborated with stakeholders from various sectors to refine its approach and address potential obstacles (Draghi, 2021). In October 2022, the President of the European Central Bank (ECB), Christine Lagarde, confirmed that the institution is making progress in designing a digital currency that could be launched within a few years. The European Central Bank (ECB) aims to conclude its deliberations on design alternatives by the conclusion of 2023 or the beginning of 2024 (Lagarde, 2022).

Beginning in 2023, the ECB has advanced the project into pilot phases, aligning with global trends in which over 100 countries are researching or implementing CBDCs. For instance, China's e-CNY and Jamaica's JAM-DEX have demonstrated the feasibility and practical benefits of CBDCs. The ECB endeavors to assimilate the insights gleaned from these initiatives while catering to the distinct requirements of the euro area (Mayer, 2024).

In the 2023-2024 period, the ECB advanced the digital euro project by encouraging public engagement, conducting user research, and refining features to facilitate use. The preparatory phase involves the regular dissemination of information to the Eurogroup and the European Parliament, with a decision on the subsequent course of action anticipated by the conclusion of 2024. In 2025, the digital euro project will proceed to the selection of suppliers, public procurement, and consultation on the implementing regulation in its initial phases. By the second quarter, the ECB will finalize the architecture and conduct a data protection impact assessment. In the third quarter, the regulation will be finalized, leading to the Governing Council's decision on the next step in October (ECB 2024), following legis

The digital euro offers numerous benefits, including the potential to strengthen economic sovereignty and financial efficiency in the euro area. The notion of economic sovereignty is predicated on the reduction of reliance on private digital payment solutions and non-European financial systems. This approach enables the European Central Bank (ECB) to exercise control over monetary policy and the financial autonomy of the eurozone. This assertion is supported by the Report on a Digital Euro, published in 2020. The digital euro is a financial innovation that aims to promote financial inclusion by providing direct access to central bank money for populations that are unbanked or underbanked (Directive 2009/110/EC).

The digital euro ensures payment efficiency through faster and cheaper transactions, especially for cross-border payments, reducing the costs and delays of current systems (Directive (EU) 2015/2366). Cyber security and fraud prevention have been prioritized in the design of the digital euro, with initiatives such as the Cyber Information and Intelligence Sharing Initiative (European Central Bank, 2020) playing a supporting role. The digital euro has been demonstrated to support monetary policy by providing innovative tools, including interest-bearing accounts, which have been shown to improve the ECB's control over liquidity (Report on a Digital Euro, 2020).

The implementation of the digital euro introduces a number of obstacles, including the potential for disrupting the existing banking system. The migration of funds to the ECB's digital wallets has the potential to reduce deposits in commercial banks, thereby destabilizing the banking system and increasing the cost of credit (Directive (EU) 2015/849). Privacy concerns have also been raised regarding the traceability of digital euro transactions, even in accordance with GDPR regulations. This traceability raises concerns about surveillance and the misuse of personal data (Regulation No. 679/2016).

Another salient issue pertains to the implementation costs, as the development of the necessary infrastructure necessitates considerable investments in technology and cybersecurity measures (Report on a Digital Euro, 2020). As the Cyber Information and Intelligence Sharing Initiative (ECB, 2020) has noted, operational risks, including cyberattacks and system failures, persist as constant threats to digital currencies.

The introduction of the digital euro has the potential to exert a significant influence on the prevailing structure of the traditional banking system. A primary concern pertains to the management of liquidity. The migration of financial assets from commercial bank accounts to digital wallets operated by the European Central Bank (ECB) has the potential to generate funding shortfalls. This, in turn, could result in banks increasing their reliance on wholesale funding sources. This could potentially lead to an increase in the cost of credit and a reduction in the profitability of banks (Law No. 210/2019).

The role of banks as financial intermediaries could be diminished, as the digital euro infrastructure allows users to make transactions without going through traditional banks. This change would compel banking institutions to innovate and prioritize value-added services in order to maintain competitiveness (Directive (EU) 2015/2366).

Conversely, the banking sector stands to benefit from its role as facilitators of the distribution of the digital euro. The integration of the digital euro into existing banking systems has the

potential to enhance payment services, streamline cross-border transactions, and reduce operational expenses for financial institutions.

4.1.5. Digital Pound

The Bank of England (BoE) and the UK Treasury are currently engaged in a thorough analysis of the potential implications of introducing a digital pound. This analysis encompasses a comprehensive review of several key factors. The ongoing shift towards cashless transactions necessitates a stable digital currency that maintains public confidence and is easy to use in everyday transactions (Bank of England, 2020). The potential of a central bank digital currency (CBDC) to enhance financial stability is predicated on its capacity to offer a secure alternative to private digital currencies, thereby mitigating the risks associated with bank disintermediation (Syed, 2022).

The implementation of a digital pound in the UK would contribute to the nation's global competitiveness, ensuring its position at the forefront of an increasingly digitalized global financial landscape. This assertion is supported by the development of competing central bank digital currencies (CBDCs) by other nations (Global Government Fintech, 2024).

The evolution of the digital pound can be categorized into multiple phases. The initial exploratory phase (2020-2022) commenced in 2020, when the Bank of England (BoE) conducted a comprehensive analysis of central bank digital currencies (CBDCs). In February 2023, the Bank of England (BoE) and the UK Treasury initiated a consultation process to evaluate the necessity for a digital pound and to solicit feedback from relevant stakeholders regarding design proposals (Bank of England, 2023).

The consultation phase (2023) involved extensive engagement with financial institutions and the general public. The objective of the study was to evaluate the level of support for the proposed design and to address concerns regarding privacy, financial stability, and access to cash. The Treasury Committee underscored the necessity of a circumspect approach, given the potential hazards to financial stability (UK Parliament, 2023).

In the design phase (commencing in 2024), the Bank of England (BoE) is prioritizing the technological and policy requirements necessary for the implementation of the digital pound. This stage involves the evaluation of the operational efficacy of the digital currency in authentic real-world scenarios and the assessment of its impact on prevailing payment systems (BoE, 2024). A review of the extant research indicates several issues that must be addressed in the development of a central bank digital currency (CBDC) in the UK.

The functionality of the digital pound is contingent upon its ability to operate seamlessly in conjunction with existing payment systems and alternative forms of currency. This necessity underscores the imperative of ensuring interoperability as a fundamental aspect of its design. This approach is designed to avert the potential fragmentation of the financial system, a scenario that could result in inefficiencies (UK Finance, 2022).

Privacy and security are also major priorities. Achieving a balance between the protection of user data and the fulfillment of regulatory oversight requirements, in conjunction with the implementation of robust cybersecurity measures to safeguard users from potential threats, is imperative (Syed, 2022).

It is imperative that the role of financial intermediaries be clearly delineated. The utilization of an intermediary model, which incorporates the participation of conventional financial institutions in CBDC transactions, has the potential to sustain their revenue streams while ensuring the effective transmission of monetary policy (Bath, IPR Blog, 2023).

The introduction of a central bank digital currency (CBDC) in the UK could have several effects, namely, payment efficiency would be improved by speeding up transactions and reducing costs for consumers and businesses (Bank of England, 2020). The implementation of a digital pound could potentially enhance financial inclusion by facilitating access to digital payment

systems for individuals who do not have access to traditional banking services (Global Government Fintech, 2024). The development of a central bank digital currency (CBDC) has the potential to stimulate innovation in financial services, thereby encouraging the emergence of new fintech solutions that improve the user experience (UK Finance, 2022).

As with the other CBDCs examined, the implementation of the digital pound in the UK entails numerous challenging tasks. The regulatory framework must be comprehensive, capable of managing the risks associated with digital currencies, but also promoting innovation, which is a complex process (Bath IPR Blog, 2023).

The success of the digital pound is contingent upon the public's trust and acceptance, yet concerns regarding privacy and government oversight of personal finances could impede its adoption (Global Government Fintech, 2024). Concurrently, elevated infrastructure expenditures pose a potential challenge, as the efficacy of a CBDC in aligning with consumer demands could influence its utilization (Global Government Fintech, 2024).

4.2. Comparative analysis

The central bank digital currency (CBDC) projects in China, Japan, the United States, the European Union, and the United Kingdom reflect a global trend toward modernizing monetary systems. However, these projects differ in their approaches due to varying local priorities. Despite the presence of shared objectives, including the enhancement of payment efficiency and the safeguarding of monetary sovereignty, these initiatives exhibit significant variations in their design, the stage of implementation, and their integration with monetary policy.

CBDCs furnish central banks with supplementary monetary policy instruments; however, the repercussions on financial stability vary considerably depending on the architecture selected and the economic context of each nation.

China's electronic yuan (e-CNY) serves as a strategic instrument of monetary policy and sovereignty. The digital yuan was conceived not solely as a means of modernizing the payment system, but also as an instrument capable of strengthening state control over the money supply and reducing dependence on the US dollar in global trade (Li, 2024). The transmission of monetary policies through central bank digital currencies (CBDCs) can be enhanced by adjusting interest rates on digital currency or rapidly implementing direct fiscal stimuli. Concurrently, China employs e-CNY as a means of ensuring financial stability in the face of volatile private cryptocurrencies, thereby mitigating the risks of financial destabilization (Cheng, 2024). Japan has been the subject of considerable concern due to its economic stability. In this context, the digital yen is regarded as an extension of cash, particularly in light of the ongoing ultra-accommodative monetary policy and the proximity of interest rates to zero. The theoretical framework suggests that the implementation of CBDCs could potentially enable the introduction of negative interest rates on digital currency holdings, thereby stimulating consumption. However, the Bank of Japan has expressed caution regarding the migration of funds to CBDCs, as it perceives that this could potentially diminish the deposit base of commercial banks, thereby impeding their capacity to extend credit to the economy (Bank of Japan, 2024).

The Federal Reserve is adopting a circumspect approach toward the issuance of a central bank digital currency (CBDC), undertaking a thorough evaluation of its potential ramifications for the transmission of monetary policy. The implementation of a digital dollar could facilitate the implementation of helicopter money measures, characterized by direct distribution to the population. However, this could concomitantly impact banking intermediation through deposit withdrawals. According to several researchers, the implementation of CBDCs would serve to reinforce the dollar's standing as a predominant global reserve currency. Furthermore, it would augment the Federal Reserve's capacity to regulate liquidity within the broader economic landscape (Borowicz, 2024; Buckley, 2024). The digital euro is regarded as a potential solution for enhancing the efficacy of monetary policy, particularly in the context of low interest rates and the necessity

for direct fiscal stimulus. The ECB is currently engaged in a deliberative process regarding potential options, including the implementation of interest-bearing accounts for the general population. This would empower individuals with greater control over their liquidity. However, the ECB has expressed concerns that the widespread adoption of the digital euro could potentially result in a withdrawal of funds from commercial banks, thereby increasing the risk of banking crises during periods of economic uncertainty (ECB, 2020).

The Bank of England (BoE) views the digital pound as a potentially transformative instrument, yet its implementation must be executed in a manner that does not compromise the stability of the banking sector. The Bank of England (BoE) endorses an intermediary model, wherein commercial banks distribute the central bank digital currency (CBDC) while retaining their conventional intermediation function. This would enable the expansion of monetary policy transmission without significantly impacting the operational dynamics of the banking system (Bank of England, 2023).

Table 1: Current status of the digital currencies analyzed

Digital currency	Cuntry/Region	Issuance year	Status
Digital Yuan	China	2019	Extended pilot phase
Digital Yen	Japonia	urmează	Test phase
Digital Pound	UK	urmează	Research/Consulting
Digital Euro	EU	urmează	Research/Consulting
Fed Dollar	U.S.	urmează	Research/Consulting

Source: author's representation based on data obtained from analysis.

A prevailing characteristic of the CBDCs examined is the objective of providing a secure and efficient digital instrument, guaranteed by the central bank. A review of the extant literature reveals that all five CBDCs examined in this study have been developed with the objective of modernizing payment systems, reducing dependency on cash, and ensuring the financial inclusion of vulnerable groups (Auer et al., 2020). Moreover, each central bank places significant emphasis on cybersecurity and data protection, which are considered pivotal factors for public acceptance (Attarde et al., 2024).

Another common point of discussion is the concern about the potential impact on financial stability. All projects are designed to analyze the potential risks to bank deposits and the role of traditional financial institutions. For instance, the European Central Bank (ECB) is investigating strategies to mitigate the withdrawal of substantial amounts of digital euro funds during periods of financial distress, as this could potentially lead to systemic instability within the banking sector (European Central Bank, 2020). The Bank of England has proposed an intermediary model for the digital pound that would allow commercial banks to maintain an active role in distribution (Bank of England, 2023).

Discrepancies emerge with respect to the velocity and magnitude of implementation. China has emerged as a leader in this field, with the digital yuan already in an extended pilot phase and utilized in various regions and economic sectors. The digital yuan also functions as a geopolitical instrument, with the objective of internationalizing the renminbi and reducing reliance on the US dollar (Li, 2024). Conversely, the United States is currently in the research phase, with a focus on the implications for citizens' rights and the prevailing banking model (Borowicz, 2024).

A recurrent theme in the analysis of CBDCs is the objective of providing a secure and efficient digital instrument supported by the central bank. The analysis of the five CBDCs reveals a common objective to modernize payment systems, reduce cash dependency, and ensure the financial inclusion of vulnerable groups (Auer et al., 2020).

Additionally, there are noteworthy disparities in the underlying design philosophies. For instance, China is implementing a centralized model with direct oversight of transactions by the

People's Bank. In contrast, the Bank of Japan and the Federal Reserve are investigating models that prioritize privacy and involve the private sector in distribution (Bank of Japan, 2024). Conversely, the ECB endeavors to achieve a balance between traceability and privacy, with the objective of complying with the GDPR regulations (European Central Bank, 2020). Despite the shared objective of modernizing monetary policy and fortifying financial sovereignty, CBDCs exhibit disparities in terms of their rate of adoption, the technological framework they employ, and the extent of private sector participation. These discrepancies are indicative of not only disparate economic and institutional conditions, but also divergent conceptualizations of the future of money.

5. Conclusions

An analysis of central bank digital currency (CBDC) projects in China, Japan, the US, the European Union, and the UK has shown that these initiatives are helping to transform the traditional functions of central banks. CBDCs allow for the expansion of monetary policy tools through the direct application of incentives, the introduction of programmable interest rates, and more effective liquidity control. Moreover, these digital tools contribute to reshaping the international monetary system through the emergence of new forms of currency competition, influencing the global geopolitical and monetary balance and leading to a possible erosion of the dominant position of the US dollar.

The results of the paper highlight that China's digital yuan is the most advanced project in the implementation phase, with extensive practical use and integration in numerous economic sectors. It is used both to modernize domestic payments and as a strategic tool for the internationalization of the currency. In contrast, Japan and the United Kingdom are taking a more cautious approach, prioritizing financial stability by maintaining the role of commercial banks as intermediaries in the distribution of digital currency. The European Union aims to modernize its payment infrastructure, ensure financial inclusion, and protect monetary autonomy in the context of the rise of private cryptocurrencies with the digital euro. On the other hand, the US is still in the research phase, taking a conservative stance on the introduction of a national digital currency, with a focus on assessing the risks to the banking system and citizens' rights. However, all the projects analyzed share similar concerns about data privacy, cybersecurity, bank deposit migration, and maintaining financial stability.

This research makes an important contribution to both theory and practice. It advances the theoretical understanding of how the architectural design of central bank digital currencies (CBDCs) affects monetary policy, financial stability, and geopolitical dynamics. The study complements existing literature by offering a comparative perspective on CBDC projects across several major economies. It shows how institutional specificities and strategic objectives significantly influence their potential impact. This detailed analysis provides a conceptual framework that researchers can apply further to evaluate national CBDC initiatives. The methodology rests on four key dimensions: implementation stage, stated objectives, identified risks, and anticipated benefits.

On the practical side, the research provides recommendations for policymakers and banking practitioners. It proposes measures that mitigate the risks of destabilizing the banking system and maximize economic benefits. The study emphasizes the need for strong cybersecurity, robust data protection, and carefully planned cross-border interoperability. It supports the development of economic policies adapted to local contexts. This research guides the effective implementation of CBDCs, improves monetary policy tools, and strengthens regulatory frameworks in the digital economy.

The research is not without its limitations. Firstly, the absence of post-implementation empirical data hinders the capacity to evaluate the actual impact on banking intermediation. Further research is also necessary to elucidate the discrepancies between developed and developing countries with regard to the motivations for adopting central bank digital currencies (CBDCs) and

the perceived risks associated with them. Another area that has been insufficiently explored is cross-border interoperability and its implications for the global monetary system. Empirical studies that analyze the effects of CBDCs on bank lending, financing costs, and financial stability are recommended. A more in-depth investigation of the potential impact of CBDCs on international trade relations and global currency dynamics would also be useful.

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List of abbreviations

ADB - Asian Development Bank (Banca Asiatică de Dezvoltare)

AML - Anti-Money Laundering (Combaterea Spălării Banilor)

API - Application Programming Interface

BIS - Bank of International Settlements (Banca pentru Reglemente Internaționale)

BoE - Bank of England (Banca Angliei)

BOJ - Bank of Japan (Banca Japoniei)

CBDC – Central Bank Digital Currencies

CFT - Combatting the Financing of Terrorism (Combaterea Finanțării Terorismului)

e-CNY - Digital Yuan

Fed - Federal Reserve (Rezerva Federală)

KCL - King's College London

PBOC - Popular Bank of China (Banca Populară a Chinei)

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