

DIGITAL CURRENCY OF THE CENTRAL BANKS: TRENDS OF THE EURO AREA AND PROSPECTS OF THE USE WITHIN THE IMPLEMENTATION OF THE EUROPEAN GREEN DEAL

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ABSTRACT

In the article, using the certain key financial concepts that are proposed in the scientific literature, the current experience and prospects of the digital currency of the central banks (CBDC) use in the global financial market are investigated. The study of the possibilities of the CBDC introduction in the world has showed that only 14 countries of the European Union of the 27 are at the development stage, the rest have not started the work on the introduction of this financial instrument. In comparison with the global trends, this is a negative indicator. The stages of the implementation of the wholesale, retail and hybrid CBDC are characterized. In the article, the possibilities of the CBDC use are proposed, the problem points that the country may face as a result of the wide use of this financial instrument are presented. The practical significance of the authors' conclusions and recommendations lies in the fact that a clear idea of the current barriers and prospects of the CBDC introduction in the European financial market, the possibility of its use in the transactions between banks and financial intermediaries, in the implementation of big investment projects, in particular, within the European Green Deal has been created.

Keywords: *Digital Currency, Central Banks, Global Financial Market, European Green Deal, Fintech, Green Financing, Green Technologies, Sustainable Development, Financial System, Financial Instruments, Financial Intermediaries*

1. INTRODUCTION

In the world, where the use of cash is declining and private electronic currencies are being spread widely, the digital currencies of the central banks (CBDC) can provide an alternative to the traditional fiat money of the central banks, improve the efficiency and inclusiveness of the payment system [1-3], and create the possibility for the investors that are interested to invest their money in the state assets. This is also positively influenced by the fact that digital technologies, in particular, a smartphone, is more common than, say, a bank account in many countries of the world, so that is namely the CBDC that can provide financial accessibility for those who do not have bank accounts, that have access to

smartphones. It is important that the CBDC will help the investors access the current digital payment instruments at a significantly lower or zero rate without a bank account [4-5].

In addition, recently, such big companies as PayPal, Tesla, Uber, the international banks, City, increase the interest in cryptocurrencies. The funds of the citizens are increasingly flowing into the crypto market [6], which cannot be regulated by the central banks. If this trend continues, then the central banks will gradually lose the ability to adequately respond to financial crises or influence the inflation – that is, they will not be able to perform their main functions.

Brunnermeier et al. [7] warn that the growth of the cryptocurrency market may threaten the country's

monetary sovereignty. That is, the significant spread of the cryptocurrency negatively affects the effectiveness and efficiency of the monetary policy of the central banks. The CBDC issued in the country will help reduce or prevent the proliferation of the private digital currency and strengthen the transmission of the monetary policy. This is also confirmed by the model of Doepke and Schneider [8], according to which the country's economy is dominated by the monetary unit of calculation, which is determined by large business that generated big payments.

CBDC – is an electronic version of money of the Central Bank and this, in first turn, differs them from the cryptocurrency. Cryptocurrencies are not regulated by state regulators, they are characterized by high volatility, and, as a result, are difficult being used as the means of payment or units of account. The CBDC's value is required to be maintained by the central banks of the countries regardless of their physical or digital form. In addition, the CBDC transactions can be easily tracked, and the owner can be determined.

The new payment systems create the externalities that influence the everyday life of the citizens and may jeopardize the objectives of the national security of the country, for example, limit the ability of the European Central Bank to monitor the cross-border flows and apply sanctions. In the long term, the lack of the EU leadership in the digital currency market could have geopolitical consequences, especially if China and other countries maintain their dominance by establishing the CBDC. The study of the role of the digital currencies of the central banks in GeoEconomics Center is carried out precisely in the direction of the research of the relationship between future money and national security.

The Director of the GeoEconomics Center and former senior advisor at the International Monetary Fund, Lipsky [9], said, “Before COVID, central bank digital currencies were largely a theoretical exercise. But with the need to distribute unprecedented monetary and fiscal stimulus around the world, combined with the rise of cryptocurrencies, central banks have quickly realized they cannot let the evolution of money pass them by.”

In addition, digitalization has revolutionized monetary and payment systems. Digital currency has already appeared in various contexts. Digital wallets such as WeChat and Alipay are widely used in China's payment system. Mobile providers have launched successful money transfer services such as Safaricom's M-Pesa. Meta has expressed interest in the metaverse and the potential integration of cryptoassets and blockchain technology into its

virtual reality platform. The company is exploring a blockchain-based digital currency concept called "Facebook Diem" (formerly known as Libra). Twitter has integrated bitcoin tipping features. It allows users to send and receive Bitcoin tips to content creators and other users of the platform. Finally, thousands of fiat cryptocurrencies have been launched in recent years and are stored on blockchains by anonymous registrars. At the same time, one of the most innovative and growing payment technologies is based on biometrics. American Express, Visa, BNP Paribas have developed payment systems based on biometric technologies. However, in developed regions such as North America and Europe, the level of adoption of these technologies is still insufficient [10]. A payment system based on biometric technologies guarantees a certain security of payments, as users are reliably identified, but service providers must ensure the trust of users by protecting their personal data. Compared to cash, digital currency electronic payment (DCEP) affects the privacy of the user's payment data, similar to the problems associated with mobile payments [11]. DCEP performs the following four main functions: QR code payment, money transfer, receipt, and short-range contactless payment [12].

The application of artificial intelligence used in fraud detection and prevention has a particular impact on the development of CBDC, as it computes huge amounts of data to prevent fraud. The next step in the application of artificial intelligence is to use it in customer interfaces, allowing users to easily and conveniently visualize their data. In 2024, fintech companies plan to implement open banking (secure data exchange between banks and third parties via APIs) mainly to verify users and reduce fraud (Sadra Hosseini, 2024).

Therefore, the digitalization of money and payment systems forms the ability of digital currency to overcome barriers and borders.

CBDC can also become a new and innovative instrument of the European Green Deal implementation.

“Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, the European Green Deal will transform the EU into a modern, resource-efficient and competitive economy, ensuring no net emissions of greenhouse gases by 2050, economic growth decoupled from resource use, no person and no place left behind” (European Commission) [13].

The European Commission has introduced the investment plan European Green Deal Investment Plan (EGDIP) (European Commission) [14] as part

of the European Green Deal, which is focused on ensuring a fair and justified transition to the green economy [15]. This program mobilizes considerable investments during 2021-2027 for supporting the regions.

The implementation of this investment plan requires the development of existing ones [16] and the introduction of new financial technologies [17]. The CBDC use in this direction will make it possible to increase the number of contactless payments and e-commerce, avoid the risk that banknotes are the way of the infection transition; to reduce the cost of resources due to the limitation of the issued banknotes and coins and no need of the physical distribution of the cash, to facilitate control over the target use of the invested resources [18], to increase the number of investors and the volume of investments.

2. LITERATURE REVIEW

Today, the discussions are taking place on the introduction of a new payment technology – the central bank digital currency (CBDC). Although the CBDC concept was already proposed in the last century [19], the attitude towards the CBDC, the need for their issuance by the central banks has changed significantly already in the pandemic period. Initially, the central banks focused on the system circumstances of the issuance [20], but over time, when some countries decided to reduce the use of the cash in circulation, the central banks focused on the relevance of the CBDC issuance. The turning point for the central banks was the announce of the issuance by Facebook's Libra of the cryptocurrency, which was supposed to reshape the entire system of the financial payments using the own cryptocurrency. As a result, the CBDC has gained the attention in the whole world and took the leading place in the center of the banking communication and the common research interest.

In the scientific literature, the discussions are focused on several fundamental aspects of the CBDC. On the one hand – how the central banks of the countries create money and what is the role of the CBDC in this process [21-24].

On the other hand – this is the study of the systematic circumstances of the CBDC introduction and what should be done to manage them [25-27].

There are some works of the researchers from the Bank of International Settlements [28] among the intensive discussions in which the political and economic circumstances of the CBDC projects are analyzed.

Many scientists are exploring the CBDC ecosystem, which provides for the private sector collaboration and interoperability with the existing payment systems.

3. RESULTS

To date, all developments of the digital cryptocurrencies can be roughly divided into two types depending on their user:

- one part of the central banks (for example, the People's Bank of China, the NBU, central banks of Sweden, Ecuador, and Uruguay) are developing the digital currencies as full-fledged substitutes of the cash. This means that their use is available for all people and companies during everyday settlements, purchase and sale of goods, and etc.;
- the other – (for example, the central banks of Canada, Singapore, The Bank of England and the ECB) are considering the introduction of the digital currencies, which will be available exclusively for the banks and financial intermediaries.

The process of the digital currency introduction includes some stages. Depending on that the country is in a definite status concerning the level of the CBDC introduction:

1. Canceled - CBDC initiative decommissioned.
2. Inactive - No formal CBDC research but ongoing development of digital wallets and the Infrastructure of new payments.
3. Research - Established working groups to explore the use of cases, impact, and feasibility of the CBDC.
4. Development - Initiated technical build and early testing of the CBDC in controlled environments.
5. Pilot - Initiated small-scale testing of the CBDC in the real world with a limited number of participants.
6. Launched - Issued the CBDC for the widespread retail and/or wholesale use.

Accordingly, depending on the stage of the digital currency introduction of the central banks as of 2023 the countries that rose the CBCD issues in their internal economic-legal sphere, can be divided in the following groups, namely those that:

- carry out the CBDC research;
 - cancelled (non-active research) of the CBDC;
 - develop the CBDC (technical collection and testing in laboratory conditions);
 - have a pilot CBDC project (testing in real conditions);
 - launched the CBDC (for wide use);
 - cancelled the CBDC (decommissioned)
- (Table 1).

Therefore, 114 countries that produced more than 95 percent of the global GDP, started the work on the possible CBDC introduction. Comparing with May 2020, there were only 35 of such countries. 61 countries were in the spread status (Development, Pilot, Launched). Out of the rest 53 countries, 40 countries are on the stage of research, 15 countries – in development and 2 countries – the CBDC cancelled (Central Bank Digital Currency Tracker, 2023 [29]).

In 2023, over 20 countries will take significant steps towards piloting the CBDC. Australia, Thailand, Brazil, India, South Korea and Russia intend to continue or begin pilot testing in 2023.

As of the middle of 2023, all G7 economies have transferred to the stage of the CBDC development.

Japan is in the stage of the political CBDC introduction.

In the United States the Federal Reserve System is moving rather sluggishly towards the CBDC introduction. The wholesale experiment of the Federal Reserve System of the CBDC Project Cedar has transferred the USA from the Research phase to the Development phase. Of the four major central banks of the world (The Federal Reserve System, The European Central Bank [30], The Bank of Japan [31-34] and The Bank of England) the Federal Reserve System is the only one that has not implemented the project on the digital currency testing.

Table 1: Classification of the countries of the world that rose the issues of the CBDC introduction.

Region / phase	Canceled	Inactive	Research	Development	Pilot	Launched
Europe		Denmark, Iceland	Montenegro, Hungary, Czech Republic, Belarus	Italy, Austria, Spain, France, Switzerland, Germany, Netherlands, Great Britain, Ireland, Norway, Finland, Estonia, Lithuania	Ukraine, Sweden	
Asia		Kuwait, Palestine, Lebanon, North Korea,	Pakistan, Jordan, Azerbaijan, Georgia, Nepal, Oman, Qatar, Bangladesh, Myanmar, Laos, Vietnam	Bahrain, Israel, Turkey, Bhutan, Taiwan, Cambodia, Macau	UAE, Saudi Arabia, Iran, India, Thailand, Singapore, Malaysia, Hong Kong, South Korea, Japan, China, Russia, Kazakhstan	
North America		Bermuda	Mexico	Canada, USA		
South America	Ecuador	Sint Maarten, Curacao, Costa Rica, Uruguay, Argentina	Trinidad and Tobago, Colombia, Peru, Paraguay, Chile, Honduras, Guatemala	Belize, Haiti, Venezuela, Brazil		Jamaica, Bahamas, Grenada
Africa	Senegal	Benin, Egypt	Eswatini, Namibia, Madagascar, Zimbabwe, Zambia, Tanzania, Rwanda, Uganda, Kenya, Eritrea, Morocco	Mauritius, Tunisia	South Africa, Ghana	Nigeria
Indonesia and Australia			Solomon Islands, Vanuatu, Fiji, New Zealand, Tonga	Indonesia, Paulo Philippines	Australia	

Source: <https://www.atlanticcouncil.org/cbdctracker/>

The digital euro is an electronic form of money issued by the European financial system (The European Central Bank and the central banks of the Euro area countries), which is available for all physical and legal entities. The digital euro should:

- not to change the cash, rather supplement it;
- be safe and stable;
- provide a high confidentiality level;
- EU financial system guarantees that all Euro area citizens shall have the access to the cash;
- be used for everyday payments, be easy and comfortable by using and be a widely available instrument for the citizens (Council of the European Union, 2023 [35]).

The issuance of the digital euro shall support the digitalization of the European financial system and actively favor the innovations in the organization of the retail payments.

Since the CBDC is a new form of the commonly accessible electronic currency issued by the Central Bank, then it is necessary to assess the role of the cash in the society for a long-term perspective where digital technologies are present. After all, the CBDC can be an analogue of the usual monetary unit, which is used in the state as fiat money and serves as a legal means of payment, but exists in the electronic form, is stored in an electronic wallet and overcomes the disadvantages of cash payments.

Payment behavior of people is changing at a fairly fast pace: in recent years, cash payments in the Euro area countries are becoming rarer, and digital payments are becoming more and more popular.

Payments are divided into two groups: regular and irregular. Regular payments are made by the bank at the agreed intervals (weekly, monthly, etc.) to the customer's account from the customer's bank account, credit/debit card of the client during the definite period of time. Irregular payments are usually made only once, represent a one-time transaction, and usually involve only one account. The amount of money often exceeds the volume of regular payments.

Out of all non-recurring payment transactions in 2022, 80% - were trading transactions, 17% - online operations, and 4% - P2P. The part of the POS operations in value terms made about two-thirds.

The share of cash payments in the POS transactions by the number of operations has decreased in recent years. This decrease accelerated during the pandemic. In 2022, 59% of transactions was carried out using the cash. In 2019, the share of cash transactions made 72%; in 2016 – 79%. However, today, cash remains the most frequently used payment method in the POS operations in the Euro area (Fig. 1).

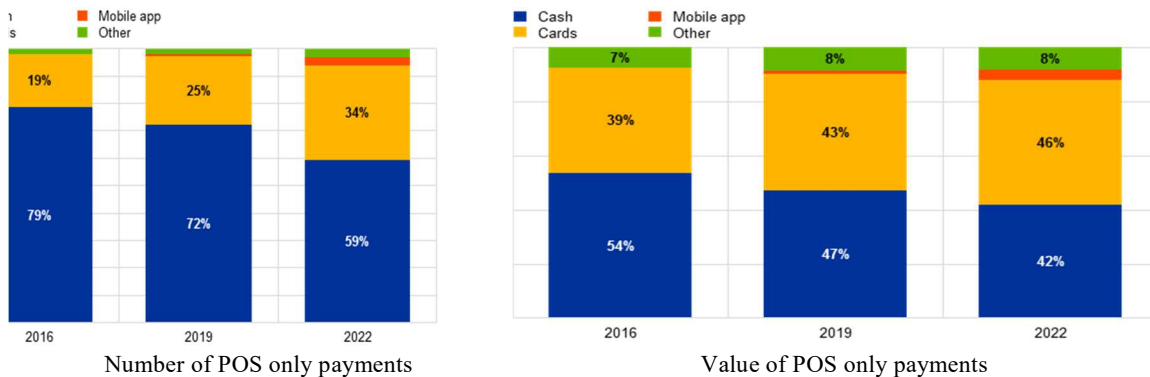


Figure 1: Share of payment instruments used in the POS operations by the number and volume of transactions, 2016 – 2022, the Euro area

Source: https://www.ecb.europa.eu/stats/ecb_surveys/space/html/index.en.html

When studying the volume of the POS transactions, the share of card transactions in 2022 (46%) exceeded the share of the cash transactions (42%) for the first time. In 2019, the share of card transactions by volume was 47% and, accordingly, the share of card transactions was 43% (Graph 2).

In 2022, the consumers were more likely to make payments using the mobile phone apps than before. However, their share in the total number and volume of the payments was low compared to cash or card payments. Mobile payments accounted for 3% of the

total number of transactions in 2022 (up from 1% in 2019) and 4% of total transactions (up from 1% in 2019).

Therefore, the tendency to reduce the use of cash in trade transactions was observed even before the start of the COVID-19 pandemic, which only intensified it. Moreover, these processes were accelerated by the availability of card and mobile payments, recommendations by the government authorities and retail outlets to avoid the cash use.

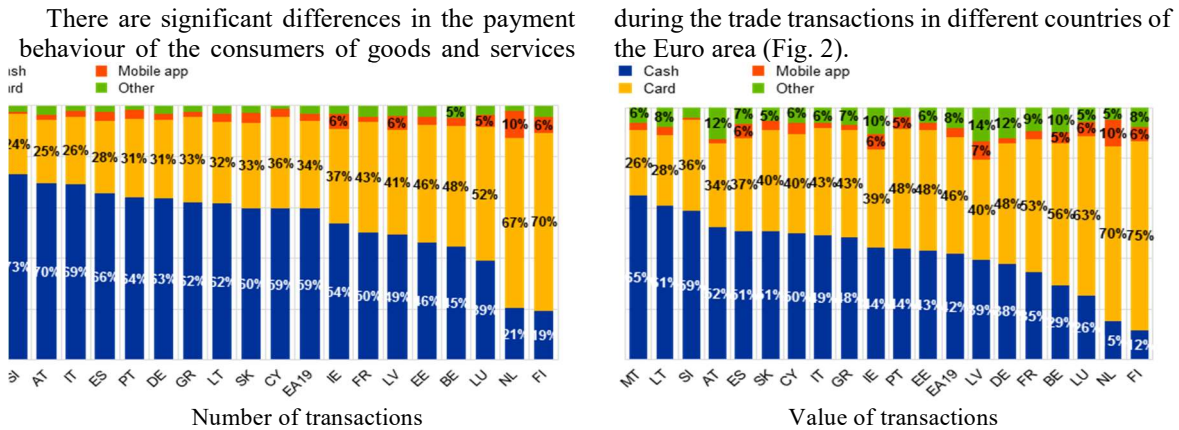


Figure 2: Share of payment instruments used in the POS operations by the number and volume of transactions, 2016 – 2022, the Euro area

Source: https://www.ecb.europa.eu/stats/ecb_surveys/space/html/index.en.html

In several Euro area countries, the preference for payments in trade transactions with the cash is clearly visible in 2022. The biggest share of the cash transactions by the number of transactions in trade operations was observed on Malta (77%), Slovenia (73%), Austria (70%) and Italy (69%), and by the amount of transactions – on Malta (65%), Lithuania (61%) and Slovenia (59%) [36]. In 2022, the card payments were the most common payment method in four countries of the Euro area: Finland (70%), the Netherlands (67%), Luxembourg (52%) and Belgium (48%). In Estonia, the share of card payments is almost the same as the share of cash payments (both - 46%).

Although, the volume of payments using mobile apps has increased in recent years, their share of trade transactions is still relatively low. The share of mobile payments (by the number of transactions) was the highest in the Netherlands (10%) and increased 5% in Finland, Ireland, Latvia and Luxembourg.

In the Netherlands and Finland, for example, cash is used in only a fifth of transactions.

Compared to 2019, the use of cash decreased. This was observed in the majority of countries of the Eurozone, though in Slovenia, and in Estonia, the share of cash payments has not practically changed. The use of cash mostly decreased in the countries of Southern Europe: Greece, Spain, Cyprus and Portugal (Fig. 2).

The essence of regular payments is significantly different from irregular payments, and accordingly, the models of using payment instruments when making them are also different.

For most types of regular payments, the debit payment instrument is most often used, and it is used by about half of consumers. Another 30-40% of consumers made their regular payments using the credit instruments. Less than 10% of consumers used payment cards, cash or other payment instruments (Fig. 3).

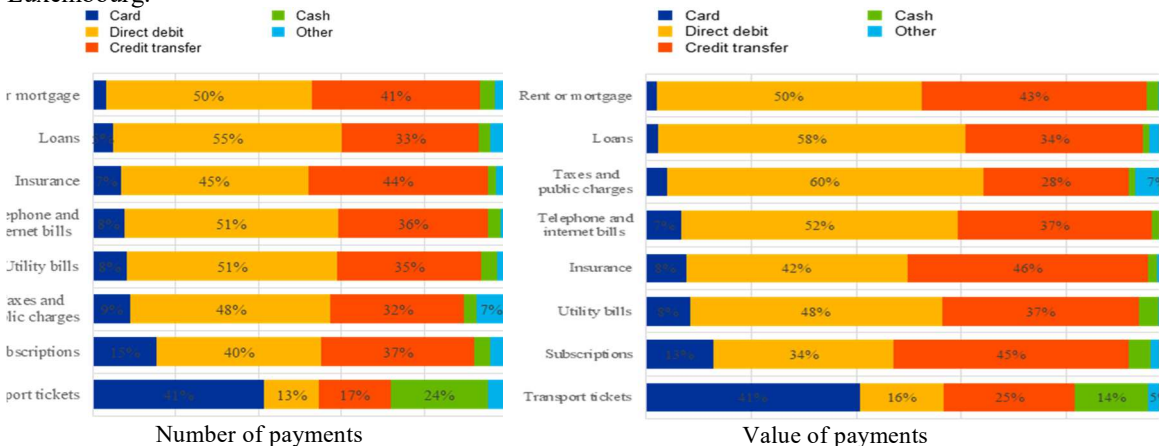


Figure 3: Structure of recurring payments by payment instrument in terms of number and value, 2022, the Euro area

Source: https://www.ecb.europa.eu/stats/ecb_surveys/space/html/index.en.html

Cash payments are mostly used in the following categories: subscription to magazines, streaming TV, etc., as well as transport tickets for the population (Fig. 3). This trend is explained by a smaller volume of these payments, as well as the fact that transport tickets are usually purchased at the transport locations. Regular payments in the sphere of rent, mortgage, loans, insurance, utility bills, taxes and fees are mostly made using debit accounts, credit payments, payment cards. Moreover, this trend is more typical for all countries of the Euro area.

In addition to the dominance of the cashless payments, the role of such resources as data and software, which are a defining feature of the digital economy, is growing. This leads to significant spending of the business scale and the reduction in marginal costs [37-39].

To meet the diverse needs of the end-users and market gaps in the countries of the Euro area, the alternative options for the use of payment

instruments are required according to the payment behavior and preferences of the users. This can be achieved by offering a sufficiently broad and effective set of possibilities for the digital currency use.

As the analysis of the above indicators shows, the conditions have been created in the international financial system for the spread-wide use of the digital currency on the state level as well. Therefore, the digital euro is designed to respond to these growing benefits of the electronic payments by making public money available in the digital form as well. The digital euro will provide the Europeans the access to the payment tools that will allow them to pay anywhere in the Euro area for free. An accessible and easy-to-use digital euro will contribute to the inclusiveness of the European financial system. The results of the currency digitalization in the countries of the Euro area are shown in Fig. 4.

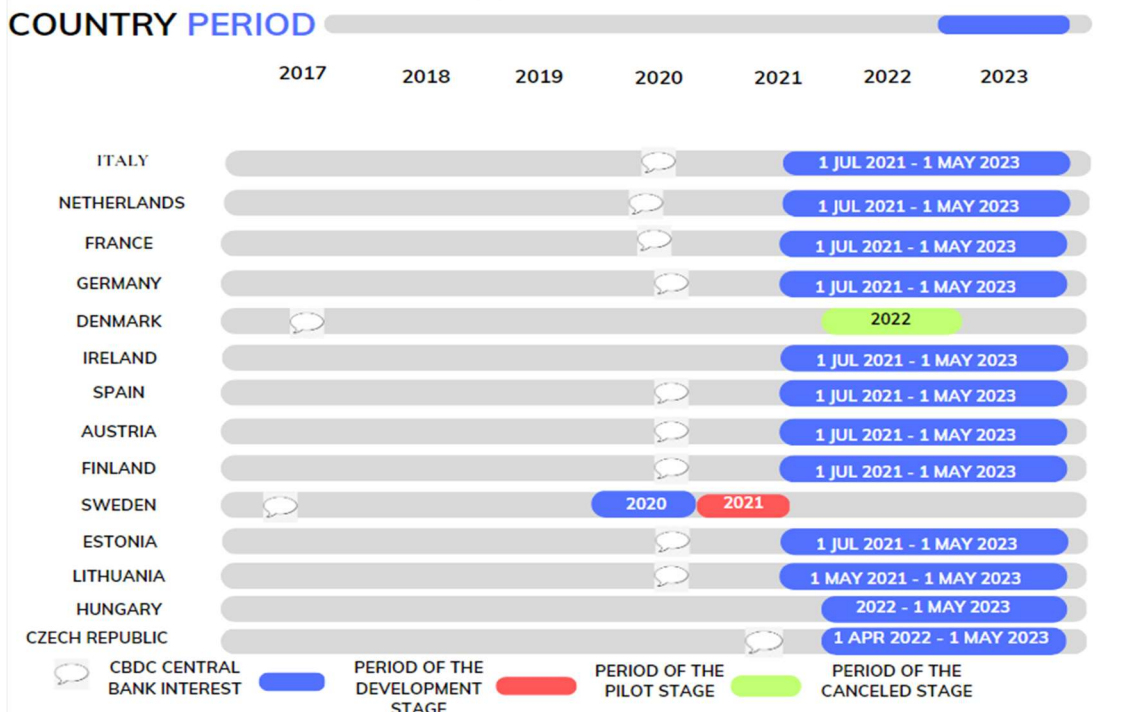


Figure 4: Timeline of the CBDC projects of the Euro area countries since 2017

Source: <https://www.atlanticcouncil.org/cbdctracker/>

14 EU countries out of 27 have started the work on the introduction of the digital currency in their territory. And only Sweden in 2021 introduced a pilot project of the e-krona digital currency. For this, an appropriate basis was formed. Back in 2018, The Bank of International Settlements characterized Sweden as the country with the smallest share of paper money in the world (Bank of International Settlements) [40-41]. Under the estimates of the

Sweden's Riksbank [42], in 2018 only 1% of the Swedish GDP was in banknotes (for the USA - 8%, and for other countries of the Euro area - 11%).

The Central Bank of Denmark conducted one of the first feasibility studies on the CBDC in 2017. The report concluded that given the efficiency of the payment infrastructure of Denmark, the CBDC would not be needed and could lead to economic instability. In the report released in 2022, the Central

Bank said that it does not see a use-case for a retail of the CBDC (Central Bank Digital Currency Tracker, 2023).

Active introduction of the digital currency in the Euro area started in July 2021, when the European Central Bank together with the central banks of Estonia, Spain, Germany, Italy, Greece, Ireland, Latvia and the Netherlands have made the decision on launching the research stage on the possible introduction of the digital euro and published the report on their experiment for the assessment of the functionality of the digital euro. The project could carry out three thousand per second with average speed two seconds per transactions.

Close involvement of the European Parliament in the research phase is a priority for the ECB. Such interaction is essential to ensure the digital currency meets the preferences and needs of individuals and entities in the ever-evolving financial relationships.

The process of the CBDC introduction in the Euro area is carrying out step by step. The ECB is gradually implementing the process of the digital currency launch:

1. July 2021: start of the digital euro project.
2. Autumn 2023: possible decision on the start of the implementation phase.
3. Implementation phase – possible making decision on the issue of the digital euro (Fig. 5).

At the time, the CBDC introduction in the Euro area is at the Development stage. The ECB is tasked with creating the digital euro, but individual countries of the Euro area can contribute to the development of both retail and wholesale CBDC.

The countries can introduce various types of the Use Case CBDC:

1. Retail.
2. Wholesales.
3. Hybrid.

EU legislative process based on Commission proposal

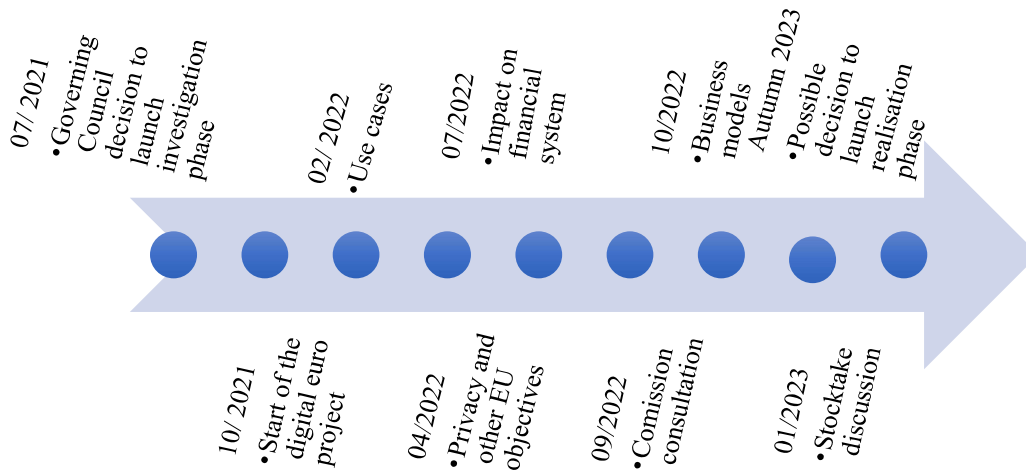


Figure 5: Timeline phase of the research and development of the CBDC projects of the Euro area countries (from July 2021 to Autumn 2023)

The wholesale CBDC – is a digital currency of the central bank that can be used alongside or in place of traditional currency of the central bank, such as reserve funds held by the banks at the central bank. By the characteristics, the wholesale CBDC is particularly suitable for big transactions, such as the settlements of securities transactions or the transfer of funds between the banks. Thus, the financial institutions and big participants of the financial

market use the wholesale CBDC to facilitate the interbank settlements and other wholesale payments.

That is why, it is optimal for the countries of the Euro area to introduce the wholesale CBDC in first turn, considering the territory of the Euro area, diversity of the countries and necessity of the consolidation of the national currencies in a single plane. The stages of the implementation of the wholesale CBDC are presented in Fig. 6.

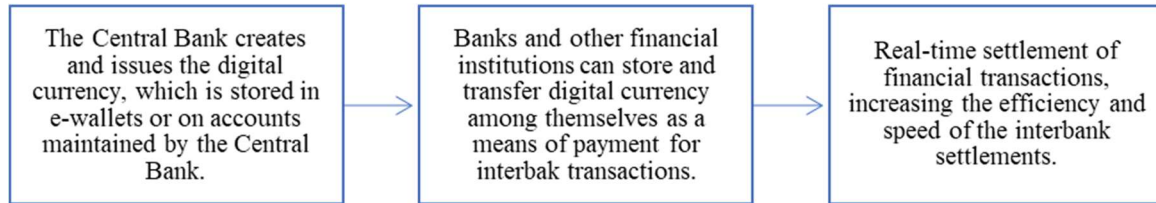


Figure 6: Stages of the implementation of wholesale CBDC

Directions of the use of the wholesale CBDC:

1. Facilitate the transnational payments between banks and other financial institutions, reducing the cost and complexity of these transactions by eliminating the intermediaries, as well as increasing the speed and reliability of the settlements.

2. Use as collateral in the financial transactions, providing a new way of risk management and a wider range of the assets as collateral.

3. Ensuring the liquidity of the financial institutions in times of crises, helping to maintain financial stability and smooth functioning of the financial system. By controlling the supply of the wholesale CBDC, the Central Bank can use it as a direct instrument of the monetary policy, which is likely to become increasingly important, especially in times of the stagnation and high interest rates.

In December 2016, the work on the possible introduction of the wholesale CBDC, this process began for the first time on the territory of the Euro area. It was a joint educational project Stella of the European Central Bank and the Bank of Japan. This

project includes three stages. The first stage (September 2017) (Bank of Japan, 2017) completed with publishing the Report on the possible use of the DLT technology to process the payments. The second stage ended with the Report (March 2018) (Bank of Japan, 2018), where the securities delivery versus payment in a DLT environment was researched. The third stage was completed with the Report (June 2019) (Bank of Japan, 2019), where the possible of the DLT use for the cross-border payments, especially from the point of view of safety, was researched. The scope of the project does not include legal and regulatory aspects (Bank of Japan, 2020).

The retail CBDC offer the potential to enable the convenient and secure electronic payment and new opportunities for the central banks to conduct the monetary policy and provide financial services to the public. The retail CBDC can be used by the general public in much the same way as the cash, only in the digital form.

The stages of the implementation of the retail CBDC are presented in Fig. 7.

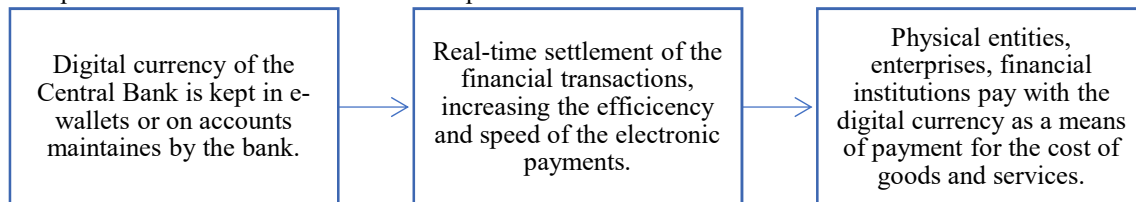


Figure 7: Stages of the implementation of retail CBDC

Directions of the use of the retail CBDC.

1. The CBDC can be used as a means of payment for goods and services, as opposed to the cash or traditional non-cash payment methods.

2. The retail CBDC can facilitate the cross-border payments by reducing the costs and complexity of these transactions and increasing the speed and reliability of the settlements.

3. The Central Bank can use the retail CBDC to provide the liquidity in the market, helping to support the financial stability and continuous functioning of the financial system.

4. And, in the countries where the access to the traditional financial services is limited, the retail

CBDC can become an alternative way for the individuals and companies to access and use the digital currency.

5. The Central Bank can use the retail CBDC as an instrument of the monetary policy by means of correcting the interest rates.

It is worth noting that the specific construction and features of the retail CBDC shall depend on the purposes of the Central Bank that issues the digital currency. For example, the Central Bank of the Bahamas has launched the retail CBDC, known as the Sand Dollar, which can be used by the general public for electronic payments. In Europe, two central banks have implemented the successful pilot

projects for issuing the retail CBDC: The Riksbank's Sweden and The National Bank of Ukraine.

The Riksbank's Sweden is carrying out further research of the implementation and potential advantages of the retail CBDC, e-krona, now. The project aims to increase the Riksbank knowledge of the digital krona issued by the Central Bank and show how the general public could use the e-krona in the test environment (Riksbank, 2020 [42]).

The National Bank of Ukraine has been working on a pilot project (CCN.com [43]) to test the usefulness of a digital version of its currency, the Hryvnia. In 2019, the National Bank of Ukraine announced completing a two-month-long pilot involving the employees of the Central Bank (Cointelegraph [44]).

Both types of the CBDC are equally being used in the market. For example, the wholesale CBDC can

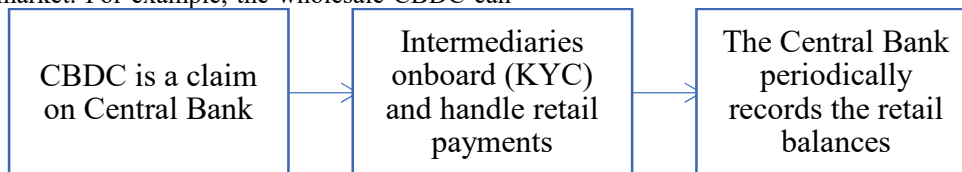


Figure 8: Stages of the implementation of wholesale CBDC

This model can also be called the “Two-Tier Model”. The “Two-Tier Model” will be used for the issuance and redemption of the e-CNY (Working Group on E-CNY) [45].

Therefore, each country should use the phased approach to the introduction of the digital currency by the Central Bank, which will allow for the gradual understanding and adoption of the different CBDC use, construction of the appropriate CBDC architecture, technical conception (traditional centralized database or the technology of the distributed register (DLT)), the access technology and the anonymity degree of the use, possible use for the internal and/or transborder payments.

Therefore, the priority directions of the financial system development as a result of the CBDC introduction are:

1. The CBDC will expand the tools of the fiscal policy available to the regulators, for example avoiding the "zero rate trap". Due to the programmability and transparency of the CBDC, it is easier for the regulators to control the monetary sphere [46]. More transparent data on the payment flows will improve the quality of the macroeconomic statistics.

2. The CBDC will enable the financial control at all levels, namely: incoming, outgoing payments, payments between the key elements within the state, made by the government officials, businessmen, militaries, volunteers, ordinary citizens.

provide the stable and safe means of settlements, decreasing the risk of the liquidity deficit and providing the strength of the financial system. The retail CBDC is an alternative of the cash funds, it can be considered as safer since the retail CBDC is less prone to risks as loss of counterfeiting.

Hybrid CBDC – is a type of the CBDC, which combines the characteristics of the retails and wholesale CBDC. The payments are processed by the intermediaries, but the digital currency itself is a direct payment claim to the Central Bank. The Central Bank, in turn, keeps a register of all transactions and manages the backup technical infrastructure.

The stages of the Hybrid CBDC implementation are presented in Fig. 8.

3. The CBDC technology can significantly improve the transparency and anti-money laundering, as well as support the anti-corruption campaigns by the governments and the IMF. The component eCurrency Information and Supervision of the CBDC platform is especially useful, it allows the central banks to track the currency operations and integrate with the systems on struggling the money laundering (eCurrency Information and Supervision) [47].

4. The CBDC is designed to increase the stability and competition in the financial sector amid the competition between the banks and technological companies and the cryptocurrencies.

5. The branches of the commercial banks may be far away, and the services may have limited the opening hours, while the retail CBDC offers 24/7 payments anywhere, including the mobile devices, smart cards and programs [48] and Keister and Sanches [49]. The settlements using the digital currencies can be significantly faster than the legacy payment systems. The CBDC can process more than 50000 transactions per second for stable commissions. The average VISA indicator makes about 5000 transactions per second.

6. The trans-border payments now face high costs. For example, on average, to carry out the payment for US 200 dollars costs near US 14 dollars. With the CBDC introduction, the international transactions shall last seconds and will be practically

free (The Bank for International Settlements, 2021). And this is especially beneficial for such countries as, for example, Ukraine, Salvador, which are dependent on the transaction of the labour migrants (in Ukraine – around 8% of the GDP, and in Salvador – 20%).

7. The blockchain can verify and carry out the CBDC transactions even offline or where the user has an unreliable connection, for example, during the martial law in Ukraine.

8. The CBDC is cheaper in comparison with the credit cards, such as VISA or Mastercard, and, at the same time reduces possible errors, crimes and reconciliations with a secure record of the transactions. The designs of the majority CBDC is formed on the national level (or in the currency union), but there are some attempts (for example, on the G7 level) to connect such schemes with several CBDC [50]. Working with one immutable and distributed ledger is more efficient than working with multiple mutable ledgers.

9. The trans-border CBDC can help reduce the dependence on the intermediaries and, therefore reduce the costs for the transactions for time. 54% of the central banks expect that the CBDC will significantly reduce the costs for the cross-border transactions, and the other 31% – for significant costs saving [51].

While there are certain advantages, there are also challenges and disadvantages to using the CBDC:

1. The concentration of the private data in the hands of the central banks may lead to the increased risks of the loss of privacy for the users: payment data of the users concentrated in the databases of the central banks will create the reasons for the cyber-attacks and a high risk in case of the leakage of the confidential data.

2. The incorrect choice of the design for the underlying the CBDC technology infrastructure can exacerbate the privacy and the issues of data protection. For example, these transactions can be illegally used for the credit assessment and cross-selling initiatives.

3. The lack of security can result in the serious loss of trust in the entire financial system on the part of the users.

4. DISCUSSION

The issue of the introduction of digital currency by central banks remains debatable, and the development of such means of payment depends on many factors. Alternative uses of digital currency are needed to meet the diverse needs of end users and market gaps in countries. This can be achieved by offering a sufficiently broad and effective set of

possibilities for using types of digital currency. Thus, a central bank can use a synthetic model that combines innovation with traditional financial stability, or implement a retail CBDC. This divergence in strategies not only reflects distinct societal values, but also sets the stage for competitive shake-ups in the financial sector in 2024 and beyond. Therefore, each state should choose its own way of introducing CBDC depending on the development of the financial system, the banking sector, and the degree of introduction of fintechologies in financial services.

This study adds to the knowledge about the functioning of CBDC in the global financial system by analyzing the application provisions of such development on the example of the Eurozone countries.

5. CONCLUSIONS

Therefore, the introduction of the digital currency of the central banks implies a structural reform of the monetary system of the state, region, and the world.

The CBDC popularity is growing worldwide for many reasons:

1. The COVID-19 crisis has caused the shift in the payment habits towards the digital, contactless payments and e-commerce due to the later disproved risk of the banknotes being a means of the infection transmission [52].

2. The cryptocurrencies developed by the private organizations or informal communities (e.g., bitcoin), have undergone significant development and increase in value.

3. Digital currencies are the next stage of the digital revolution, the fintech landscape is evolving to meet the increased interest and demand for digital currencies. As the digital process of integrating financial services into non-financial products and services moves at breakneck speed, the adoption of CBDC is an inevitable event. In addition, new technologies, including artificial intelligence and machine learning, are entering the field of finance.

The CBDC introduction in the Euro area and outside it definitely correlates with the main concepts of the European Green Deal. After all, we can speak not only about reducing the costs of issuing and maintaining the circulation of euros, but also about the clear control over the investments for the recovery after the COVID-19 pandemic, the funds were submitted from the EU's multiannual budget (2021-2028) and the EU's unique NextGenerationEU (NGEU). The digital euro will not substitute other electronic means of payment or cash. It will rather supplement them. And this way,

it will protect the currency sovereignty, strengthening the strategic autonomy of Europe.

Nearly a dozen countries have fully deployed the CBDC, and about 90 other countries have launched the CBDC pilot programs, development or research. From these countries, the retail CBDC have been already introduced and developed by several central banks. In contrast, the wholesale CBDC at the present moment are currently mostly being tested in a few countries.

CBDC does not yet exist and not all effects can be thought through in advance. For that reason, a gradual introduction makes sense. The next step for the CBDC introduction in the Euro area would be to develop and experiment with the prototypes. This will make it possible to more accurately measure the consequences of such decision.

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