Will the Digital Euro Be Attractive Enough to Generate Significant Demand?

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Summary: The decline in the use of cash and the emergence of innovative digital payment systems have prompted the ECB, like many other central banks, to consider introducing its currency in digital form. The technological problems of introducing a digital euro do not appear unsurmountable. However, one issue that has received less attention is the demand for a digital euro. The digital euro will only be attractive if it offers individual users additional benefits compared to current payment systems. These benefits may relate to convenience, return, cost, transaction speed, risk, and data protection. The paper concludes that hardly any significant additional benefits are currently apparent in these areas. Hence, the case has still to be made that a digital euro is indeed welfare increasing. There are also open questions from a regulatory perspective, as the ECB may become a direct competitor of commercial banks and payment service providers.

Zusammenfassung: Der Rückgang der Verwendung von Bargeld und das Aufkommen innovativer digitaler Zahlungssysteme haben die EZB wie viele andere Zentralbanken dazu veranlasst, die Einführung ihrer Währung in digitaler Form zu erwägen. Die technischen Probleme bei der Einführung eines digitalen Euro scheinen nicht unüberwindbar zu sein. Ein Thema, das jedoch weniger Beachtung gefunden hat, ist die Nachfrage nach einem digitalen Euro. Der digitale Euro wird nur dann attraktiv sein, wenn er dem einzelnen Nutzer im Vergleich zu den derzeitigen Zahlungssystemen zusätzliche Vorteile bietet. Diese Vorteile können sich auf die Bequemlichkeit, die Erträge, die Kosten, die Transaktionsgeschwindigkeit, das Risiko und den Datenschutz beziehen. Der Beitrag kommt zu dem Schluss, dass in diesen Bereichen derzeit kaum nennenswerte Zusatznutzen erkennbar sind. Es muss also erst noch gezeigt werden, dass ein digitaler Euro tatsächlich den Wohlstand steigert. Auch aus regulatorischer Sicht ergeben sich einige Fragen, da die EZB zu einem direkten Konkurrenten von Geschäftsbanken und Zahlungsdienstleistern werden könnte.

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1 Introduction

Over the past few years, the European Central Bank (ECB) and many other central banks have started to contemplate the introduction of their currency in digital form. This is often seen as the response of central banks to the digitalization of the payment system and the entire economy. With the goal that everyone should have access to the central bank digital currency – abbreviated by CBDC and sometimes simply called „digital cash" – the ECB and other central banks are exploring how such a system can be implemented. It appears that most of the work has so far focused on the technological side of introducing and operating a central bank digital currency and relatively little has been studied about the demand for it. This paper looks at the background and implications of the introduction of the digital euro and examines the demand side as well as some issues from a regulatory perspective.

The rest of the paper is organized as follows. Section 2 examines the rationale behind the idea of a central bank digital currency. Section 3 looks at some of the ECB's specific considerations for the design of a digital euro. Section 4 briefly considers the implications of the introduction of the digital euro for the demand for cryptocurrencies. Section 5 examines potential benefits and the scope of the digital euro as a medium of exchange that could affect the level of demand for the euro. Section 5 looks at some empirical studies related to the introduction of a central bank digital currency. Section 6 highlights some possible implications for commercial banks and the money market. Section 8 addresses some issues from a regulatory perspective that have received little attention so far. Section 9 provides conclusions.

2 What motivates the ECB and other central banks to think about digital cash?

Technological developments have always had an impact on money and financial markets. This is currently also the case, as payment systems are going through innovative processes (Frenkel 2023). With the introduction of a digital central bank currency, central bank money would be available to non-banks not only in the form of physical cash (banknotes and coins), but also in a digital form.

Three developments may have prompted the ECB and other central banks to consider introducing their currency in digital form. First, the number and importance of cryptocurrencies have increased sharply over the past years. In mid-2023, the number of cryptocurrencies was approximately 10,000 with a market capitalization of €1.1 trillion, compared to the value of euro banknotes and coins in circulation of about €1.6 trillion (Statista 2023). Cryptocurrencies are mostly associated with Bitcoin and blockchain technology. The popularity of cryptocurrencies stems from several advantages associated with their technological design. These advantages are seen in the security of payments, their anonymity, and the decentralized processing, which means that the payment processes are not tied to a financial intermediary (Frenkel and Munoz, 2021). Proponents of cryptocurrencies emphasize that this creates acceptance and trust. Therefore, cryptocurrencies are often perceived as competitors to central bank money, and central banks may see central bank digital currency as a way to ward off the rise of cryptocurrencies, as, for example, Mellor (2021) points out for the Swedish central bank.

A second development that may have caused central banks to think about digital cash are innovative and customer-friendly payment systems that fintechs and large technology companies have developed and plan to use, in part, as their own private money for national and cross-border transac-

tions. Such platforms often aim to retain customers on their internet-based platforms. The growth of such payment platforms has increased significantly over the past 15 years, and they have gone global. Recent examples include Alipay (a mobile payment app that originates in China), GrabPay (a Singaporean payment app), and WhatsApp Pay (a unified payments interface – UPI – that allows users to connect several bank accounts in a single app and make real-time payments). These developments may involve the risk that Europe loses sovereignty in the payment system. In fact, the emergence of a multitude of such systems could lead to money fragmentation (Brunnermeier and Landau 2022). A policy objective for the ECB, as for other central banks, may therefore be to maintain and strengthen the importance of its currency and its sovereignty in the payments infrastructure. This could also become relevant if central banks outside the euro area grant Europeans access to their central bank digital cash.

A third development in the context of developing the idea of digital cash is related to the decline in the use of cash. More and more payments are now being processed via bank and credit cards. For cross-border retail payments in particular, the latter market is dominated by the two credit card companies Visa and Mastercard (ECB 2019). Khiaonarong and Humphrey (2019, 2022) examine the development of cash use and conclude that the demand for cash has slowly declined in major countries. It appears that the Covid-19 pandemic has accelerated this decline (Wisniewski et al. 2021, Kotkowski and Polasik 2021). This may have originally been related to concerns that cash carries a relatively high risk of virus transmission, but it could well be that these habits persist post-pandemic. In some countries, the use of digital payments is particularly high. For example, the Scandinavian countries and some regions of Southeast Asia (e. g., South Korea, Hong Kong, and Taiwan) are among the countries that are closest to a cashless society (Oban International 2023). Digital cash could be considered a further logical development of payment transactions with central bank money.

These developments raise important economic policy questions. For example, one might ask whether these developments could lead to a complete move away from cash and national currencies in physical form and whether this would eliminate the current structures of the monetary sector with its two-tier banking system or would at least lead to the emergence of a parallel payment system. It can be argued that greater digitization could reinforce these developments and would increase the importance of private means of payment. Such a development could lead to a reduction in the influence of central banks on the money market.

These changes have led the ECB and other central banks to think more fundamentally about changes in payment systems. In order to not only monitor the developments in these systems and leave the digital markets entirely to their own devices, but to maintain control over the payment system, the ECB, the Fed, the Bank of England, the Bank of Japan, and other central banks have been exploring how they can issue central bank money in digital form to a wider audience. So far, central bank digital money only exists in the form of deposits of commercial banks with the central banks. Some see the introduction and use of digital central bank money as the natural response to the wishes of individuals for more digitization in payment transactions, in which cash plays less and less of a role (Hanl and Michaelis 2019). If this wish is widespread, it is understandable that the ECB has an interest in developing a digital euro for individuals and companies outside the banking system.

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3 Design considerations of the ECB on the digital euro

According to the idea, the digital euro is a book claim on the ECB. In October 2021, the ECB started an investigation phase of the digital euro project. It expects the Governing Council of the ECB to decide in fall 2023 on whether to launch a project phase to design and test the digital euro (ECB 2023a). The digital euro is then to be introduced in 2026. In May 2023, the ECB published two reports on exercises it had conducted with the objective to get a better understanding of the feasibility of introducing a digital euro. These exercises were part of the work during the so-called investigation phase of the project towards a digital euro. Both studies deal with the technological side of digital cash and, hence, the supply side of a digital euro market. In one of the two reports, the ECB published the outcome of its „market research", which focused on the question of whether there is sufficient knowledge in the market to provide technical solutions for the digital euro. This research was conducted jointly with private service providers and covered several components required for the introduction of the digital euro. The ECB concludes „that there is a sufficiently large pool of European providers that are able to develop digital euro solutions" (ECB 2023b, p. 3). In a second report, the ECB gives details on its „prototyping exercise", which included the development of a settlement architecture („back-end prototype") and different user interfaces („front-end prototypes"). The report highlights that there is still considerable work to be done in the future and lists the areas in which additional work and prototyping activity are required (ECB 2023c). It can be expected that the ECB will refrain from using infrastructures based on distributed ledger technologies such as blockchain and instead use existing payment infrastructure. Nevertheless, the introduction of a digital euro will require significant changes in payment processing at the ECB. For example, the ECB's current clearing system processes a relatively low volume of relatively large payments daily, whereas the digital euro will lead to the clearing of a relatively high volume of mostly small payments (Williamson 2022).

It is by now ruled out that every end user of the digital euro will be able to open an account with the ECB. Instead, it is foreseen that the digital euro will be made available in the form of a digital wallet and account management via private companies. In its third report on the progress on the investigation phase, the ECB explains that access to the digital euro would be either through existing banking or payments apps of payment service providers or an app developed and provided by the Eurosystem (ECB 2023a). This implies that it would be possible to use the digital euro as a means of payment at any time.

One of the advantages of the digital euro is seen in the fact that the corresponding amounts – unlike account balances at commercial banks – are not liabilities of a commercial bank, but – like cash – liabilities of the ECB. Since it is a liability of the central bank, it is also not subject to the insolvency risk of a commercial bank. In this respect, the digital euro has the same issuer quality as cash but is more secure against theft.

Once the pilot phase for the digital euro begins, the details of the implementation will become clear. However, it has already been indicated that there will be an upper limit for the digital euro of €3,000 to €4,000 per individual user, which would mean a total volume of €1.0 to 1.5 trillion for a population of 340 million in the euro area and thus roughly comparable to cash in circulation (Panetta 2022). The project phase itself, but even more so the introduction and operation of the digital euro, are associated with high costs, both in terms of investment and the human capital required in all phases of project development and for the operation of the system.

In its studies on the digital euro, the ECB focused on technological issues related to the design of digital cash, but much less on the demand side. The question therefore arises as to whether the digital euro creates sufficient demand for it to be an adequate response to the developments that motivated the considerations described above on the introduction of the euro in digital form for a broader public? The following sections examine this issue in more detail.

4 The demand for a digital euro and the demand for cryptocurrencies

One development that has triggered the consideration of digital cash is the emergence and growth of cryptocurrencies. However, it is unlikely that the digital euro will develop into an alternative to Bitcoin or similarly constructed cryptocurrencies. This can be explained by considering the three functions of money, namely unit of account, medium of exchange, and store of value. Taking Bitcoin as an example, the strong price volatility has prevented Bitcoin from serving as a unit of account and a medium of exchange at a large scale. Stablecoins do not bring the problem of price volatility, but the failure to reach critical mass is more significant. In transactions where Bitcoin is used as a medium of exchange, anonymity often plays an essential role, which is particularly important for illegal transactions including tax evasion. The digital euro will not provide this anonymity. In fact, the digital euro will be less anonymous than cash, as it will not be possible to open a corresponding „digital wallet" completely anonymously. It should also be borne in mind that the argument of anonymity is generally associated with amounts that significantly exceed the upper limit of €3,000 to €4,000 per user discussed in connection with the digital euro.

If one considers the third function of money, namely as a store of value, Bitcoin and other cryptocurrencies can at best be associated with this function. In fact, Bitcoins like other cryptocurrencies are a highly speculative asset due to their price volatility. Since Bitcoin does not fulfill the functions of a unit of account and a medium of exchange, it can be argued anyway that it is not a currency but a crypto asset. In contrast, with the planned cap on digital euro holdings per user, the ECB wants to ensure that the digital euro is only used as a unit of account and as a medium of exchange, but not as a store of value. The ECB does not want savings to be shifted from the traditional banking sector to the digital euro. It has already taken a clear position here and emphasized that the digital euro can be designed with effective instruments so that it is not used as a form of investment (Panetta 2022).

Considering that the demand for Bitcoin and other cryptocurrencies is related to the store-of-value function of money and that the euro is not supposed to fulfill exactly this function, it seems very unlikely that the introduction of the digital euro will lead to a significant switch from Bitcoin to the digital euro (Frenkel 2023). In addition, one may argue that neither the ECB nor other central banks should be worried about cryptocurrencies at all. Since these assets serve as money only to a limited extent, they are unlikely to represent a serious risk to the stability of the monetary or financial system (Ali et al. 2014).

5 The demand for the digital euro as a medium of exchange

Can the digital euro be expected to replace payments via online banking, bank cards or credit cards? The use of the digital euro instead of other already existing payment systems would require additional benefits for individual users. The benefits could come in the form of

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- more convenience,
- higher returns,
- faster transactions,
- lower costs,
- less risk, or
- better data protection.

Of course, the overall demand for the digital euro will also depend on some scope considerations. The following sections examine the extent to which a digital euro may address these issues and provide additional benefits in these areas.

5.1 Convenience

With the digital euro, the ECB wants to create a payment system that is easy to understand and therefore easy to use (Panetta 2022). However, it should be noted that it is already possible to pay anywhere in Europe using existing payment systems such as online banking and bank or credit cards. Online banking takes a certain level of digital literacy, but this is due to the required security standards and some of such knowledge can also be required for the use of digital cash. Payments by bank cards or credit cards are already convenient, as they can be made without additional activities. This also applies to payments on platforms of technology companies.

The assessment of convenience may be different for payments to countries outside the euro area. For such payments, credit cards dominate payment for retail payments. The two major credit cards, Visa and Mastercard, are widely accepted internationally. Whether such acceptance will be the case with the digital euro is not yet clear. Therefore, cross-border payments are an important issue for retail payments. If the digital euro cannot be integrated in cross-border payments, it would not offer the same convenience as existing payment systems. A recent study of the BIS (2023) has examined this question. Another aspect of convenience is also the cross-currency functionalities that payment service providers already offer. Nothing specifically has been decided for the digital euro in this respect. So far, the ECB (2023a) has only expressed the intention to support this functionality.

One convenient function of the digital euro would be the ability to make direct payments from one person's wallet to another person's wallet. This would be equivalent to a cash payment between two people. However, the ECB intends to initially allow digital euro wallets only for euro area residents (ECB 2023a) so that payments between individuals are limited to euro area residents. It plans to make the digital euro also available to merchants and governments in the euro area, but both groups would be subject to zero-holding limits (ECB 2023a).

Another aspect of convenience is related to the applicability of the digital euro for making payments. The cap of €3,000 to €4,000 per individual user precludes the use of the digital euro for more expensive products that consumers may purchase. This may reduce the convenience for several users. On balance, it is not clear whether the digital euro offers additional convenience.

5.2 Returns

The ECB, just like any other central bank that will issue its currency in digital form, could pay an interest rate on the amounts in the wallet. Since commercial banks already have a digital euro in the form of the amounts in their accounts at the ECB, the amounts in the wallet could be treated in the

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same way. One could even argue that non-discrimination requires the same treatment. In this case, the interest rate of the deposit facility would also be applied to the digital currency holdings of individuals. If the interest rate is positive, then holding digital cash has a monetary advantage over holding physical cash. However, if the deposit facility interest rate is negative, it must also be applied to the amounts that an individual holds in his or her wallet. A positive interest rate applied to amounts held in the wallet is an advantage over cash, but not necessarily an advantage over checking accounts. If banks recognize that account holders associate a high utility with interest on balances held in wallets, commercial banks are likely to respond by paying interest on balances held in digital wallets. Banks could then pay the same interest rate as the central bank or even a higher interest rate on balances in checking accounts,

5.3 Speed of payments

Payments with the digital euro within the euro area are expected to be very fast, perhaps even instantaneous. It is also planned that payments with the digital euro will be possible directly between individual users and will therefore not have to go through a financial intermediary. The latter may indeed be advantageous for individual users. For other payments, existing payment systems are already relatively fast and can partly be used for instant payments. In addition, it is not clear whether and how fast payments can be made to recipients outside the euro area. This indicates that the speed of payments with a digital euro can be higher for some transactions, especially between individuals, but it is unclear for others.

5.4 Costs of payments

As far as the costs of the payment transactions are concerned, it is expected that no fees are charged for the use of the digital euro. By contrast, existing payment systems are usually not free of charge. In some cases, especially for payments via bank accounts, fees may be charged for individual transactions or for transactions exceeding a certain number of transactions. Fees are higher for payment transactions to countries outside the euro area. For such payment transactions, a digital euro could become an attractive alternative to credit cards. However, the fees for several global platforms have dropped significantly in recent years. At the same time, there is the question of who will bear the costs of the private providers that the ECB will include in the digital euro payment processes. The same question could be asked about the costs incurred by the digital euro at the ECB and the national central banks. It appears unlikely that these costs will be offset by lower cash maintenance costs. These considerations suggest that while the costs to the individual users of the digital euro may decrease, it is likely to be borne by the taxpayer.

5.5 Risk aspects

Regarding risks associated with payments and liquidity holdings, various types of risk are conceivable. One risk is that an amount is deducted in a cashless transaction and does not arrive in the account of the intended recipient. This risk already appears to be extremely low with existing payment systems, as they offer high security standards for both the payer and the payee.

Another risk aspect arises from the fact that the digital euro is a claim on the central bank, whereas bank deposits are a claim on an institution that may become insolvent. This might suggest that the risk of digital euro deposits is lower than that of bank deposits. However, the existing deposit insurance scheme protects a single user's deposits with any bank up to €100,000. In fact, a single

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user can have higher deposits covered by spreading them across multiple banks. Furthermore, the cap on digital euro deposits of €3,000 to €4,000 means that the digital euro offers no additional protection against bank insolvency. The risk of a crisis of the entire banking system could be considered an additional risk. If such a crisis occurs or is expected in the near future, the cap on digital euro deposits will make it impossible for individuals to switch from bank deposits to the secure digital euro on a significant scale. Of course, one may question whether the cap is credible in times of a banking crisis, as the demand for an increase in the cap could rise. However, this could exacerbate the banks' liquidity problems and thus make the crisis even worse.

Another risk aspect could be seen in the possession of cash, as counterfeit banknotes turn up from time to time and there is a possibility of theft. However, it is unclear whether the corresponding risk can be completely ruled out for the digital euro, as it is difficult to ascertain whether hackers have no chance of gaining possession of digital euros. If this cannot be completely ruled out, this risk must be compared with the risk of counterfeiting and theft.

5.6 Data protection

In terms of data protection or privacy, there may be different views on whether the digital euro offers additional benefits (Ahnert et al. 2022, Kantar 2022). On the one hand, payments through bank accounts are recorded in the books of banks and carry the risk of being used by unauthorized persons or institutions. This risk is reduced by shifting from payments via bank accounts to payments with a digital euro. On the other hand, digital cash will not be as anonymous as physical cash. Opening a digital wallet will require a certain level of legitimation, most likely equivalent to opening a bank account, and payments made with the digital cash are also recorded somewhere. Therefore, they also carry a certain privacy risk. The ECB aims for a high level of data protection for the digital euro. However, it is an open question whether individuals have full confidence in the central bank to protect their payment transaction data.

5.7 Scope of users and relative volumes

The ECB plans that merchants and governments in the euro area can participate in the digital euro payment system, but they would not be able to hold digital euro balances (ECB 2023a). This is implemented by immediately transforming incoming digital euro amounts into bank deposits and funding outgoing digital euro payments from bank accounts. If, at some point, are allowed to hold digital euro balances, this would only be of interest to them if the upper limit for the amount in the digital wallet is significantly higher than for private individuals.

Making the digital euro available to individuals in the „wider European Economic Area and selected third countries" (ECB 2023a) is not envisaged for the time being. However, it is also not ruled out that this would be part of a subsequent phase.

6 Empirical evidence

Studies on how large the demand for digital central bank money are rudimentary at best and much less frequent. For example, Li (2023) uses survey data for Canada on households' cash and deposit holdings as well as information on individuals' perception towards specific payment features to estimate how big the change from cash and deposits to central bank digital currency could be and

reports a range from 4–52 % of total liquid assets of households. However, the data were collected in a context where there was no reference to digital cash, which limits the conclusiveness of the study.

In general, in countries, where central bank digital currencies have been tested, the uptake has been very little (Lukonga 2023). Huynh et al. (2020) conduct a counterfactual experiment using a structural model of demand for payment instruments and find that – under plausible assumptions – the usage rate for all retail payments remains below ten percent.

The lack of further studies on the demand for digital cash is primarily due to the lack of data, as no major central bank has yet introduced digital central bank currency. However, only by knowing roughly how much demand there is for the digital euro can the impact of the digital euro be assessed.

7 The digital euro, commercial banks, and the money market

The introduction of a central bank digital currency such as the digital euro may have a significant impact on the business of commercial banks. The digital euro is expected to lead to a shift from deposits at commercial banks to deposits at the ECB. The extent will depend on the level of demand for digital euros. The ECB is expected to work closely with commercial banks during the introduction of the digital euro, as it did on the introduction of the euro. Nevertheless, to the extent that individual users shift their deposits from commercial banks to the digital euro wallet, commercial banks will have fewer lending opportunities with the same central bank money they receive from the ECB. Only in the extreme case where individual users exclusively replace cash with the digital euro would such an effect not occur. However, a reduction in the ability of commercial banks to lend would then contradict the ECB's stated intention to cooperate with private financial intermediaries and not to constrain their services and business opportunities (Panetta 2022). In a system where the primary source of central bank liquidity creation is central bank lending to commercial banks, the introduction of a central bank digital currency has a similar effect on commercial bank lending as an increase in physical cash holdings of non-banks. The money supply multiplier will become smaller. Such deposit disintermediation implies that commercial banks must have more access to ECB lending in order to sustain their own lending. The effect on commercial banks' ability to lend thus depends on how the ECB responds to a reduction in commercial bank deposits (Mancini-Griffoli et al. 2018). Conceivably, the ECB's lending to commercial banks could be increased. However, since most demand deposits at commercial banks are non-interest-bearing and central bank loans are costly, the refinancing of commercial banks may become more expensive. This would increase the interest rate for borrowing from commercial banks, which would affect the real sector of the economy.

The introduction of a central bank digital currency will have consequences for the structure of the money market. It will lead to a change in the velocity of money, and frequent shifts between bank deposits and the digital euro will increase the volatility of commercial banks' reserves. This will also affect the monetary transmission mechanism and will have an impact on monetary policy (Lukonga 2023). The possibility of the ECB applying an interest rate – positive or negative – to the amounts in the euro wallet has further implications for commercial banks and the money market. It seems that such macro-financial effects still need to be studied in more detail.

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8 Issues from a regulatory perspective

The introduction of a digital euro also raises regulatory policy questions. It seems that they have not received sufficient attention in the literature and by policymakers. One question is whether developments in digitalization really require the introduction of a currency in digital form. It appears that this has not been convincingly argued. The mere fact that it is possible to introduce central bank digital money for individual users may not be reason enough to actually do it. Does the reduction in the use of cash really limit the power of a central bank to such an extent that it can no longer achieve its objective?

A related issue is the cost-benefit analysis of the digital euro project. Is the demand that can be expected for the digital euro or that is considered by some more conceptual considerations large enough to justify the substantial costs of the system? The costs of developing and operating the system should not be underestimated. It requires significant hardware and software as well as skilled labor and services purchased from the private sector. Not only could the number of payment transactions be very high, but the instant settlement requires that the system be maintained around the clock every day.

If the introduction of a digital euro offers significant additional benefits to individual users, the demand for a digital euro can be significant. In this case, however, individual users would use the digital euro to make payments that they have previously made via their bank accounts. Given the maximum amounts individual users can keep in their digital euro wallet, many small payments would be made through the digital euro wallet, and the ECB would become a kind of superbank. This would put the ECB in direct competition with commercial banks, for example for payments, money transfers, perhaps even internationally. In terms of regulatory policy, this does not seem unproblematic.

Another question from a regulatory perspective is who bears the costs of the system. What specifically justifies passing on the costs of holding money and providing financial services to a group of individual users to taxpayers? One justification would be that the digital euro is a public good. Indeed, the security of payment transactions is to be ensured by the central banks. This is a public good that justifies regulatory intervention. However, since the digital euro replaces some services that commercial banks can provide to individual users in almost the same way, it may not be that obvious that the digital euro and its associated services are a public good.

Ultimately, the issues from a regulatory perspective require a welfare analysis. So far, there are hardly any studies on this topic. An exception is Williamson (2022) who develops a model for a central bank digital currency that includes a welfare analysis. He finds that a central bank digital currency can be welfare enhancing if there are incentives for a commercial bank to renege on its insurance promise in case the commercial bank defaults. However, if there is insurance for individuals for their claims to commercial banks and there are no incentives not to honor the insurance contracts, then there is no welfare gain from the introduction of a central bank digital currency.

A further question is what mechanism will be used if the maximum limit that individual users of the digital euro can hold in their wallets is to be changed. Should the ECB explicitly state which guidelines it will use to assess the appropriateness of the cap and how often it will be reviewed? It seems unlikely that the cap will not need to be changed over time, as inflation reduces the possibility

of using the maximum amount in the digital wallet for payments. The more the cap is raised relative to inflation, the more the digital euro can become a store of value, which means additional competition with commercial banks.

9 Conclusions

As with other central banks, the increasing digitalization of the economy provided the impetus also for the ECB to consider the introduction of the euro in digital form for a wide audience. In recent years, the use of cash has declined and innovations in digital payments have come from companies outside the traditional two-tier banking system. Along with the emergence of cryptocurrencies, this has raised concerns among central banks that their influence on the money market is waning. Against this backdrop, the ECB has already conducted intensive studies on the possibility of introducing the digital euro. The studies within the euro system have focused mainly on the technical side of the introduction of a digital euro. Although the problems examined do not seem unsurmountable, some questions remain unanswered so far.

At present, it is not possible to reliably assess whether there will be significant demand for the digital euro. The maximum amount for the envisaged planned digital wallet is low so that the digital euro is intended to only serve as a medium of exchange. The ECB deliberately does not want to design the digital euro as a store of value. The crucial question is what additional benefits the use of the digital euro will have compared to the current payment systems. The answer will depend on the characteristics of the digital euro. The digital euro will only be attractive if it offers clear additional benefits to individual users. These benefits may relate to convenience, returns, cost, transaction speed, risk, and data protection. The discussion in this paper suggests that the digital euro in its currently planned form does not offer significant additional benefits for individual users. The deposit insurance already in place and the simplicity and security of alternative payment systems play an important role in this result. However, if additional benefits do not become available, the demand for the digital euro could be very limited. Of course, it could be that individuals enjoy the greater variety of payment instruments that the introduction of a digital euro would entail (Ali et al. 2014).

The discussion in this paper also shows that there are still open issues from a regulatory perspective. Not only do the potential additional benefits of a digital euro for individual users need to be addressed, but also the question of what justifies the ECB becoming a direct competitor of commercial banks, which would be the case for money transfers, possibly even to countries outside the euro area. Given the substantial costs of operating the system of a digital euro, a cost-benefit analysis is also required. The goal would be to show whether the introduction of a digital euro is welfare-enhancing. In addition, the macro-financial implications and the implications for monetary policy need to be studied in more detail.

A final decision on the introduction of the digital euro has yet to be made. The next step towards a digital euro will be In October 2023, when the Governing Council is expected to decide on a preparation phase, in which the digital euro will be designed and tested. At this point, the details of the design of the digital will be determined. So far, there are only templates and the analysis in this paper is related to a likely scenario, but later decisions can deviate from this. Nevertheless, it seems unlikely that the fundamental decision to move forward with the project of a digital euro will be

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negative and that the idea of launching the digital euro will be discarded after so much work has already been invested in the project.

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