Can the Digital Euro be made attractive to all key stakeholders?

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Abstract This paper explores the challenges and opportunities related to the adoption of central bank digital currencies (CBDCs), with a particular focus on the Digital Euro. It critically examines the motivations behind the introduction of the Digital Euro, addressing the often unclear problems it is intended to solve. The paper emphasises the necessity of motivating key stakeholders, especially commercial banks, consumers and merchants, to support and use the Digital Euro. It argues that simply mandating adoption is insufficient for success; instead, intrinsic motivation and clear business cases for each stakeholder group are essential. The paper also highlights the potential risks and unintended consequences of the Digital Euro, particularly its impact on commercial banks and the broader economy. Additionally, the paper proposes that an offline CBDC, resembling a modern form of cash, might offer a viable path forward, providing benefits such as increased financial inclusion and enhanced privacy. Ultimately, the reader can expect to gain insights into the complexities of CBDC adoption, the strategic considerations for different stakeholders and the potential models for making the Digital Euro a success.

KEYWORDS: Central Bank Digital Currency (CBDC), Digital Euro (D€), payments ecosystem, stakeholder motivation, offline payments, finance innovation, digital finance policy, financial inclusion

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INTRODUCTION

The reader is assumed to be familiar with broad discussions around CBDC and the Digital Euro. Background on these may be read up elsewhere.[1–10]

Among the many CBDC-related papers, presentations, papers on technology,[11] specific aspects like privacy,[12,13] etc this paper focuses on two essential areas that seem very much underserved in the current discussion:

- What problem is CBDC/D€ trying to solve?
- How to motivate the key stakeholders (especially commercial banks, consumers and merchants) to support/use CBDC? (with a special focus on the Digital Euro of European Central Bank (ECB) since this is one of the world's leading initiatives in this area)

Although massive state investments are already taking place (eg over €1bn Tender for D€ providers[14]), it is essential to clarify the foregoing issues before going further and before the European Parliament passes the law and the ECB governing council makes its final go/no go decision on the realisation phase.[15]

WHAT PROBLEM IS CBDC/D€ TRYING TO SOLVE?

Amazingly, this area is still very woolly. ECB has stated 10 motivations why a Digital Euro is deemed necessary (see Figure 1); other members of the Eurosystem come up with yet more (eg Bundesbank board member suggesting that CBDC could be used for distributing child benefit payments); Bank for International Settlements (BIS) initially

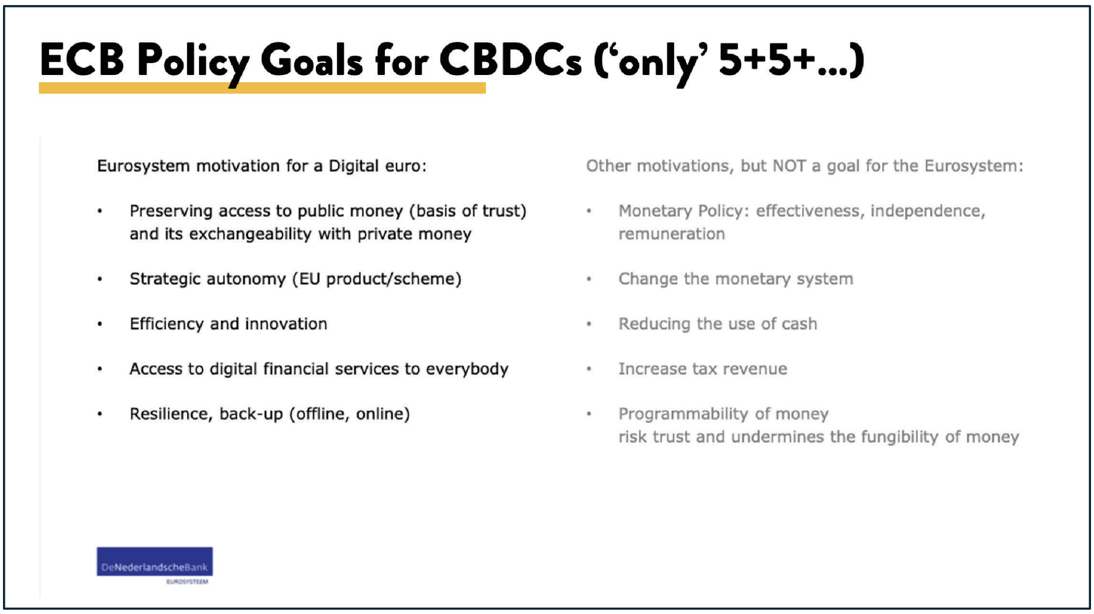

Figure 1 The ECB 'only' has five reasons for the D€, plus another 5 motivations, and a few more from individual Eurosystem members

Source: Spaanderman, J. (12th September, 2023) 'The Role of Public Money', De Nederlandsche Bank (Dutch National Bank), CBDC Conference Istanbul; Bundestag, At a recent government (Bundestag) hearing (19th February, 2024), available at https://www.bundestag.de/dokumente/textarchiv/2024/kw08-pa-finanzen-digitaler-euro-988934, the German Bundesbank was asked to state a plausible reason for the introduction of the Digital Euro. The response was: 'to allow the state to pay Child Support directly to citizens'. In the UK a novel application proposed for CBDC is to 'Pay for Vehicle Tax'. Paying child support, paying vehicle tax are, of course, entirely possible (and done) without CBDC.

mentioned 6 reasons,[16] globally around 40 reasons have now been stated (see Figure 2). This sounds like a solution looking for a problem.

Evidently, the Eurosystem is struggling to identify which problems are being solved with the Digital Euro. What is needed instead is a clear, narrow focus on what real problem CBDC is really going to solve. Trying to solve many things at once will probably mean that nothing is solved. In particular, we need to focus on something that is not already being well served by existing means.

One of the top reasons regularly (and rightly) stated in Europe is the goal of 'Strategic autonomy' (ie becoming more independent of US card schemes, PayPal, the GAFA). India's experience, however, shows how a government-driven, mandated, new payment scheme may actually *increase* dependence on Apple, Google, Facebook/Meta, Amazon Pay, Walmart's PhonePe, etc, as the following finding in India shows:

> *'UPI is dominated by Walmart's PhonePe and Google Pay with a combined market share of 83% — a de facto duopoly, leaving the national PayTM — which was supposed to assure sovereignty — far behind'.*[17,18]

Thus, even when the reason/problem to be solved is very valid and laudable, it is important to be alert to unintended consequences and ensure that the problem is really being solved and not exacerbated.

UPI was driven by real problems to be solved (enable access to the digital economy for the nonbanked, reduce the flow of dark

Policy goals being put forward globally for CBDCs

General goals
- More digitisation
- More innovation
- Follow the evolution of money

Policy goals
- Protect trust in the monetary system
- Increase sovereignty/reduce dependence on GAFA etc,
- Retain monetary anchor
- Geopolitical agenda
- New levers for monetary policy
- Prevent another Facebook Libra/Diem
- Break through lower zero bound on policy rates
- Trace spending/get better data for policy decisions
- Give legitimacy for banning crypto
- Fight tax evasion, money laundering, etc
- Pan-(European) payment solution
- Distribution of helicopter money
- Make life easier for consumers

Social goals
- More inclusion
- Better privacy
- Support sustainability/ESG
- Increase resilience/stability

Protect future role/relevance of central banks
- Replacement for declining cash
- Preserve seigniorage revenue
- Find new role for CB personnel, eg in cash departments

Cost reduction
- Increase general efficiency with digitsation
- Reduce cost of cash distribution
- Lower transaction costs
- Distribute child benefits to parents
- Better cross-border
- Reduce fragmentation
- Making tax effortless

New functionalities
- Time-limited money subsidy
- Coloured money
- Faciltate pay-per-use
- Micropayments
- Pay for vehicle tax
- Offline digital
- M2M integration

Figure 2 (Too) many reasons being put forward where CBDC is supposed to be the solution

Note: There may appear to be duplicates; indeed, some topics are closely related, but each has a distinct goal/is unique.

Source: Salmony, M. (2023) 'Summary Report on Central Banks at CBDC Conference Istanbul', https://fintechistanbul.org/en/2023/09/25/central-banks-rethinking-cbdc/ (accessed 4th October, 2024).

money) and has achieved these so successfully that it (together with the Brazilian PIX) has become a role model for central banks globally and a shining example of how private/public partnerships can work. The mark about sovereignty, however, was sadly missed.

As a second stage — if there does turn out to be a convincing reason for the massive investment, upheaval and state intervention — then attention should be focused on how to make CBDC work. For this there need to be incentives for *all* key market participants, not merely for the benefit of the central bank. Banks need to support, customers need to understand and merchants need to see an advantage — otherwise, the project will fail. If only one part of the ecosystem is not intrinsically motivated, this initiative cannot succeed.

Just making the D€ *mandatory* for banks (to distribute) and for merchants (to accept) will not ensure successful adoption — as demonstrated by countless examples in the past (eg PSD2) — the real need is *intrinsic motivation and business cases*.

VIEW OF THE CUSTOMER

Explaining to the man in the street why he should have a 'Deutsche Bank Euro' and also a 'Central Bank Euro' in his mobile banking app seems difficult enough (Figure 3).

Customers are already quite happy with the current state, can transfer money digitally/electronically instantly easily to/from any account in Europe, etc — there seems no immediate value-add for a consumer[19] (or business). Customers also get

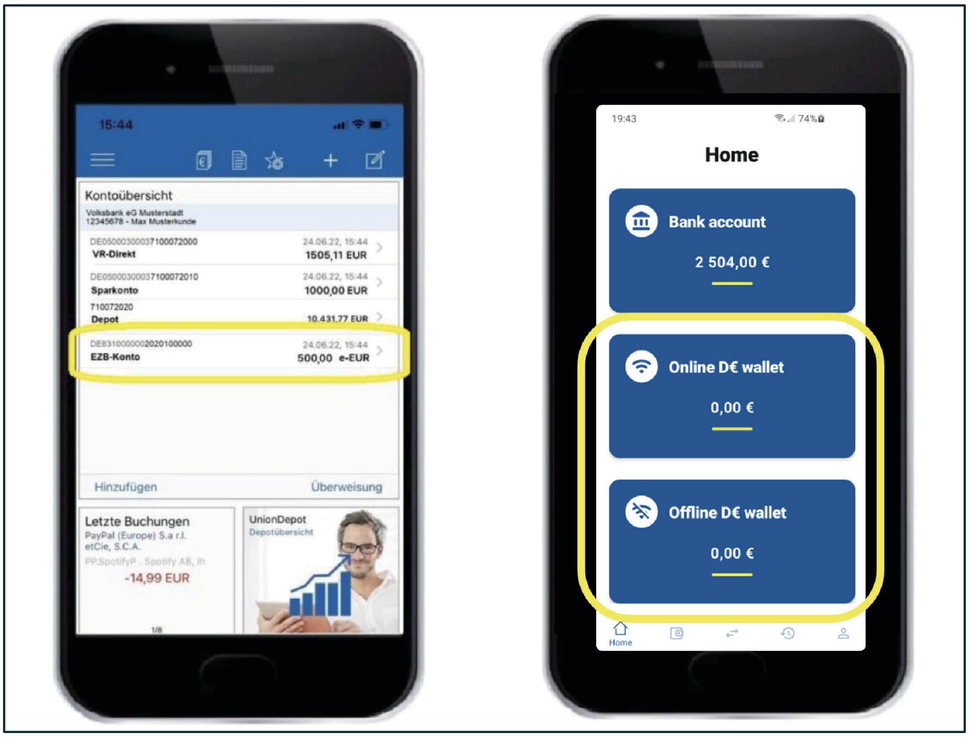

Figure 3 Sample mock-ups of future mobile banking apps — showing accounts in Euro, Digital Euro, Offline Digital Euro … will consumers understand this?!

Source: Krüger, N. (July 2023) 'Towards Acceptance Criteria for a Digital Euro', IU International University of Applied Sciences, available at https://www.researchgate.net/publication/372551011_Towards_Acceptance_Criteria_for_a_Digital_Euro/link/64be30858de7ed28babed0ea/download (accessed 4th October, 2024); The Payers (30th May, 2023) 'Worldline Delives a Front-End Prototype for the Digital Euro', available at https://thepaypers.com/cryptocurrencies/worldline-delivers-a-front-end-prototype-for-the-digital-euro--1262832 (accessed 4th October, 2024).

interest on the current money and have no limits on how much they can hold — unlike CBDC, which is limited[20] and will probably bear no interest.[21] So the Digital Euro actually seems to be an inferior proposition[22] to customers' current state.

Given the foregoing concerns, there is currently much speculation over whether the D€ will be a big flop, a success or a huge success. It is clear that adoption should ideally be in the 'Goldilocks Zone'[23]: not too little[24] (otherwise, all investments are for nothing, and central banks incur reputational risk), nor too big (to avoid crowding out private initiatives, to avoid bank runs) (see Table 1).

In order to gain some more clarity, the Eurosystem[25] and others[26] have recently launched a spate of consumer surveys to determine support. Asking the consumer, however, notoriously leads nowhere (see figure 4),[27] and asking a loaded question will not yield any answer that one can rely on.[28]

Despite the foregoing, there may, however, be a way to ensure that consumers still actually adopt the D€. This would be despite the fact that it has no value to them (indeed is confusing), is inferior to the existing euro. The solution may lie with the merchants. Merchants may be able to convince users to adopt this new means of paying/new currency if they find the fees lower,[31,32] the dependence on PayPal, Apple/Google Pay and US card schemes reduced, the irreversible finality valuable and because they can accept euros cross-border[33,34] more easily. Merchants will, in any case, most likely be forced by regulation to accept the D€ as legal tender,[35] so these advantages may permit them to recoup their investments. Merchants have been successful in steering consumers to payment methods they find attractive.[36]

VIEW OF BANKS

An even more difficult — and even more critical — question is how to convince the commercial retail banks to support CBDC.[37] They will need to spend billions[38,39] just to comply with the legal obligations, as they are being asked to do all the consumer-facing work (onboarding, KYC, hotline support, issue online and offline digital wallets, handle

Table 1: Many arguments on all sides on direction in which D€ consumer adoption might go — will we reach the golden middle?

Arguments for high adoption of D€		Counter arguments which would lead to low adoption of D€
- D€ is 100% **secure** (state backed)	'Goldilocks' Zone (ideal adoption)	- Deposits already secured to 100k€
- D€ is as **private** as possible (within the limits that it is online)		- In practices consumers care more about convenience than privacy (see global success of AdroidPay) - Consumers more likely to care about D€ yielding no interest - Privacy not cast in stone but may be changed with one stroke of the legislative pen ('slippery slope')
- D€ holdings will be **limited,** bence reducing risks of money laundering, terror financing and bank runs. Stability of the financial system and not funding criminals is in everybody's interests.		- Limit not cast in stone but may be increased/removed with one stroke of the legislative pen ('slippery slope') - Even with current 3000€ limit, the average European can keep/move *all* his monthly incomes in D€ — hence banks not motivated to support — hence banks will not encourage consumers to use D€
- D€ is an attractive modern **digital** form of cash		- People already have Euros digitally in their existing bank accounts, can move them digitally, can spend them digitally—no value-add seen - Indeed having several electronic Euro balances (in commercial bank account, D€, offline D€) will likely be very confusing - Concern in population about reduction/fear of abolishment/ access to cash (see Sweden: elderly, crime, disabled, ...) if only digital payments available
- D€ provides a **pan-European** means of payment		- Consumers scan already pay across the world (not only Europe) using Mastercard, Revolut, etc
- D€ promotes **innovation, competition, new solutions**		- Consumers are already overwhelmed by the number of (new) solution; payments is already one of the most innovative, competitive domains of the economy
- D€ increases **sovereignty,** versus foreign providers		- Sovereignty is not a concern for consumers (until Trump turns the off the tap, untill Apple hikes its fees)
Consequences of too high adoption/too much Success: disruption to banking system (state organised 'Bank run'), increased shift to state-run (vs private) infrastructure, scope creep of ECB mandate, ...	**Consequences of ideal adoption:** **Balanced roles between state and private sector, stability of financial system (no bank runs), advantages to all stakholders in the ecosystem, ...**	**Consequences of too low adoption/Failure/Flop:** **waste of investment, distraction of management time, broken promises, reduced trust in Eurosyste, ...**

Apple did not ask consumers if they wanted an iPod — one could not image what that was at the time. Asking the man in the street whether he wants a central bank digital currency will similarly not yield any useful result.

Organisations, however, often those desperate to try and find a justification for developing a 'solution' that they want to push anyway, do keep trying to ask the customer. Even the ECB, already once failed with their previous Digital Euro consumer survey on privacy.[29]

It is well understood in the literature[30] that what consumers *say* is not necessarily what they *do* (see privacy, ecology, voting surveys, etc). Hence, basing business decisions on the results of consumer surveys is as good as building a house on quicksand.

Finally, as is the case here, presenting a 'loaded' question will, of course, not yield any representative result. What you get out of consumer surveys very much depends on how you phrase the question.

The question posed by the Bundesbank/Eurosystem was the following:

'Assume there is credible news casting doubts on the stability of the banking sector. A banking crisis could emerge which could impact your bank. You may suddenly not be able to withdraw your money, access cash or make transfers.

Now imagine there is a Digital Euro as an alternative that can be redeemed in cash and used to make transfers.

Would you transfer your bank money to Digital Euro?'

(author's summary/translation)

Clearly, the response was very favourable.

If the question had been:

'Assume that the state wants to spend billions of your taxpayers' money on creating a new Euro that will compete with the existing Euro and with existing solutions (like your bankcard, like coming EPI) and that has the potential for state surveillance of all your previously private cash transactions.

Do you think this is a good idea?'

Then the response may have been a little different …

Figure 4 On the perils of asking consumers

disputes/refunds, … see Figure 5) and will probably not be remunerated for the effort, investment and risk.[40]

Instead, banks face serious commercial risks:

> 'CBDC launches involve meaningful risks for the existing banking and payments landscape, whether via payment cannibalisation, flight of commercial bank deposits to a 'risk-free' CBDC alternative or exceptional pressure on prices and costs of existing payment systems' … 'The combined effect on interest (through deposit substitution) and transaction fees (erosion of payments volumes) could quickly reach billions of Euros'.[41]

Fortunately for banks, merchants cannot hold Digital Euro balances; these are converted — upon receipt — directly into commercial bank money.[42] To quantify the effect of consumer holdings, however, it may be noted that the €3,000 limit for D€ currently being discussed would allow the

(i) Opening a digital euro account, onboarding and 'Know Your Customer'
(ii) Closing a digital euro account and offboarding end users
(iii) Payment instrument management (provision and maintenance)
(iv) Linking the digital euro account to a payment account
(v) User life cycle management processes
(vi) Funding (manual and automated)
(vii) Reverse waterfall
(viii) Defunding (manual and automated)
(ix) Waterfall
(x) Transaction initiation (one-off transactions)
(xi) Authentication
(xii) Payment confirmation/rejection notification
(xiii) Refunds
(xiv) Dispute/exception management

Figure 5 Essential services to be performed by banks — without remuneration

Source: Prof Dr Peter Bofinger, Chair for Monetary Policy and International Economics at the Department of Economics at the University of Würzburg (12th September, 2023) 'The Digital Euro: An Anchor of Stability or a Gigantic Flop?' at CBDC Conference, Istanbul.

average European to keep their net monthly salary *entirely* in the CBDC wallet.[43] Also, since the state-backed D€ is 100 per cent safe,[44] people may also move their *savings*[45] away from commercial bank deposits to CBDC. Thus CBDC may significantly reduce bank liquidity. The European Commission has published a most revealing report[46] on how the banks — especially smaller banks, the backbone of Europe's economy — will be impacted negatively through this effect (see Figure 6).

The foregoing is predicated on the assumption that there will be holding limits. Prominent figures,[47,48] however, argue 'the case for *unlimited* holdings of digital euros'. Since holding limits, even if implemented initially, are not set in stone but can be adjusted (or entirely removed) with one fell stroke of the legislative pen (see also Table 1), this slippery slope means potentially unlimited risks on banks' balance sheets and liquidity.

Reducing the banks' liquidity reduces their ability to lend, impacting their core business, a measure that they will not take lightly.[49] The consequences are 'banks might reduce cash, costs for lenders would increase, banks might reduce loans ("this latter effect would be the most detrimental to the real economy")' — as the EC report itself states. Thus, the initial proposition for banks is not good and the consequences for the economy may be dire (Figure 7).

Banks have not only a financial impact but also a strategic one. The financial impact may be manageable (eg German Savings Banks reported a profit in 2023 of €17bn, so they should be able to shoulder the necessary €0.2bn for CBDC), but the management capacity and IT resources are scarce and limited ('we will not be able to do anything else for 2–3 years').[50] This will severely inhibit other innovation/customer-facing developments — while GAFAs continue to evolve at high speed. Finally, the banks are also faced with duplicate investments/costs/management efforts for their own market-driven pan-European payment solution (EPI) and for the regulatory-driven pan-European[51] payment solution (Digital Euro).[52] Thus, this unhelpful confrontation of central bank and commercial bank policies will probably mean that both sides will lose.

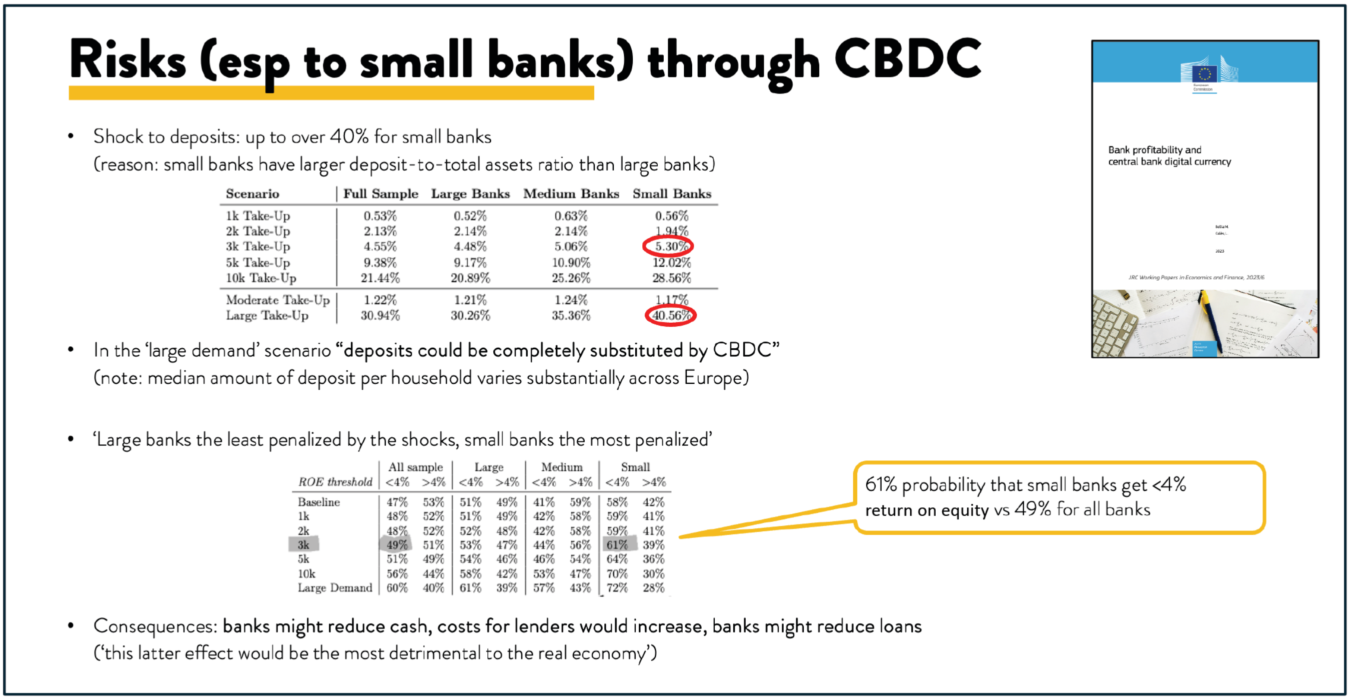

Figure 6 Shock to banks through D€ with particularly deleterious effects on small banks and the economy

Source: Linkedin, 'Post' 2024, https://www.linkedin.com/posts/activity-7151499739992080384-ZKlG; as warned in the context of 'A Simple Microeconomic Model for the Analysis of Vollgeld' by Profs. Bofinger and Haas, June 2018 https://www.econstor.eu/bitstream/10419/179674/1/1024071626.pdf, this 'will damage especially those banks, which are largely dependent on their credit business. These are mainly regional banks or cooperative banks like Raiffeisen bank. These small-scale banks have a stabilising influence on the economy and are vital for sustainable growth, as they lend predominantly to households and small and medium-sized enterprises. Germany avoided major asset bubbles as the banking sector consists mainly of these small banks'.

Hence, the central banks would be well advised not to adopt a hostile stance towards commercial banks[53] but instead to embrace a public/private partnership model[54] where all sides benefit. This is also called for in a recent paper by the European Parliament:

> '… banks today manage most retail payments and settle them on their deposit accounts; in the new situation, they would compete with the ECB (the D€ would be an alternative to a bank deposit) … This generates potentially adverse incentives and *warrants a well-designed compensation structure for the services provided by banks*. The ECB reports give no information on this.' (author's italics)[55]

Fortunately for banks, people may actually not hold onto much D€ at all. The wallet could be a 'pass-through' device (just topped up as needed on the fly[56] like a PayPal wallet[57] — with only a small amount remaining in the wallet once it has gone through transit) — in that case the liquidity reduction issue will go away. But the costs to the banks remain. Hence, there is a need to at least seriously look at revenue opportunities for commercial banks to balance the costs they will incur in providing and running the D€ infrastructure.

REVENUE OPPORTUNITIES FOR BANKS IN CBDC/D€

Here we present a model on potential transaction revenues from CBDC for banks,[58] based on current understanding of legislation.

Article 17 of the proposed Digital Euro Regulation[59] states that the potential fees charged by the Digital Euro intermediaries (that is to say, credit institutions, payment

	d€				Cash				Deposits			
	Q1 vs Q2		Q4 vs Q5		Q1 vs Q2		Q4 vs Q5		Q1 vs Q2		Q4 vs Q5	
	Mean	Median	Mean	Median	Diff.	% Diff	Diff	% Diff	Diff	% Diff	Diff	% Diff
All	9.37	0	19.27	10	-1.25	-4.16	-10.41	-13.94	-6.36	-12.36	-4.86	-23.35
Keen	21.1	20	28.12	20	-4.02	-13.51	-14.19	-19.14	-13.56	-26.75	-7.33	-28.22
Open	10.87	5	22.35	16	-1.63	-5.41	-11.96	-16.38	-7.22	-14.85	-5.73	-26.42
High Trust	12.28	5	25.18	20	-1.81	-7.76	-12.47	-19.7	-8.43	-16.97	-7.01	-27.68
Low Trust	4.58	0	10.4	0	0	3.26	-6.62	-8.37	-3.62	-7.85	-2.04	-22.78

Table 2: Projected unremunerated d€ holdings and withdrawal shares (based on Q2 and Q5) as well as changes in cash and deposit holdings after introduction of CBDC in Q2 and Q5, respectively. The different rows distinguish between all, keen, open, high trust and low trust respondent. The changes for deposits and cash are shown in percentage points and percent.

	Base CBDC $\mu_{cb} = 0.86$	No CBDC $\mu_{cb} = 0$	Keen CBDC $\mu_{CB} = 0.98$	CBDC Costs $\psi_{cb} = 0.2\%$
		Key moments		
Welfare W (CE)[a]	–	0.14	0.04	0.12
Run probability[b]	2.51	1.34	2.20	1.55

Table 4: Welfare, financial stability and economic outcomes of various policies

Figure 7 CBDC reduces welfare, increases probability of bank runs and can have massive negative impacts on bank deposits — is this how to motivate banks?

Source: Linkedin, 'Posts' 2024, available at https://www.linkedin.com/posts/activity-7200431881534812160-R8EU; https://lnkd.in/eU7nhdQb (accessed 4th October, 2024).

institutions and e-money institutions) may not exceed the lesser of (i) the fees charged by comparable means of payment (including debit card and instant payments) or (ii) the costs incurred in the distribution of the Digital Euro plus a margin. These fees would include two components: merchant service rates (equivalent to current MSR applied to digital means of payment) and inter-PSP (payment service provider) fees, which would replicate the current model that applies to interchange fees.

The expected low volume of the Digital Euro in its first year will mean a higher unit cost, so it is likely that the lowest of both ceilings will be that of comparable digital means of payment, leading to two alternative scenarios:

a. Keeping the same fee as with other existing payment methods: this will enable a higher margin for intermediaries, compensating investments
b. Reducing the fees, making the Digital Euro more appealing for merchants than other payment methods, and thus cannibalising revenues from intermediaries' issued payment methods (debit cards or instant payment mobile solutions)

The latter scenario will be very damaging for the banking industry since they have invested heavily in developing proprietary instant payment solutions at both entity and industry levels (eg Bizum in Spain, EPI in Europe), which could be easily cannibalised by a cheaper and more complete solution (including online and offline use cases for P2P and POS (Payment Terminal)) that merchants would foster.

On the positive side, it has been suggested that there are potential opportunities for banks to generate revenue from value-added services around D€, since this is explicitly permitted by the proposed legislation. It is hard to see, however, which, if any, of these so-called value-added services customers will really need and pay for (see Figure 8).

OFFLINE CBDC — THE ANSWER?

Some lack of clarity has been evidenced on what problem the Digital Euro may actually be solving along with some significant concerns in regard to how customers can be persuaded to use it and how a commercial model can be built that is attractive for banks to distribute it. An attractive and viable way forward, however, may actually be found in one particular sub-domain of the retail CBDC.

A clue to this valuable sub-domain can be found in 'Central-bank digital currencies: proceed with caution'[60] where it is noted that

- 'Token-based CBDC would compete with private providers of digital payments (such as international credit card companies, PayPal and Alipay)' *which is surely the aim of the ECB; whereas*
- account-based CBDCs 'would compete with traditional bank accounts', *which is surely not the remit of the ECB and should not be their goal.*

Thus, an examination of offline CBDCs, based on tokenised money, now needs to be undertaken.

The offline CBDC, eg a smartcard (more generally a Hardware Bearer Instrument HBI[61]) that can be topped up from one's bank account[62] with Digital Euros (up to a holding limit), is surely a truly modern form of cash. It thus conforms perfectly to the role of the central bank. Instead of handing over printed pieces of paper and milled pieces of metal, one taps one's card/phone against another person's and the money is transferred. Thus, old central bank money (notes and coins) can over time be moved to a modern digital form. Physical P2P and POS payments can be effected by tapping phones together, tapping a phone/D€-card on a POS or by exchanging value between smartcards using an intermediary device (see Figure 9).

	Users	Merchants
User Management	• Notification Service • Shared costs • Financial Management Tools • Virtual wallets • Insurance for online wallet • Insurance for own custody wallet	• Value-added information about transactions
Transaction Management	• M2M payments • P2P games • CBDCs exchange • Shared costs	• Delivery payments • Account division • Provision of POS terminals • Direct debits
Liquidity Management	• Funding to non-customers via ATM • Funding to non-customers via branch • Automatic funding	• Unanchoring management

Figure 8 Potential 'value-added' services for D€ to user groups — are these monetisable for banks?

Source: de Buruaga Azcargorta, M. S. (29th February, 2024) 'Fee models for the CBDCs: the Digital Euro', at Digital Euro Conference 2023, Frankfurt, available at https://bgwbpj.clicks.mlsend.com/tb/c/eyJ2Ijoie1wiYVwiOjc2NzE5MyxcImxcIjoxMjcxODQyMDA4MDY2OTYyOTgs XCJyXCI6MTI3MTg0MjA0NjgzMjgyMDcxfSIsInMiOiJlMjUyZmI4NmZiNDJiMWYxIn0 (accessed 4th October, 2024).

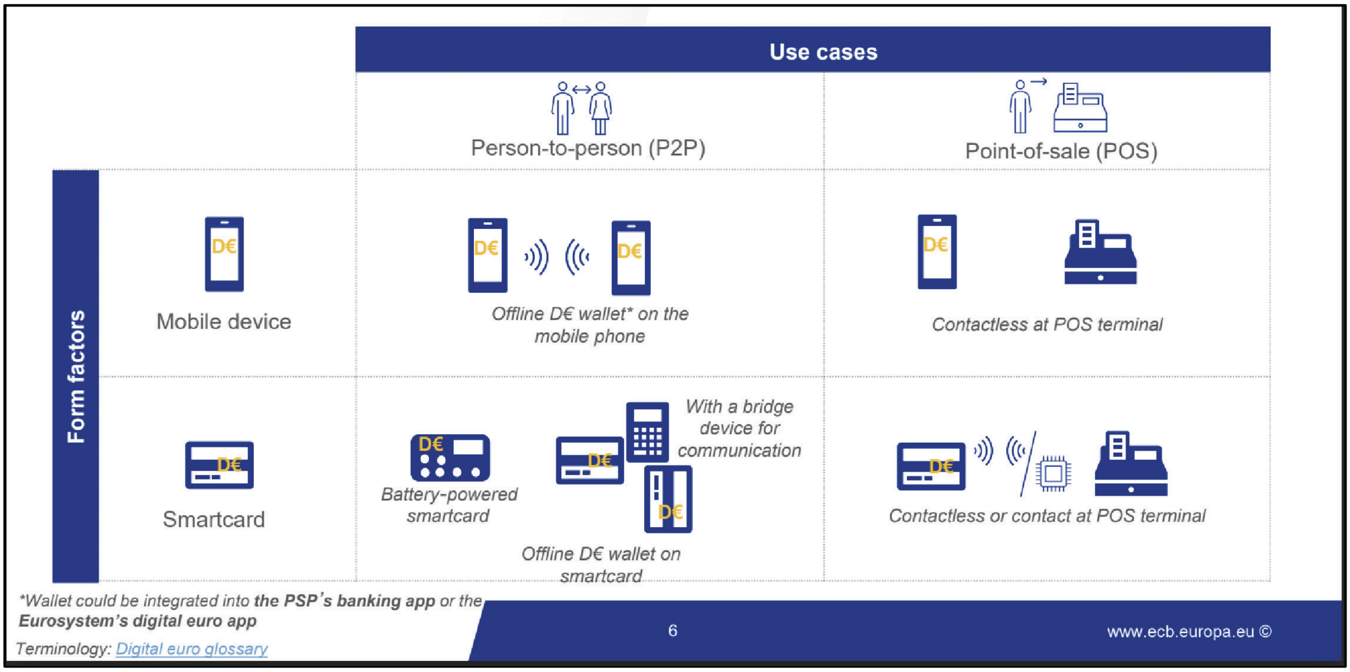

Figure 9 Offline Digital Euro use cases and scenarios

Source: ECB, 'Progress on the Preparation Phase of a Digital Euro', available at https://www.ecb.europa.eu/euro/digital_euro/progress/html/ecb.deprp202406.en.html (accessed 4th October, 2024).

Ideally, the transfer would be in a tokenised form (see Figure 10) where cryptograms, issued by the ECB, are moved between wallets without the need for bank accounts, clearing and settlement infrastructures, messaging systems, etc or even traditional payment infrastructures. These cryptograms (eg €1 tokens[63]) can be issued by the ECB,[64] just as they issue €1 coins today, and can freely be exchanged between people and shops. The ECB can revoke tokens, just as they take old banknotes and coins out of circulation if they wish to reduce the money supply.[65] This is a highly resilient solution (independent of electricity and wireless networks) and can support to increase inclusion (which is also important in Europe, where 13.5 million adults are still unbanked[66]). Finally, all transactions between people are as private as cash[67]:

> 'The offline functionality is innovative, ensuring a high degree of privacy: payments with the Digital Euro are made without an intermediary and without an internet connection.'[68]

In this world of tokenised transfer of money, the assets could

- Roam and redistribute themselves *free*ly (just as notes and coins redistribute themselves across an economy without anyone essentially controlling how much anyone has).[69]
- Or, if one wants to keep more control — which would be very advisable[70] for anti-money laundering/counter-terrorist financing/… reasons — one can impose technical *holding limits* (eg each person can never hold more than €3,000 in their smartcard).[71]

There is, however, a challenge in regard to how the limit per person can be managed across the multiple wallets (at multiple providers, using multiple form factors and repositories, such as phone and cards).

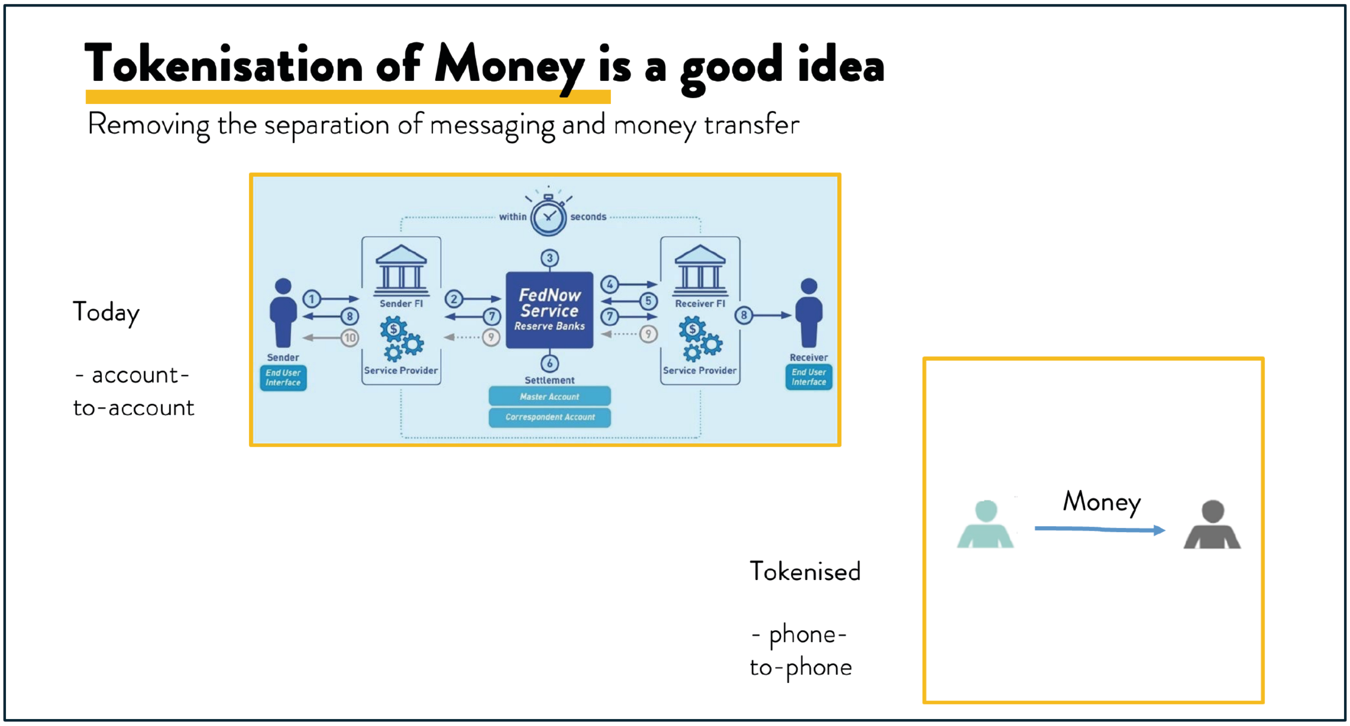

Figure 10 Modern form of money — moving value directly between people/device/companies/machines
Using tokens/cryptograms (but not necessarily DLT/Blockchain)

- Alternatively, one could keep track not only of holdings but also of all *transactions* using a suitable technology (distributed database, DLT, etc — whatever has the best scalability, performance, privacy, modifiability, …).

  This last option, however, does require the offline CBDC to connect online periodically to update/synchronise the records.[72]

The technologies to implement these options are eminently available,[73–75] and banks could find a role in all of these variants[76] as distributors of the modern form of cash. Indeed, banks and other parts of the payment system may find a positive business case in the use of the offline D€ at POS, thus assuring the support and motivation of the industry here.

In the context of Project Polaris,[77] 49 per cent of central banks consider offline payments with retail CBDC to be ‘vital’, while another 49 per cent deemed it to be ‘advantageous’ — ie all think this is a good idea, as also evidenced by the BIS Survey (Figure 11).

A concern that does still need to be addressed for the offline wallet scenario is that historically, almost all such pre-paid e-purses have failed globally. Geldkarte,[78] Proton, Mondex,[79] Avant,[80] Dinero Electrónico,[81] etc were all spectacular failures. Academics have studied and evidenced this phenomenon systematically.[82] The empirical evidence was thus against the offline D€. Technology, however, has since moved on,[83] and maybe the offline Digital Euro can join the ranks of major e-wallet successes like those of Starbucks,[84] Suica/Pasmo[85] in Japan, Octopus in Hong Kong or further Asian wallets like Alipay in China.[86]

Indeed, looking more internationally beyond Europe, the offline D€ could be a very attractive proposition for people in developing economies with unstable currencies. Instead of jumping from the frying pan into the fire (going from local/corrupt money to crypto,[87,88] losing all their

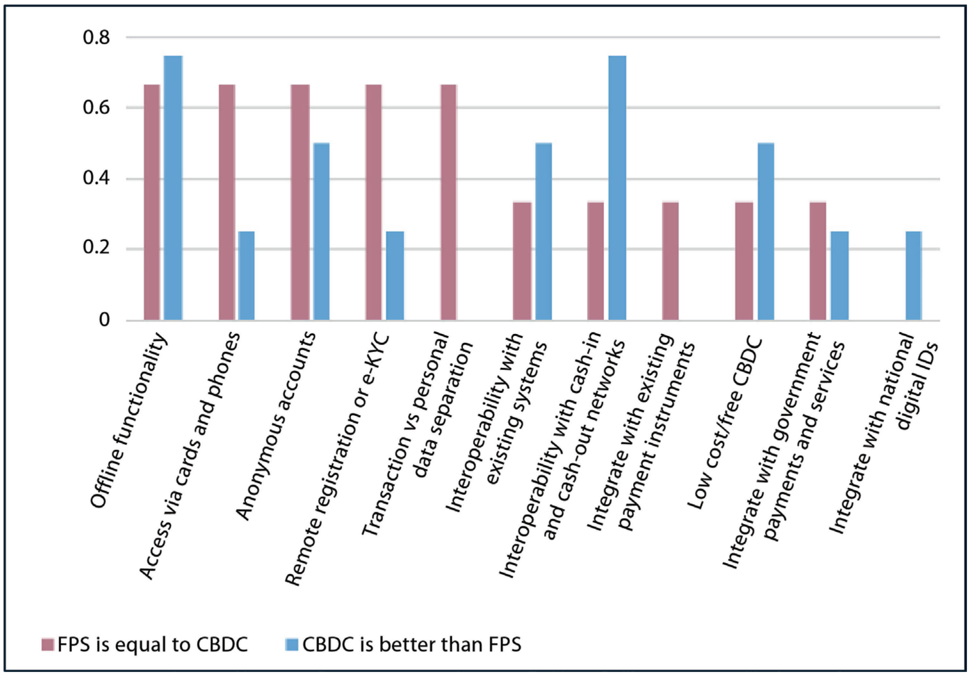

Figure 11 In the BIS Survey 'offline' is the leading category where CBDC is considered better than 'normal' faster (i.e. online) payments

Source: Chen, S. *et al*., (2023) BIS, 'Beyond Technology: Considerations for rCBDC adoption', *Journal of Payments Strategy & Systems*, Vol. 17, No. 4, pp. 408–21, available at https://www.ingentaconnect.com/contentone/hsp/jpss/2023/00000017/00000004/art00006 (accessed 4th October, 2024).

money), unbanked people from developing countries (see Figure 12) could use euros backed by the ECB. A CBDC card (or phone) could be tapped onto that of another family member or merchant — even in the depths of sub-Saharan Africa without electricity or internet. Although politically sensitive, this would promote the euro as an international currency and also has advantages for the local population there. China is already in the process of making its currency, the Renminbi, more dominant in developing countries[89,90] with quite some success[91,92] also owing to its Digital Yuan eCNY.[93] The USA has left the race for CBDC,[94] and thus Europe could offer a strategic alternative for the benefit of developing nations and for its own geopolitical agenda.

In summary, an offline Digital Euro

- Conforms with the ECB's role as a provider of cash — not establishing a state-driven competitor to emerging industry-driven multi-country payment solutions such as EPI, EuroPA,[95] EMPSA,[96] SPAA/giroAPI, EAPS 2.0[97] and SepaR2P.
- Enhances the sovereignty of the euro, also internationally.
- Ensures the maximum privacy (like cash) as an intrinsically offline means of payment.
- Provides the basis for a business case for banks, ensuring key stakeholders are motivated to distribute it (unlike the online CBDC, which negatively impacts banks and potentially the wider economy[98]).
- Increases financial inclusion.
- Takes the wind out of the sails of populist parties who scare the population about the abolition of cash[99] (by showing that cash is now actually being *reinforced* in a modern way).
- Is simple for the average consumer to use and understand (unlike the online CBDC, where consumers have a normal

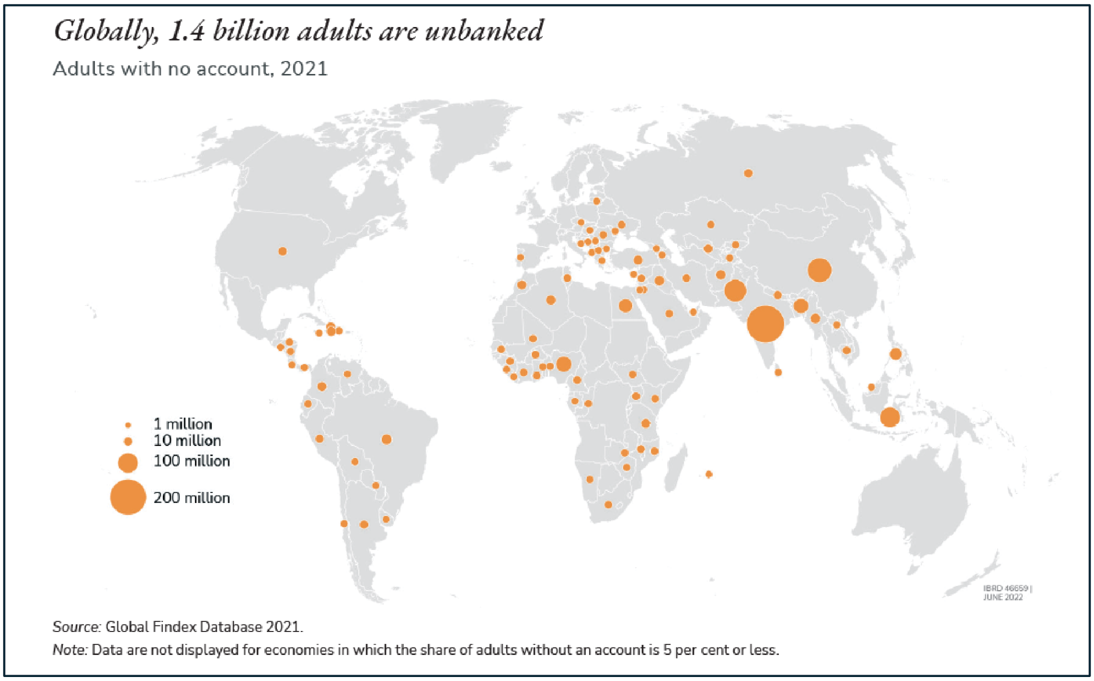

Figure 12 Over 1 billion unbanked people, especially in developing countries, could benefit from a modern form of cash: stable, private, with no need for electricity or internet — such as offline CBDC from Europe

Source: World Bank, 'The Global Findex Database 2021', available at https://www.worldbank.org/en/publication/globalfindex/Report (accessed 4th October, 2024).

euro in their mobile banking as well as a central bank euro, which is confusing and unnecessary).
- Paves the way for the wider introduction of modern tokenised money.

Thus, the offline CBDC may thus be the best and perhaps the only viable path to pursue.

SUMMARY

Politically, the Digital Euro is clearly 'doomed to success' since the ECB/Eurosystem will not stop (after the gigantic investments, promises and developments) until the D€ is a 'success' (however that may be measured). The D€ is, after all, a fundamentally *political* project to retain control of the monetary system. Maybe this is a good approach: there are several examples of agendas[100] that have been pushed by regulators, against much opposition, raising many concerns, which ultimately ended up being of benefit to all. The best strategy may be to accept the inevitable, make it work and see how each actor can profit the most from it. Resistance is futile.

But the game is not over yet. Some other geographies are having another think, notably:

- UK ('A solution in search of a problem'[101])
- US (which recently passed the 'CBDC anti-surveillance act', blocking a central bank digital currency[102] also after scathing remarks on CBDC by the Federal Reserve[103])
- Even voices in the EU, eg the European Parliament's paper 'Digital Euro: When in doubt, abstain',[104] raise significant concerns:

'Launching a Digital Euro would put the ECB in a new position: that of offering a new payment instrument in competition with banks and other PSPs. It is not clear that there is a market niche for a D€, nor that a D€ would have a good chance of establishing itself in today's highly diversified, competitive, innovative and fast-moving retail payment industry. … the ECB should continue its exploration, including a testing phase, but in the end not launch a D€ unless new elements emerge, strongly supporting such a decision. At the present time, the risks and imponderables of this enterprise are stronger than the arguments in favour of it.'

- early adopters like El Salvador[105] (which rejected CBDC after their disastrous foray into trying to make Bitcoin legal tender), Nigeria (whose eNaira, after a massive push for years is now only being used by 0.5 per cent of Nigerians[106] despite more than 50 per cent of the population already having fallen for crypto[107]), Eastern Caribbean Currency Union/Bahamas, India[108] and Jamaica all experienced very poor adoption, and 20 other countries are now inactive or have cancelled their CBDC engagements. Even China — despite its massive push of the eCNY — is not seeing the hoped-for adoption.[109,110]

These are all coming out against the mainstream hype towards CBDC[111] and now may be spending their central banks' time, money and resources more wisely, especially on making the *existing* fiat money system[112] better[113] rather than inventing a parallel/competing infrastructure.[114]

CONCLUSION

The subject of CBDC is extremely extensive and multi-dimensional, so here we were unable to touch on many aspects, such as the interesting dimensions of store-of-value/synthetic CBDC,[115] or wholesale CBDC (which may improve cross-border payments[116] — a nut that the industry, G20 and others have been trying to crack for decades) — which is garnering increased attention.[117] But in summary we can say that there are severe risks for retail CBDC, specifically the Digital Euro project. We have evidenced that there is currently no clear focus and that there is a very unhealthy competition between the state and the private sector, to the extent that failure is likely for both sides. We conclude that a narrow focus on solving a real problem, which is the evolution of physical cash, based on a private/public partnership model where all sides benefit is the best and maybe only viable path to pursue.

So the answer to this paper's title 'Can the Digital Euro be made attractive to all key stakeholders?' is clear: if the policy goals are defined in a realistic and focused manner, if a public-private partnership model is designed to provide benefits to all stakeholders, then, yes — CBDC, specifically the Digital Euro (maybe beginning with the offline version with the many clear advantages explored previously), can become yet another example where Europe leads the world in finance infrastructure, regulation and payments.[118]

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(32) Even if the fees are lower, however, — either because of the foregoing or simply because there are no scheme fees in the D€ — this does not necessarily mean that the system will result in the cheaper payment solution becoming dominant; see 'Gresham's law of payments', Address to the Australasian Institute of Banking and Finance Industry Forum, Sydney, 23rd March 2005, Reserve Bank of Australia Bulletin, April 2005, https://www.rba.gov.au/publications/bulletin/2005/apr/pdf/bu-0405-2.pdf (which shows that incentives to banks and customers can make them promote the most expensive means of payment).
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(36) See how, in the pre-PSD2 days, the Conrad merchant convinced even many of the — normally super privacy-sensitive — Germans to adopt 'Sofort' payment, where they share their private bank credentials across the internet because it was better for the merchant.
(37) Formally, we should be addressing all PSPs (ie including nonbank PSPs such as Wise, PPRO, Worldline), but we focus here on banks as being likely to carry the major burden and impacting the D€ success the most.
(38) The European Savings and Retail Banking Group (ESBG) estimates the costs to be '1–2 billion euro on the Eurosystem side and a similar total amount on the Member State's side … with a large part of the investment required on the acceptance acquiring side' in European Savings and Retail Banking Group (March 2023) 'A Digital Euro: What Does it Mean for Savings and Retail Banks?', available at https://www.wsbi-esbg.org/wp-content/uploads/2023/03/ESBG-paper-on-a-digital-euro-what-it-means-for-savings-and-retail-banks.pdf (accessed 18th November, 2024).
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(44) Although European bank balances — where people get interest — are already guaranteed up to €100,000. Thus, a bank run to CBDC with its

much lower limit, no interest and poorer protection (eg no chargeback) seems unlikely.

(45) Germans have ca €6,000 per capita on average according to https://www.statista.com/statistics/1221225/savings-per-capita-in-the-european-union-by-country/ thus even the wealthy Germans could move half their savings into CBDC. In times of crisis, with low interest rates, this may be an attractive proposition.

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(48) See also other prominent voices such as Cyril Monnet, Dirk Niepelt and Seraina Grünewald all arguing to introduce the D€ without limit

(49) As indicated by many prominent nonbank voices such as Grünewald, Monnet and Niepelt, saying that 'without a sound business model, there is no incentive for PSPs to support the (mandatory) issuance of the digital euro'.

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(51) Actually, the D€ is 'only' a pan-Euro solution — it excludes those 8 of the 27 (especially Nordic and Eastern) European countries that have retained their own currencies — thus, the D€ is not pan-European.

(52) In other areas where the EU aims to improve its sovereignty, the state subsidises that industry heavily (eg Agriculture (€387bn 2021–2027), Space (€15bn 2021–2027 for Galileo, etc), Quantum (€1bn 2018–2028), Chips (€43bn), Fusion (€6bn), Cloud (€7.5bn), AI, Batteries, … not to mention Defence, Security, etc). In payments, by contrast, the state sets up a competing initiative — thus effectively giving *negative* subsidy to industry efforts (like EPI) that aim to increase European autonomy. The state politically clearly cannot subsidise banks (as they do farmers) but support for the service providers, the merchants, the scheme would surely be appropriate for such an important strategic topic as payments.

(53) See, for example, quotes from (Nocciola and Zamora-Pérez, ref 24 above): 'A widely available CBDC would serve as a close — or, in the case of an interest-bearing CBDC, near-perfect — substitute for commercial bank money', 'evidence … suggests there is substantial demand for CBDC, with that demand likely to lead to substitution away from other forms of money … especially out of bank deposits', 'Eine Disintermediation führt dazu, dass ein Bankensystem, das anfällig für Runs ist, schrumpft. Dies bringt positive Wohlfahrtseffekte mit sich' (ie reducing share of banking system in the economy would increase welfare for citizens) could be considered rather confrontational.

(54) Ozcan, P. and Gurses, K. (2019) 'Collaborative Market Making: The Critical Role of Dyadic and Multipartner Alliances in the Formation of New Markets', The Oxford Handbook of Entrepreneurship and Collaboration, available at https://scholar.google.com/citations?view_op=view_citation&hl=en&user=b-tTbT8AAAAJ&citation_for_view=b-tTbT8AAAAJ:_FxGoFyzp5QC (accessed 4th October, 2024).

(55) Angeloni, I. (April 2023) 'Digital Euro: When in Doubt, Abstain (but be prepared)', Economic Governance and EMU Scrutiny Unit (EGOV), Directorate-General for Internal Policies, available at https://www.europarl.europa.eu/RegData/etudes/IDAN/2023/741507/IPOL_IDA(2023)741507_EN.pdf (accessed 4th October, 2024).

(56) Maybe using automated (reverse) waterfall mechanisms for funding/defunding.

(57) Sadly, PayPal does not disclose how much money is transferred through PayPal in Europe and how much float is held in European PayPal wallets. We estimate, however, that only a small fraction of the value of consumer's payments stays in the wallet — most is topped up on the fly from a bank account/card.

(58) de Buruaga Azcargorta, M. S. (29th February, 2024) 'Fee models for the CBDCs: the Digital Euro', at Digital Euro Conference 2023, Frankfurt, available at https://bgwbpj.clicks.mlsend.com/tb/c/eyJ2Ijoie1wiYVwiOjc2NzE5MyxcImxcIjoxMjcxODQyMDA4MDY2OTYyOTgsXCJyXCI6MTI3MTg0MjA0NjgzMjgyMDcxfSIsInMiOiJlMjUyZmI4NmZiNDJiMWYxIn0 (accessed 4th October, 2024).

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(60) Prof. Bofinger (29th October, 2019) available at https://www.socialeurope.eu/central-bank-digital-currencies-proceed-with-caution (accessed 4th October, 2024).

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sufficiently secure' under certain excellent important takeaways.
(62) But caution is advised when topping up CBDC wallets with cash owing to fraud concerns. Nevertheless, some, eg the Bank of England are saying that they want to assure 'the interoperability with existing systems', which would imply funding of CBDC with cash …
(63) Or even tokens to the value of fractions of Euro, thus at last enabling micropayments — a subject that the industry has so far not been able to realise effectively.
(64) The central-bank-backed tokens could also be issued by highly regulated private entities under the Reserve-Backed Token (RBT) model https://www.ingentaconnect.com/content/hsp/jpss/2024/00000018/00000002/art00004. This seems, however, to add more risks and complexities with little advantage.
(65) Replacing old notes and coins if they are worn out through use or if their security features are no longer up to date will, of course, no longer be necessary in the digital world.
(66) World Savings and Retail Banking Institute (2021) 'ESBG Analysis of the Global Findex Database 2021, Recently Released by the World Bank', available at https://www.wsbi-esbg.org/number-of-unbanked-adult-eu-citizens-more-than-halved-in-the-last-four-years/ (accessed 4th October, 2024).
(67) Since the *online* CBDC will be embedded/managed in/initiated by phones (Apple iPhone, Google Android), accepted at merchant terminals, passed through commercial bank accounts and service providers, the customer data of each payment will be shared with numerous parties beyond the ECB. Thus, ECB cannot ensure privacy and would not be credible to try asserting this. The *offline* CBDC, by contrast, can pass directly from wallet to wallet without intermediaries — and thus has maximal privacy by design.
(68) Mallekoote, P. (June 2024) 'Digital Euro Preparations Gain Momentum', *CBPN Central Bank Payments News*, Vol. 7, No. 6, pp. 15–19, available at https://cbpn.currencyresearch.com/blog/2024/06/27/digital-euro-preparations-gain-momentum (accessed 4th October, 2024).
(69) Of course this closed system must be extremely secure (eg using SE/TEE, not HCE) since any compromise of an entirely offline system would be disastrous. Apple has recently been forced to allow third-party access to the iPhone's SE secure environment for use of NFC https://www.apple.com/newsroom/2024/08/developers-can-soon-offer-in-app-nfc-transactions-using-the-secure-element/, however, should this still prove technically/commercially/geographically infeasible, secure elements in phones are already widely available using eSIMs https://www.linkedin.com/posts/lars-hupel_cbdc-can-gain-further-adoption-with-esim-activity-7224730639990759424-2fBi (accessed 4th October, 2024).
(70) Drug dealers would very much welcome passing compact D€ offline cards holding €1m to each other instead of sending lorry loads of cash across borders.
(71) Apple, ref 69 above.
(72) See discussion about 'intermittent offline' vs 'extended offline' in Minwalla, C. *et al*., Central Bank of Canada (February 2023), available at https://www.bankofcanada.ca/2023/02/staff-analytical-note-2023-2/ (accessed 4th October, 2024).
(73) Finextra (4th July, 2024) 'G+D Unveils Offline Payments Tech', available at https://www.finextra.com/newsarticle/44414/gd-unveils-offline-payments-tech (accessed 4th October, 2024).
(74) Worldline (16th September, 2002) 'Worldline Selected by ECB for Joint Prototyping of User Interfaces for the Offline P2P Digital Euro', available at https://worldline.com/en/home/top-navigation/media-relations/press-release/worldline-selected-by-ecb-for-joint-prototyping-of-user-interfaces-for-a-digital-euro (accessed 4th October, 2024).
(75) Schwarz, M. and NTT Data (3rd September, 2023) 'The Digital Euro in the Digital Age: Can We Really Digitise Cash?', *Journal of Payments Strategy & Systems*, Vol. 17, No. 4, pp. 398–-407, available at https://www.ingentaconnect.com/contentone/hsp/jpss/2023/00000017/00000004/art00005 (accessed 4th October, 2024).
(76) Citibank, Examples are: 'The Regulated Internet of Value', available at https://www.citibank.com/tts/sa/insights/articles/article191.html; 'The Regulated Liability Network' https://regulatedliabilitynetwork.org/ and also commercial opportunities eg with CBDC ATMs (just as cash ATMs) can be explored for banks.
(77) BIS (11th May, 2023) 'Project Polaris: Handbook for Offline Payments with CBDC', https://www.bis.org/publ/othp64.htm (accessed 4th October, 2024).
(78) Spiegel (20th January, 2000), 'Von den Käufern verschmäht', The German pre-paid card 'Geldkarte' was introduced in 1996 and closed in 2024, never having achieved any significant adoption (0.1%) despite huge investments in cards, terminals, communication over many years, available at https://www.spiegel.de/netzwelt/tech/geldkarte-von-den-kaeufern-verschmaeht-a-60536.html (accessed 4th October, 2024).
(79) McEvoy, N. (13th July, 2021) 'Mondex Memories and CBDC', The 1990s Mondex scheme: the Mondex purse, on a smartcard, carried up to five currencies, against reserves at central banks, https://chyp.com/2021/07/13/mondex-memories-and-cbdc/ (accessed 4th October, 2024).
(80) Grym, A. (August 2020) 'Lessons Learned From the World's First CBDC', Bank of Finland, available at https://www.econstor.eu/bitstream/10419/224448/1/1733131086.pdf (accessed 4th October, 2024).
(81) Chen, S. *et al*., (2023) BIS, 'Beyond Technology: Considerations for rCBDC adoption', *Journal of Payments Strategy & Systems*, Vol. 17, No. 4, pp. 408–21, available at https://www.ingentaconnect.com/

contentone/hsp/jpss/2023/00000017/00000004/art00006 (accessed 4th October, 2024).

(82) Leo Van Hove's multiple publications on the subject eg 'Electronic Purses: (which) Way to Go?', *First Monday*, Vol. 5, No. 7, July 2000, available at https://firstmonday.org/ojs/index.php/fm/article/view/770/679 saying 'initial expectations about consumer uptake and retailer acceptance of e-purses were unrealistic … the initial euphoria has faded away … Today, things look even bleaker'.

(83) Kantar, S. (March 2023) 'Study on Digital Wallet Features', available at https://www.ecb.europa.eu/euro/digital_euro/timeline/profuse/shared/pdf/ecb.dedocs220330_report.en.pdf which conducted focus group sessions with 'general population, tech-savvy, underbanked, and merchants' to assess each of their affinities to modern digital wallets. Most noted, however, that situations for offline use cases are rather limited and so thought they would rarely use this option.

(84) Starbucks e-wallets held ca $1.5bn in 2021 — which means they held more assets than 85 per cent of US banks, available at https://fieconsult.com/starbucks-a-bank-that-sells-coffee-the-epitome-of-digital-wallets-strategy/ (accessed 19th August, 2022) — however, these are, of course, closed wallets, not open to all merchants.

(85) These remain successful proprietary systems, unlike the Oyster card in UK which moved to an open system based on EMV (Europay Visa Mastercard) standards and thus also allows use of normal contactless bank cards.

(86) With more than a billion active users, available at https://docs.stripe.com/payments/alipay.

(87) The Guardian (23th January, 2024) 'HyperVerse Crypto Scheme Targeted Developing Countries Before Collapse Left Some Investors "suicidal"', available at https://www.theguardian.com/technology/2024/jan/24/hyperverse-crypto-scheme-targeted-developing-countries-before-collapse-left-some-investors-suicidal (accessed 4th October, 2024).

(88) The Conversation (11th September, 2022), 'One Year on, El Salvador's Bitcoin Experiment Has Proven a Spectacular Failure', available at https://theconversation.com/one-year-on-el-salvadors-bitcoin-experiment-has-proven-a-spectacular-failure-190229 (accessed 4th October, 2024).

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(91) China Global Television Network CGTN (17th August, 2018) 'The Renminbi Is Becoming Increasingly Popular in Africa', available at https://news.cgtn.com/news/3d3d514e3455544e79457a6333566d54/index.html

(92) Mukeredzi, T. (August 2014) 'Chinese Yuan Penetrates African Markets — Could It Be the Next Global Reserve Currency?', UN Africa Renewal, available at https://www.un.org/africarenewal/magazine/august-2014/chinese-yuan-penetrates-african-markets (accessed 4th October, 2024).

(93) Saldivar, F. (17th December, 2021) 'Africa and the Digital Yuan: Helping China Break U.S. Hegemony Over the Global Financial Order', Afronomics Law, available at https://www.afronomicslaw.org/category/analysis/africa-and-digital-yuan-helping-china-break-us-hegemony-over-global-financial stating that the proportion of RMB settlement across the continent rose from 5 per cent on 2015 to 12 per cent in 2018.

(94) Manoylov, M. K. and Wynn, S. (23rd May, 2024) 'US House of Representatives Pass Republican-led anti-CBDC Bill Along Partisan Lines', The Block, https://www.theblock.co/post/296361/us-house-of-representatives-pass-republican-led-anti-cbdc-bill-along-partisan-lines (accessed 4th October, 2024).

(95) The Paypers (8th April, 2024), 'Mobile Payment: Southern Europe Moves towards Interoperability', SIBS (Portugal), Bancomat (Italy), Bizum (Spain) Interoperability Initiative, available at https://thepaypers.com/expert-opinion/mobile-payment-southern-europe-moves-towards-interoperability--1267582 (accessed 4th October, 2024).

(96) European Mobile Payment Systems Association, 'Enabling Seamless Mobile Payment Across Europe', Blik (Poland), Swish (Sweden), Twint (Switzerland), Vipps (Nordics), Bancomat (Italy), etc Interoperability Initiative, available at https://empsa.org/ — now also with Alipay (China) https://www.linkedin.com/feed/update/urn:li:activity:7217414616639782912/ (accessed 4th October, 2024).

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(99) Bundesbank (11th July, 2024) 'Der digitale Euro: Podiumsdiskussion mit Joachim Nagel und Peter Bofinger', see panel with Prof. Bofinger and Bundesbank, available at https://www.bundesbank.de/de/aufgaben/themen/der-digitale-euro-podiumsdiskussion-mit-joachim-nagel-und-peter-bofinger-935492 (accessed 4th October, 2024).

(100) In the payments domain: SEPA (Single Euro Payments Area), Instant, etc … in other domains: car safety belts, food labelling, etc … were all initially much resisted by the relevant industries before they were later embraced for the benefit of all, including/especially the industries themselves.

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(103) G Dowd Law (17th October, 2023) 'US Fed Governor Bowman: CBDC Benefits Remain Unclear, Could Pose Significant Risks', available at https://gdowd.law/2023/10/us-fed-governor-bowman-cbdc-benefits-remain-unclear-could-pose-significant-risks/ (accessed 4th October, 2024).
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(105) The Conversation, ref 88 above.
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(107) Ree, J. (2023) 'Nigeria's eNaira, One Year After', IMF Working Paper No. 2023/104, available at https://www.imf.org/en/Publications/WP/Issues/2023/05/16/Nigerias-eNaira-One-Year-After-533487 (accessed 4th October, 2024).
(108) Reuters, ref 18 above.
(109) MIT Technology Review (3rd August, 2023) 'What's Next for China's Digital Currency?' says 'Almost three years later it seems the government is still struggling to find compelling applications for it, and adoption has been minimal', available at https://www.technologyreview.com/2023/08/03/1077181/whats-next-for-chinas-digital-currency/ (accessed 4th October, 2024).
(110) South China Morning Post (4th March, 2023) 'China's Ambitious e-CNY Plan Faces a Giant Hurdle', available at https://www.scmp.com/tech/policy/article/3212245/chinas-ambitious-e-cny-plan-faces-one-giant-hurdle-winning-over-1-billion-consumers-home (accessed 4th October, 2024).
(111) Atlantic Council, 'Central Bank Digital Currency Tracker', Over 130 countries are currently exploring CBDC, most of them in the 'research' phase, available at https://www.atlanticcouncil.org/cbdctracker/ (accessed 4th October, 2024).
(112) Better to leverage Europe's true assets: SCTinst (ie instant payment between all accounts), IBAN (standard addressability of all accounts), APIs (standard access by third parties to all payment accounts to enable FinTech innovation), EUID (for standard private & public attribute verification, onboarding, authentication), etc — an infrastructure that most other countries, including the US, can only dream of — by adding standard QR, pan-European card, pan-European wallet, etc. This would address the remaining failings, for example that the EU is the only major economic region in the world not to have a unified POS system.
(113) Salmony, M. (March, 2023) 'Do We Need Another Dollar, Euro, Pound or Yuan? How to Create the Right Ecosystem for a Successful Central Bank Digital Currency' in special edition on 'Next Steps for Digital Currencies' of the *Journal of Payments Strategy & Systems*, Henry Stewart Publications.
(114) McLaughlin, T. 'Tokenizing Commercial Bank & E-Money', Banct Whitepaper, 'Fiat 2.0 — Cryptopia or Fiatland', available at https://www.citigroup.com/tts/insights/articles/article25.html (accessed 4th October, 2024).
(115) Prof. Bofinger, ref 60 above.
(116) Salmony, M. (25th October, 2023) 'CBDC: The silver bullet for cross-border payments?' in Trade Finance Global, available at https://www.tradefinanceglobal.com/posts/cbdc-the-silver-bullet-for-cross-border-payments/ (accessed 4th October, 2024).
(117) 'The banks are now shifting focus to wholesale', 'likelihood that central banks will issue a CBDC within the next six years is now generally greater for wholesale than for retail CBDC' according to BIS, available at https://www.finextra.com/newsarticle/44327/wholesale-not-retail-cbdcs-more-likely-to-be-issued-in-near-term---bis (19th June, 2024) report 'Wholesale, not retail, CBDCs more likely to be issued in near-term'.
(118) Europe has a long history of leading the world on global infrastructures and regulation: from GSM for mobile in the 1980s to GDPR (General Data Protection Regulation) for privacy, first to regulate Open Banking, … all becoming global standards. More recently, Europe is leading the world in pervasive, instant, fully addressable payments (see above note 112) for all its 750 million inhabitants and has now defined and rolled out a new world-leading identity infrastructure to become the next global phenomenon.