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CBDC as an element of the fight against financial exclusion on the example of Nigeria

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Abstract

The article examines the potential of central bank digital currency (CBDC) as a policy tool to reduce financial exclusion, with particular reference to Nigeria's eNaira project. The study investigates whether implementing a CBDC can facilitate access to financial services and contribute to improving inclusion levels, especially in regions affected by persistent economic and technological disparities. Nigeria serves as a representative case due to its pioneering role among developing economies in introducing a national digital currency aimed at enhancing financial inclusion. The methodological framework is based on a critical literature review supported by both quantitative and qualitative evidence. The literature search covered 2018–2025 and included databases and sources such as Google Scholar, World Bank publications, central bank repositories, and peer-reviewed academic journals. The inclusion criteria encompassed studies addressing CBDC implementation, financial inclusion indicators, and digital infrastructure in Nigeria. The findings suggest that while CBDCs can enhance accessibility to financial services, their effectiveness depends on factors such as digital literacy, infrastructure quality, and public trust in digital financial systems. The case of the eNaira highlights both the opportunities and limitations of CBDC deployment in developing countries, offering valuable implications for policy design and financial innovation strategies.

Keywords

- CBDC
- eNaira
- financial exclusion
- Industry 4.0

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Introduction

New technologies are becoming more and more present in our lives. Lack of access to them, can hinder a country's economic development, as well as exacerbate social inequality and financial exclusion. Cellary (2019) points to the great importance of information in the modern economy and defines Economy 4.0 as including Industry 4.0 with collaborative smart factories, environments from many sectors such as energy, transport, healthcare and agriculture. An indispensable part of the modern economy is also the financial sector, which also needs to adapt technologically to the realities of Economy 4.0, and to find solutions to contemporary problems such as the financial exclusion of a significant number of people around the world. This is a serious problem, as this de facto phenomenon makes the daily lives of the financially excluded much more difficult, but also limits the potential profits of banks and financial sector companies due to the lack of deposits and revenues from the services offered to them. Therefore, the authors, through this article, will try to answer the following question: can a central bank digital currency (CBDC) be a solution to the problem of financial exclusion, especially in developing countries. As Warchlewska (2022, pp. 7–10) notes, the development of financial technology creates opportunities for facilitated and universal access to banking services. On the other hand, it may contribute to the technological and financial exclusion of groups that are less familiar with new technologies, such as the elderly, the poorly educated or people with disabilities[3]. The response of some central banks whose countries are facing the problem of financial exclusion is the implementation of CBDCs. These have been introduced by central banks in, among others: Nigeria, Jamaica and the Bahamas. It is currently being piloted in many countries, such as Russia, the People's Republic of China (PRC) India, Iran, Australia (Denecker et al., 2023).

The purpose of the central bank is, among other things, to fight inflation (maintaining stable prices), to reduce the risk of financial crisis (Kiedrowska & Marszałek, 2003). However, increasingly, there growing discussion about new tasks for central banks, which so far have not been part of the traditional central bank responsibilities. As Kliber (2022) notes, the goals of central banks are changing and evolving. The author points out that there are ongoing discussions about a different approach of the central bank to its policy (taking climate change into account), as well as about the use of CBDC to support climate policy.

In the context of the dynamic development of the banking sector and new technologies, the central bank can effectively combat financial exclusion. However, in the authors' opinion, CBDC may not be an appropriate tool for financial inclusion in areas characterised by low development of mobile communication technolo-

[3] The issue of financial education that may contribute to financial inclusion of people with disabilities is analysed by, for example, Banaś (2024).

gies, underdeveloped economies and low levels of education. An illustrative example is Nigeria – a country where limited access to banking service and mobile internet (Ozili, 2023; Statista, 2022) would suggest significant challenges for digital financial inclusion through CBDC. Nevertheless, the Central Bank of Nigeria decided to launch a central bank digital currency despite these adverse conditions. In this article, we present statistical data on the socio-economic and technological environment in Nigeria and examine how these factors interact with CBDC adoption and the prospects for financial inclusion.

This study aims to evaluate the role of CBDC as a tool in reducing financial exclusion, with a specific focus on Nigeria. We assess whether the introduction of eNaira has led to measurable improvements in financial accessibility and inclusion. In academic discussions, CBDC is considered as an example of technology which is increasingly used as a tool for financial inclusion (Auer et al., 2020; Inder, 2024; Tan, 2024). The first part of this article outlines what the phenomenon of financial exclusion is. CBDC is then defined, and the characteristics and potential applications in the context of the financial inclusion process are demonstrated. This is followed by a discussion of the implications and reasons for the introduction of CBDC in Nigeria, and the opportunities it presents. The study area, its specifics and its key economic and social features are also described. The discussion concludes with an analysis of the findings and their implications for financial inclusion.

The methodological approach in this article is based on a case study of Nigeria, supplemented with a selective literature review. Instead of a systematic literature review, the study focuses on sources directly relevant to financial exclusion and the implementation of eNaira. Comparative analysis centres on changes in financial inclusion before and after the launch of eNaira, alongside evaluation of technological and infrastructural conditions that influence CBDC adoption in a developing country. Data sources include reports from the World Bank, Central Bank of Nigeria and EFInA (Enhancement of Financial Innovation and Access), which provide reliable measures of Nigeria's financial exclusion. The analysis compares financial inclusion rates before and after the introduction of eNaira – 45% in 2021 (launch year) and 52% in 2023 – while total financial inclusion (formal and informal channels) reached 74% (Demirgüç-Kunt et al., 2022; EFInA, 2023).

1. Financial exclusion – defining the concept

The issue of financial exclusion is directly linked to functioning in society and its economic consequences. It is possible to consider it on many levels and as an effect or cause of other types of exclusion, e.g. social exclusion (Warchlewska, 2020) or digital exclusion (Banaś, 2024).

The term financial exclusion was first defined by Leyshon and Thrift (1995) as processes that serve to limit access to the financial system for specific social groups. They also pointed out that it mainly affects people with limited income. In subsequent years, the perception of the problem has evolved to take into account changing circumstances. An example of an attempt at a new definition is presented in the 2008 EC report on financial exclusion (Leyshon & Thrift, 1995, p. 10). There, more attention was paid to the general population, and the focus was on problems in accessing or using financial services and the resulting impediments to the individual's functioning in society. Szopa and Szopa (2011), returning to the first definition of the concept, again pay more attention to the limitation of financial resources preventing the use of any services.

Due to the wide-ranging phenomenon and the lack of an unambiguous definition of this issue, new attempts to standardise the understanding of financial exclusion are still emerging. In reviewing the literature, it is important to point out that both the definition and assumptions relating to financial exclusion have evolved over time and continue to do so. These changes can be observed in Table 1, which presents selected definitions. For this reason, it currently seems impossible to adopt a single, irrefutable definition that addresses all aspects of such a complex problem. For the purposes of this article, the authors rely on the definition proposed by Warchlewska (2022), as financial exclusion was mainly considered to be an example of the lack of access, or impeded access, of the population to banking services in the broadest sense, particularly electronic and internet banking, which play an increasingly important role in modern society.

Table 1. Selected definitions of the term "Financial Exclusion"

Definition	Author and year of publication
Financial exclusion is the processes that serve to restrict access to the financial system for specific social groups. It most often affects groups with limited income.	Leyshon & Thrift, 1995
A process in which citizens experience problems in accessing and/or using financial products and services in the mainstream market that are appropriate to their needs and enable them to lead a normal life in society.	European Commission, 2008
Financial exclusion refers to the state of limitation or lack of financial resources available to the subjects, which does not allow them to make effective use of financial services, banking, insurance, business advice, legal services or even health, education, culture, prevents the activity of investing in the stock market, in investment funds or having a bank account.	Szopa & Szopa, 2011
The totality of difficulties faced by financial services actors in the sphere of their consumption, production and social cohesion is defined as financial exclusion.	Warchlewska, 2022

Source: own elaboration.

2. The dimension of financial exclusion

A broad look at this phenomenon allows us to see the complexity and heterogeneity of this problem. By treating financial exclusion as, on the one hand, a difficulty in accessing services and, on the other hand, as an inability to use the services and products offered, we can conclude that this problem is the result of the consequences of exclusion not only in this, but also in other areas (Warchlewska, 2022, pp. 18–19).

Problems of accessibility to financial products can have two substrates: demand and supply. The former is mainly the result of self-exclusion caused by the public's reluctance or distrust of the banking sector and, to a lesser extent, due to a lack of need for banking services (Solarz & Swacha-Lech, 2011). The supply-side substrate refers to the banking sector providing services, and we can decompose it into direct and indirect factors. The former consists in the accessibility not so much of the services but of the banking facilities themselves. This is a particularly significant problem in societies where there is a preponderance of older people, who are usually more reluctant to bank electronically (Mei, 2024; Msweli & Mawela, 2020; "You can't bank…", 2023). Direct factors consist of a bank denying a customer access to certain services, where the decision to do so is made on the basis of risk, customer profile and bank policy (Czarnecka, 2018).

Access to financial services is a fundamental prerequisite for effective financial inclusion and the widespread adoption of digital payment solutions. The physical presence of branches and payment service outlets remains important, especially for vulnerable groups and individuals less able to access or use digital channels. Monitoring trends in the availability of these physical points helps illustrate the challenges, as well as the progress, in adapting traditional banking infrastructure to the evolving financial landscape.

Physical financial infrastructure remains deeply important for financial inclusion strategies in developing economies. While advanced economies have reduced the number of bank outlets in favour of digital channels, developing economies like Nigeria still rely on physical branches and agents to reach excluded populations. Studies show that limited digital penetration and concentrated banking networks in urban areas create barriers, especially in rural Nigeria. The eNaira's distribution model relies on both central and commercial bank infrastructure – which remains insufficiently developed outside large cities (Central Bank of Nigeria, 2021; Demirgüç-Kunt et al., 2022).

According to the 2011–2021 data for the world, we can observe an average increase in the percentage of the population with accounts in financial institutions or their mobile equivalents of around 2.5% per year. The increase from 50.6% to 76.2% in account ownership among the global population over the age of 15 clear-

ly indicates a significant reduction in financial self-exclusion. More adults having access to an account – whether at a bank or through a mobile money provider – directly translates to increased opportunities for using financial services, saving securely, accessing credit and participating in the digital economy. This suggests that fewer people are left outside the formal financial system, and barriers such as lack of documentation, high costs or distance are being more widely overcome. It should be noted that in 2021, as many as 74% of these people have accounts with financial institutions. In contrast, only 10% have a mobile version (Demirgüç-Kunt et al., 2022, p. 2).

One can see a huge disparity in the use of mobile and traditional services. It is possible that this is a result of mobile services not being sufficiently disseminated to the general population. Also, the large proportion of people who prefer traditional solutions and do not intend to use mobile solutions as long as the ones they use are still operational may have a significant impact on this distribution.

3. CBDC – definition of the concept

The central bank digital currency (CBDC) concept was launched by the European Banking Authority in 2013. Due to the fact that it is a new form of money, work is ongoing all the time to implement the concept effectively for public use, and in some regions it is already being implemented. In May 2023, the digital currency was fully introduced by 11 countries (Atlantic Council, n.d.). These are mainly less developed countries, with the three largest being the Bahamas, Jamaica and Nigeria. However, it should be noted that research and pilot implementations of

Table 2. Selected CBDC definitions

Definition	Author and year of publication
A digital form of fiat money that is issued and regulated by a country's monetary authority.	European Parliament, 2019
A new form of money, issued in digital form by the central bank, to be used as legal tender.	Griffoli, 2018
A liability of the central bank, expressed in the prevailing unit of account, which serves as a medium of exchange and a means of holding value.	BIS, 2018
A liability denominated in an existing unit of account that serves as both a medium of exchange and a store of value and has no physical form.	Iwańczuk-Kaliska, 2018

Source: own elaboration.

CBDC are also underway in more developed economies, including China and India, where authorities treat the digital currency as a tool for upgrading payment infrastructure, digital innovation and – in certain cases – financial inclusion (Turrin, 2022). During the existence of the concept, researchers have repeatedly attempted to come up with the best possible definition (Table 2).

It can be argued that this is a new form of publicly available central bank money. It represents an innovation for entities that, in most functioning monetary systems, do not have access to reserves in accounts held by the central bank (BIS, 2018). At the same time, Iwańczuk-Kaliska (2018) points out that the initiation of CBDC research by banks has been triggered, among other things, by the growing importance and market value of cryptocurrencies, which, due to their lack of connection to any central bank, can create a kind of threat to the currently existing financial system.

4. CBDC – conception and possibilities

The CBDC is thus the digital equivalent of a country's currency, and the start of the conceptual work, as already mentioned, was due, among other things, to the empowerment of cryptocurrencies. Some models for implementing this instrument are currently being considered. Bech and Garrat (2017) proposed three main models for the implementation of CBDCs for public use:

- a model based on central bank accounts,
- a model based on token issuance for retail payments,
- a model based on token issuance for high-value payments.

The first model assumes universal acceptance of CBDCs and that the payer and the payee have accounts at the central bank. Payments would be initiated by users via terminals, apps or on a website, and then processed in real time by a closed system administered by the central bank (this would be done in a similar way to how payments are settled in terms of a single bank). Users' CBDC accounts would be credited by transfer from a payment account at a commercial bank. There would also be the possibility of reversing this process to settle debts with entities without a CBDC account. The incredible advantage of this model would be the ability to make payments without internet access. However, it should not be overlooked that these payments would have a certain amount or quantity limit, thus guaranteeing relative security (Bindseil, 2020; BIS, 2023). Should this model be introduced, the central bank would gain another instrument in conducting a more effective monetary policy, and the accounts themselves could earn interest directly at the central bank (Bindseil, 2020; Kiff et al., 2020). In addition, if the

underlying architecture of the solution (API) were made available, third parties would be able to expand the range of services and capabilities in the implementation of CBDC as a monetary measure (Auer & Böhme, 2020). In this case, the central bank would be limited to account management and monetary policy, and all additional functionality and payment solutions developed would be provided by others (Auer & Böhme, 2020; BIS, 2023).

The model for retail payments reduces the role of the central bank to the issuer of CBDC tokens as digital representatives of value. It would be the entity responsible for setting and implementing the standard and for keeping a record of the volume of token issuance (it could delegate these competences to another entity under its supervision). Issuance would be made by accepting funds deposited with the central bank and assigning the appropriate number of tokens to the holder's account. These, in turn, could be stored in a digital wallet (offline or online, accessible, for example, via apps). Payments would be made via an appropriate interface having access to the digital wallet and would be settled in real time. Authentication of transactions would take place using a private and public key, and funds would be transferred from the payer's account directly to the recipient's account stored in the decentralised register. On the other hand, commercial banks become the distributors following this assumption (NBP, 2021). It should also be noted that it would be possible to use tokens as an alternative to cash. This would be done using a local recording of the CBDC on a data carrier, for example: an app, a SIM card in a phone or some kind of payment card. Payments would be made via an adapted terminal or application of the payee. The settlement of payments within the specified security limits would not need to communicate with the system (they would be possible offline) and the funds would be transcribed from the payer's carrier to the payee's carrier. Such a solution would enable the issuing of virtually anonymous digital money operating on the same principles as current cash. Losing or becoming a victim of theft of the token carrier would be tantamount to losing access to the funds stored there without the possibility of recovering them. In the model described, the National Bank of Poland (NBP) states that it does not envisage any interest on the tokens and that data collection will be limited to the amount of CBDC issued as well as transactions made with it.

The last model assumes the implementation of CBDCs for high-value payments, international settlements or securities settlement. Additionally, what is also under consideration is the use of this model for cross-border payments. The main demands are:

- achieving a shorter time to credit the payee's account (in the case of securities, also assigning the corresponding ownership rights to the payer),
- reducing the costs associated with the maintenance and administration of the system.

The process of issuing CBDC tokens would be virtually identical to the previous model. Namely, in exchange for funds deposited in an account at the central bank by commercial banks, the latter would grant tokens and register them in the system. In view of the well-developed Real-Time Gross Settlement (RTGS) interbank settlement system, this model would not be applicable, as the potential benefits of implementing this solution would be marginal or non-existent. The implementation of this solution would only be beneficial for older, less efficient versions of RTGS systems, or as an alternative to National Electronic Funds Transfer (NEFT) systems, where there is a delay of approximately two hours in the execution of transactions. However, the model would find application in payment settlement and securities market transactions, where there would be a significant improvement in the time to settle payments and to recognise the instrument purchased (linked to immediate execution of the order). In the long term, it is also estimated that transaction and system costs would be reduced and the payment method itself would not change (NBP, 2021).

Just as Kliber (2022) points out, the CBDC implementation models presented for use will force central banks to make decisions. Introducing a model for high-value payments will be tantamount to introducing a new monetary order, shattering the current one put in place after Bretton Woods (Twarowska, 2014), and cutting individual customers out of the system, with potentially adverse consequences for both banks and consumers.

Dyson and Hodgson (2016) believe that CBDCs can counter financial exclusion by bringing into the financial system individuals and communities that it may not be profitable for conventional commercial banks to serve. This may be because, for example, the cost of acquiring such a customer is too high and the revenue generated from serving them is low. The central bank transcends one of its traditional functions of a so-called 'bank of banks' and takes on the role of a commercial bank, which is atypical for central banks. In sectors where, for various reasons, commercial banks are unwilling or unable to offer their services to potential customers. As an example of such a country, Dyson and Hodgson (2016) cite, among others, Ecuador, where citizens have the right to open an account with the country's central bank. It is also worth noting that it will only be possible to counter financial exclusion if digital exclusion does not occur or is reduced.

5. Nigeria – pioneer of CBDC implementation

Nigeria became a global pioneer by launching its own central bank digital currency, the eNaira, in October 2021. The introduction of the eNaira was motivated

by the need to promote financial inclusion, modernise the country's payment system, reduce costs and increase transparency in financial transactions. However, as Statista (2022) shows, in 2022, only 37.34% of Nigeria's population had mobile internet access (Figure 1), a critical requirement for using the eNaira wallet application. This illustrates both the ambitions and the significant practical limitations associated with deploying a CBDC in an environment with relatively low digital penetration.

According to Ozili's (2023) research, the states with the highest interest in the eNaira project were Yobe, Jigawa, Adamawa and Gombe (with the exception of Jigawa state, these are the states with GDP per capita below the median). Recent evidence demonstrates the persistence of elevated banking costs (Adeyinka et al., 2023). This shows that the Central Bank of Nigeria has not reached all states with potentially the highest proportion of financially excluded people. As Itah and Emmanuel's (2014) study shows, the margins of Nigerian commercial banks are relatively high compared to Western banks. Recent evidence demonstrates the persistence of elevated banking costs. In 2024, the five largest Nigerian banks (Zenith Bank, Access Bank, GTB, UBA and FCMB) generated net fees and commissions totalling approximately ₦1.2 trillion ($748.2 million), representing an 82% increase from 2023 (Orjiude-Ndibe, 2025). Electronic banking charges alone accounted for $147.3 million in 2024, up from $78.2 million in 2023, underscoring the substantial commission structure within Nigerian banks (Orjiude-Ndibe, 2025). Additionally, as of 2024, Nigerian banks charge account maintenance fees ranging

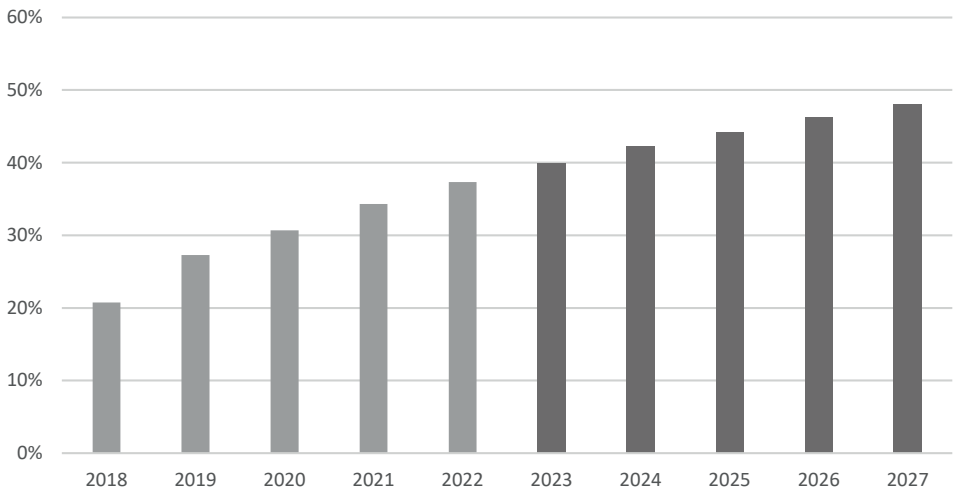

Figure 1. Percentage of mobile internet users in Nigeria

Note: grey – real data, dark grey – projected data.

Source: own elaboration based on data from: (Statista, 2022).

from ₦1 per mille of customer-induced debit transactions to fixed monthly fees of up to ₦2,500 for premium accounts, with card issuance and replacement fees reaching ₦1,075 per transaction (Stanbic IBTC Bank, 2024). Such cost structures cause many Nigerians to opt out of banking services, with the indigent, the most vulnerable to financial exclusion, being most affected.

To assess eNaira's impact on financial exclusion, it is essential to compare inclusion metrics before and after its launch. eNaira was officially introduced in September 2021. Before its launch, only 45% of adults had an account in a financial institution or with a mobile money provider (Demirgüç-Kunt et al., 2022). By 2023 – after over two years of operation – bank-based inclusion rose to 52%, formal inclusion reached 64%, and total inclusion (formal + informal) reached 74% (EFInA, 2023). While inclusion grew 7 percentage points, much of this increase reflects mobile service and informal channels – eNaira itself remained marginal at just 0.36% of circulating currency (Ojukwu, 2024).

In Nigeria, the percentage of adults (aged 15 and over) who owned an account at a financial institution or through a mobile money provider increased from less than 30% in 2011 to 45% in 2021, according to World Bank data (Klapper et al., 2022, pp. 2, 12, 99). Although this demonstrates a clear upward trend, progress has not been uniform, with growth rates fluctuating across the period. Despite these gains, Nigeria still lags behind the global average: in 2021, the global percentage of adults with an account was 76%, marking a 31 percentage point gap (Table 3).

However, when comparing Nigeria to other countries at a similar stage of economic development – specifically, those with a gross national income per capita between $1,046 and $4,095 – the divergence is less pronounced. In 2021, this group's average was 62%, meaning Nigeria trailed by 17 percentage points. For additional perspective, the average across low and middle-income countries was 57%. Table 3 below summarises these figures.

Table 3. Percentage of adults (15+) with an account at a financial institution or through a mobile money provider in Nigeria, selected country groups and the world

Region/country	2011 (% adults with account)	2021 (% adults with account)	Global average 2021 (%)	Deviation from global average (pp)
Nigeria	< 30	45	76	–31
Low & middle-income group	~31	57	76	–19
Countries with GNI per capita $1046–$4095	~28	62	76	–14
World	51	76	76	0

Source: based on: (Demirgüç-Kunt et al., 2022, pp. 2, 12, 99).

In Nigeria, the eNaira wallet app had more than half a million downloads in the Google Play shop (as of 1/05/2023), with a Nigerian population of 213.4 million. Indeed, eNaira is a tool for fast payments without consumers having to pay commissions (Abiodun, 2023). In November 2022, the Central Bank of Nigeria celebrated 700,000 payments through eNaira with a volume of about $17.4 million. According to news articles, this may be due to the fact that the Central Bank of Nigeria has chosen not to partner with commercial entities, practically making eNaira not solve the problems the project was intended to solve. The project currently does not introduce new solutions that commercial banks could not offer, for whom this introduction of CBDC could be highly disadvantageous as it takes commissions away from commercial banks on payments through electronic banking as a mode of payment. Indeed, eNaira is a tool for fast payments without consumers having to pay commissions.

Nevertheless, eNaira has been successively, albeit rather slowly, making an increase in recorded payments and users. This may suggest that financially excluded individuals are either not sufficiently informed about the availability of the CBDC, unable to use it because they cannot meet the requirements of the CBDC wallet application, or that financial exclusion in Nigeria stems from factors beyond limited access to formal banking services. Mobile financial services are highly developed in Africa, particularly in Sub-Saharan African countries, where millions of adults use mobile money accounts and, in numerous markets, it is possible to open a financial account entirely via a smartphone app (Demirgüç-Kunt et al., 2022; GSMA, 2023).

Recent studies highlight a significant gap between eNaira's ambitious goals and actual adoption. By March 2024, total eNaira in circulation was only ₦13.98 billion, accounting for just 0.36% of all circulating currency (Ojukwu, 2024). With Nigeria's population at 213.4 million, the number of active eNaira users was about 700,000 – just 1.3% out of ~55 million financial accounts (Usman et al., 2025). Comparable challenges occurred with Jamaica's JAM-DEX and the Bahamian Sand Dollar: in both cases, usage has been minor versus conventional cash, with most transactions tied to government transfers instead of organic consumer demand (Anthony, 2025).

Discussion and conclusions

Our findings suggest that while CBDC can address some aspects of financial exclusion – such as accessibility and transaction costs – its impact is significantly constrained by digital infrastructure limitations. The analysis suggests that digital exclusion is one of the major obstacles limiting financial inclusion in Nigeria;

however, the limited reach and diversity of formal financial services offered by the banking sector may also significantly contribute to this issue. This limitation is visible in infrastructure gaps and service diversity. World Bank Findex data show that, while globally 76% of adults held an account in 2021, only 45% did so in Nigeria – reflecting limited service outreach especially beyond urban centres (Demirgüç-Kunt et al., 2022). EFInA's 2023 survey reports financial exclusion rates above the national average in northern regions, such as Borno State (75% exclusion), where banking infrastructure is particularly sparse (EFInA, 2023).

In the authors' opinion, a solution to this problem could be introducing a token-based CBDC rather than the current account-based CBDC in Nigeria. However, this is an unlikely solution as it would require the development of a new CBDC system, which would be both time-consuming and costly. The first step toward reducing financial exclusion in Nigeria should therefore be not the introduction of a CBDC, but the expansion of mobile telephony and mobile internet infrastructure. CBDC does not seem to solve the problem of financial exclusion in Nigeria, as it is directly caused not by the lack of accessibility to banking services, but by the lack of access to mobile connectivity, which results in the inability to use the e-banking services of Nigerian commercial banks. The CBDC could therefore be effective in combating financial exclusion, provided digital inclusion is carried out in Nigeria, allowing Nigerians to enjoy the benefits of the Internet.

On the other hand, in the event of reducing digital exclusion, Nigerians would likely have access to financial services from outside Nigeria, offered by foreign banks and fintechs. This would increase competition in the Nigerian financial market and force Nigerian banks to lower their existing margins. Net interest margins for major Nigerian banks have remained high, averaging 10–12% in 2024, compared to 3–5% in developed economies. Fidelity Bank, for example, raised its net interest margin from 8.1% (2023) to 12.0% (2024), benefiting from elevated interest spreads (Fidelity Bank, 2025). The Central Bank of Nigeria's policy rate reached 27.50% in November 2024 before dropping slightly to 27% in September 2025 ("Nigeria interest…", n.d.).

Another option would be to introduce top-down regulation to force a reduction in bank rates, or to introduce EU-like solutions similar to the Basic Payment Account offered in the EU. The role of the CBDC as a tool for financial inclusion therefore seems superfluous. The introduction of CBDC may both reduce costs for consumers by introducing real competition in the payment services market, but paradoxically it may also increase the prices of other banking services. Commercial banks may then reduce the cost of credit transfers and basic banking services, as competition from the central bank will somehow force them to do so. This is likely to increase the prices of services not offered by the central bank, such as loans. A factor in favour of such a scenario is the willingness of commercial banks to compensate not only for lost profits from intermediation of transactions, but also for lost bank deposits to the Central Bank of Nigeria.

Those affected by financial exclusion may not be aware of the specific ways in which they could benefit from using eNaira for payments. The project seems to ignore the fact that a large proportion of the financially excluded are people who are excluded not by their own choice (known as self-exclusion), but because they lack the knowledge or resources to be able to use the technology.

Thus, the introduction of CBDCs does not appear to have had much impact on the eradication of financial exclusion in Nigeria. However, this is a relatively young project and further conclusions will only be possible in about 2–3 years. At present, it is difficult to say whether eNaira is a failed project or whether it is going through the initial difficulties characteristic of any innovative project. This uncertainty is well illustrated by the concept of the product life cycle, which highlights that new products and technologies typically begin with an introductory phase marked by low adoption, limited public awareness, technical and operational challenges, as well as a need for ongoing user education. The issues currently observed with eNaira, such as slow uptake, technological barriers and scepticism among users, are common in the early stages of many innovative financial products, especially in environments facing infrastructural and educational challenges. Therefore, these initial struggles do not necessarily signal failure, but may rather be an inherent part of the adoption and development process. The long-term outcome for eNaira will depend on how effectively these challenges are addressed and whether the project can successfully transition into the next phases of growth and broader acceptance. In the context of Nigeria, the eNaira and the CBDC initiative overall are primarily intended to complement, rather than substitute, the existing banking system. The architecture adopted by the Central Bank of Nigeria follows a two-tier model in which the central bank issues the digital currency, but private banks and financial institutions are responsible for customer relationships and the provision of related services. This approach aims to enrich and modernise the payments ecosystem by adding a digital alternative to cash, as well as supporting everyday transactions and remittances, rather than replacing traditional bank accounts or banking services. The growing cooperation between the central bank and private sector entities can broaden the range of available digital services, but this expansion will mostly benefit people who are already integrated into the digital financial system. For the moment, technological and educational barriers prevent the eNaira from significantly reaching or replacing solutions for the digitally excluded. In 2022, only 37.34% of Nigerians had mobile internet access, restricting eNaira's reach (Statista, 2022). EFInA's 2023 data indicate that financial inclusion rates are 68% among adults with formal education, but only 16% without. Adoption studies stress that social influence, awareness, and perceived usefulness are crucial factors, with information on eNaira limited outside major cities (Ozili, 2023).

In the absence of the technical background required by CBDC, it is not capable of eradicating financial exclusion. It is worth noting that this is a relatively new

economic concept that is very flexible and adaptable to local realities. In the case of Nigeria, the potential of CBDC has not been fully realised. The people to whom CBDC was mainly targeted are probably not aware of its existence at all, or even if they are aware of it, they have no opportunity to take advantage of it, as the cited data on digital exclusion indicate.

Using Nigeria as an example, it is not possible to make a clear judgment on the role of CBDCs in combating digital exclusion. On the one hand, it does not appear from the cited data that CBDC has received much attention in Nigeria. On the other hand, it may not be the fault of CBDC per se, but of inadequate promotion, the inadequacy of this tool to the realities of Nigeria, digital exclusion or lack of knowledge about how to use eNaira. It is important to ask whether, if the problems by which CBDC has currently failed in Nigeria are addressed, commercial solutions would succeed. In the authors' view, this is possible, which calls into question the idea of using CBDC to combat financial exclusion. It is certainly a cost-effective solution for the state, as it reduces, or in the case of complete substitution, eliminates the costs associated with the production of new banknotes and coins. According to Dyson and Hodgson (2016, pp. 1–2), the benefit of issuing CBDCs can be maintaining mint annuity income while reducing cash issuance. Thus, from a state budget perspective, it is a worthwhile solution that could generate additional revenue and reduce state budget losses. Moreover, such a transformation of money circulation may bring tangible benefits, as a complete shift to electronic forms of payment in a country has the potential to generate annual savings approaching 1% of GDP (Humphrey et al., 2003). However, it appears that the CBDC project is premature at this stage of Nigeria's development, and that the money spent on its development and implementation would yield better results both economically and socially when spent on combating the digital exclusion.

CBDC is not a one-size-fits-all concept and developed countries have different objectives and applications for it than developing countries. Developed countries, in addition to the use of CBDCs within their own countries, hope to expand this means of payment to developing countries and derive economic benefits from it. Developing countries, on the other hand, see it as a panacea for the economic problems they face. Unlike the digital currency projects of the central banks of developed countries, eNaira is in current use. The highest stage of CBDC development in the developed countries is currently piloting; countries such as Nigeria and Jamaica are in the vanguard here. This raises the question of whether a developing country with less economic and scientific potential can create such a tool faster than countries and communities much more advanced, like the United States, China or the European Union.

Experience from other developing economies provides crucial context. Jamaica's JAM-DEX, launched in July 2022, suffered minimal uptake beyond government transfer programs. Initial transaction volume came mainly from government em-

ployment program payments, not consumer-driven demand (Anthony, 2025). Similarly, The Bahamas' Sand Dollar, launched in October 2020, has had little organic use, with government promotions and giveaways driving most activity. These cases suggest that adoption challenges – low awareness, poor infrastructure, competition from other digital methods – reflect broader innovation obstacles and are not unique to Nigeria's CBDC.

In the future, according to the Copernicus-Gresham law inferior money drives out superior money (Investopedia, 2025), CBDC may be the dominant form of payment. It is an easy to use, convenient and secure form. The state, as the dominant entity, can top-down impose its use, which commercial banks cannot afford to do. Such a scenario is likely, as a lot of resources have already been invested in the Nigerian eNaira project. Nigeria will probably want to develop the concept in the future, especially as the project is already being developed, including the Central Bank of Nigeria entering into partnerships with commercial entities, the lack of which has been criticised in the press.

Our analysis indicates that CBDC, in its current form, has not significantly contributed to reducing financial exclusion in Nigeria. While some positive effects, such as improved access to digital financial services and lower transaction costs, can be observed, the overall impact has so far been limited, particularly among rural and unbanked populations, due to barriers like insufficient digital infrastructure and low levels of digital literacy. Future research should therefore explore whether infrastructure improvements and targeted financial education initiatives could enhance the effectiveness of the eNaira in reaching the unbanked population. It would also be valuable to extend comparative research to other countries that have implemented or piloted retail CBDCs, such as Jamaica and the Bahamas, to assess whether similar patterns and challenges are observed in other developing economies. Additionally, analyses of more advanced economies – for example, China, where mobile internet access is far more widespread – could provide insights into whether greater technological readiness translates into broader CBDC adoption and more substantial progress in financial inclusion. Such comparative studies would deepen our understanding of the contextual factors shaping the effectiveness of CBDCs as tools for reducing financial exclusion.

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