

## **DIGITAL CURRENCIES AND INFORMAL ECONOMIES: ASSESSING THE FINANCIAL INCLUSION POTENTIAL OF CBDCs IN EMERGING MARKETS**

**Loso Judijanto\***<sup>1</sup>

IPOSS Jakarta, Indonesia

Email: losojudijantobumn@gmail.com

**Ajeng Faizah Nijma Ilma**

IESP, FEB, Universitas Jenderal Soedirman, Indonesia

Email: ajeng.faizah@unsoed.ac.id

**Farikhul Muafiq**

ITSNU Pekalongan, Indonesia

Email: farikhul@gmail.com

### **Abstract**

This research aims to explore the potential of central bank digital currencies (CBDCs) to increase financial inclusion in emerging markets, particularly in the context of the informal economy, which still dominates economic activity in many regions. Through a comprehensive literature review of previous studies, policy reports, and international regulatory documents, this research analyzes how the design and implementation of CBDCs can bridge the financial access gap faced by marginalized groups and workers in the informal sector. The study finds that CBDCs have significant potential to provide cheaper, safer, and more accessible payment systems, as well as increase trust in the formal financial system. However, these benefits are highly dependent on factors such as technical design, public trust, digital infrastructure, and privacy protection policies. This research recommends that the development of CBDCs in developing countries seriously consider the local socio-economic context and foster close collaboration between governments, the private sector, and local communities to ensure inclusive and sustainable adoption.

**Keywords:** Central Bank Digital Currency, informal economy, financial inclusion, emerging markets, digital transformation.

### **INTRODUCTION**

The development of financial technology over the past two decades has given rise to various innovations that have disrupted the way people transact and manage their finances. One of the most significant breakthroughs is the

---

<sup>1</sup> Correspondence author

emergence of digital currencies, initially known through decentralized forms such as cryptocurrencies. However, with increasing concerns about financial system stability and the need for stronger regulation, many central banks across the world have begun developing Central Bank Digital Currencies (CBDCs) as digital versions of state-issued fiat currencies (Khaing, 2024). CBDCs are digital representations of national currencies issued and guaranteed by monetary authorities and designed for widespread use by the public as legal tender. This concept emerges amidst the growing need to expand financial inclusion, particularly in developing countries with large informal economies and populations largely untouched by formal financial services.

The informal economy, encompassing businesses without formal registration or legal protection, plays a vital role in the economic life of many developing countries. In some countries, the informal economy accounts for up to 60% of total employment and serves as the backbone of millions of people's livelihoods. However, this sector is often outside the reach of the formal financial system, complicating government efforts to design inclusive and effective monetary, fiscal, and social protection policies. The inaccessibility of formal financial services also prevents people in the informal economy from accessing efficient savings, credit, insurance, and payment services. This situation poses a significant obstacle to efforts to increase productivity, alleviate poverty, and achieve inclusive economic growth. In this context, CBDCs offer a strategic opportunity to bridge the financial access gap by providing a cheap, secure, and affordable digital transaction facility, even for the unbanked population (Foster et al., 2021a).

On the other hand, the adoption of CBDCs in developing countries is not without complex structural and social challenges. While CBDCs have the potential to be a revolutionary tool for financial inclusion, their implementation in countries with unequal digital infrastructure, low financial literacy, and limited public trust in state institutions could present unique dynamics. In the context of the informal economy, where cash transactions predominate and economic relations are more social or communitarian, the introduction of state-led digital payment instruments may be met with skepticism. Therefore, it is crucial to understand how CBDCs can be designed and implemented to address the needs and characteristics of the informal sector, while ensuring that the introduced technology does not further exacerbate financial exclusion due to technological barriers, regulations, or cultural preferences.

Several early studies have shown that CBDCs can reduce reliance on cash, lower transaction costs, improve the efficiency of cross-border payments, and open up more transparent and targeted channels for the distribution of social assistance (Mugamba, 2024a). For example, the eNaira project in Nigeria is one of the early case studies demonstrating a developing country's efforts to use CBDCs to address financial inclusion challenges. However, the results still show a gap in adoption across different socioeconomic groups (Armas et al., n.d.). This underscores the need for an approach grounded in an understanding of the local context, including how the informal economy operates, how people manage money, and how digital technology is adopted in everyday life.

Within this framework, research on the potential of CBDCs to strengthen financial inclusion in emerging markets must consider a spectrum of structural, behavioral, and institutional factors. Structural factors include the availability of digital infrastructure, mobile device penetration, and the ability of governments and monetary authorities to design systems accessible to all segments of society. Behavioral factors include public trust in the banking system and government, preference for cash transactions, and comfort with digital technology. Institutional factors, meanwhile, encompass a regulatory framework that supports innovation while protecting consumers, and the ability of financial institutions and fiscal authorities to adapt to more open and inclusive financial service models. These three aspects are interrelated and are key determinants of whether CBDCs can truly catalyze expanded financial access or deepen existing exclusion.

This research is crucial given that the success of CBDC implementation in developing countries will depend heavily on how policy and technology design interact with the complex and dynamic realities of the informal economy. The existence of CBDCs is not only about the availability of digital payment tools, but also about how these tools can integrate with the daily economic practices of communities that have traditionally been outside the formal financial system. In this regard, an in-depth literature review approach will allow researchers to examine various early experiences, adoption models, and the challenges and successes of CBDC implementation in various developing countries. Through comparative analysis and synthesis of literature across contexts, this research aims to provide a more comprehensive understanding of the potential of CBDCs in addressing the challenges of financial inclusion in the informal sector, as well as develop strategic recommendations for

policymakers and financial institutions in designing approaches responsive to the needs of grassroots communities (Feyen et al., 2021).

CBDCs have a high potential to reach groups traditionally marginalized by the banking system, such as informal workers, street vendors, and micro-entrepreneurs (Boakye-Adjei et al., 2023). By removing barriers such as official document requirements or minimum balances, CBDCs can facilitate easier and faster digital account creation. Furthermore, integrating CBDCs with mobile payment applications can provide a shortcut to expanding financial services without the need for expensive and slow physical infrastructure. In this context, CBDCs can also serve as a means of collecting microeconomic data that has previously been systematically under-recorded, thus providing an opportunity for governments to design more inclusive, data-driven, and responsive economic policies to the dynamics of the people's economy.

However, cybersecurity challenges, privacy risks, and potential resistance from conventional financial institutions must be central to this discourse. Careless implementation of CBDCs could actually create new inequalities, especially if informal economy communities feel intimidated by overly technical systems or are too tied to state oversight. In some cases, state dominance in payment systems can also raise concerns about excessive social control, particularly in countries with low levels of trust in government. Therefore, an inclusive CBDC model must be accompanied by guarantees of privacy, economic freedom, and adequate access to digital education and training. This means that CBDCs must be designed not only as technological tools, but also as social policies that support equitable access and economic empowerment of the people.

Against this backdrop, this study highlights the strategic role of CBDCs in bridging the financial gap between the formal and informal sectors in emerging markets. Through a literature review approach, this study will identify how CBDCs can be optimized to facilitate broad financial inclusion, while not ignoring the complexity and diversity of socio-economic contexts in each country. The results of this study are expected to contribute to the global discussion on inclusive and contextual CBDC design, while also serving as a reference for developing countries considering or in the early stages of implementing CBDCs as part of their digital economic transformation strategies.

## **RESEARCH METHOD**

This research uses a literature review approach as the primary method to explore the potential of Central Bank Digital Currencies (CBDCs) in promoting financial inclusion in developing countries, particularly within the informal economy. This literature review was chosen because it allows researchers to synthesize existing empirical findings, theories, and policies related to the relationship between central bank digital currencies and informal economic dynamics. Utilizing academic sources, international agency reports, and government and central bank publications, this research seeks to build a comprehensive understanding of how CBDCs can address the challenges faced by groups underserved by the formal financial system.

The literature review process was conducted systematically by collecting and analyzing relevant publications from the past two decades. The literature reviewed covers aspects of CBDC technology, monetary and financial inclusion policies, the economic behavior of informal sector communities, and case studies of early CBDC implementations in several developing countries. The analysis was conducted by evaluating the consistency, repeatability of findings, and gaps in the existing literature. This method allows for the identification of key factors influencing the effectiveness of CBDCs in reaching underbanked populations, such as informal sector workers, micro-merchants, and rural communities.

Furthermore, this literature review method was used to assess the potential risks and obstacles to CBDC implementation in the informal economy. This research utilizes a critical-analytical approach to compare diverse perspectives and models proposed by various authors and institutions. Thus, the results of this study not only offer a synthesis of existing thinking but also provide conceptual direction for further research and more measurable policy recommendations. This study is expected to contribute to the formulation of inclusive and equitable financial digitalization strategies for developing countries.

## **RESULT AND DISCUSSION**

### **The Informal Economy in Developing Countries**

The informal economy is an integral part of the economic structure in many developing countries, playing a crucial role in providing employment, income, and goods and services to communities, particularly low-income groups (Schneider, 2022). This sector encompasses a wide range of economic activities that fall outside the reach of government regulation and oversight,

yet remains a key pillar of livelihood for millions of individuals. Amidst economic instability and limited formal employment opportunities, the informal sector is often the only viable alternative for people to survive. The informal economy also reflects complex local social and cultural dynamics, making its understanding crucial for formulating inclusive development policies.

The scale of the informal sector in developing countries is enormous and continues to grow in line with urbanization, population growth, and the weakness of formal employment systems. According to estimates by the International Labour Organization (ILO), more than 60% of the workforce in developing countries works in the informal sector. In many large cities, this sector includes not only street vendors or day laborers, but also home workers, informal transportation such as motorcycle taxis and bajajs, and small services widespread in residential areas. The dominance of the informal sector is evident in the national economy, in some cases even serving as a major supporter of domestic consumption (Fredström et al., 2021). However, because it is not officially recorded, its contribution is often overlooked in macroeconomic planning and fiscal and monetary policymaking.

Key characteristics of the informal sector include a lack of compliance with labor regulations, taxation, and business standards. Informal economic actors typically lack business permits, do not pay taxes, and are not recorded in official statistics. Their businesses are often small-scale, subsistence-based, and use very limited technology and capital. This sector is also characterized by job insecurity, long working hours, and a lack of social security or legal protection for workers. Nevertheless, its flexibility and low barriers to entry make the informal sector an easily accessible economic space for vulnerable groups such as women, young people, and internal migrants.

In practice, transaction patterns in the informal sector tend to be informal and based on social trust. Relationships between sellers and buyers, employers and workers, and other informal business actors are formed through close-knit community networks. Oral agreements, informal arrangements, and familial ties often replace written contracts or formal legal mechanisms. This makes the informal sector relatively resilient to formal economic shocks, yet simultaneously vulnerable to the risks of exploitation and conflict (Huang et al., 2020). Furthermore, the dominance of cash in all aspects of transactions reinforces the informal nature of this sector. Informal business operators typically receive and pay using cash because they lack

access to digital payment systems or bank accounts, further reinforcing their isolation from the formal financial system.

Limited access to formal financial services is one of the main challenges facing the informal sector (Etim & Daramola, 2020). Many informal economy actors lack official identity documents, credit history, or collateral needed to open a bank account or access credit from formal financial institutions. These barriers are exacerbated by remote geographic locations, low financial literacy, and negative perceptions of the informal sector by financial institutions, which consider it high-risk and unprofitable. As a result, most informal actors rely on informal financial systems such as arisan (social savings associations), loan sharks, or loans from relatives, which often come with high interest rates and social risks. This financial isolation not only hinders business expansion but also exacerbates the cycle of structural poverty among informal sector actors.

The lack of formal financial inclusion also impacts the informal sector's ability to withstand and adapt to economic crises or structural changes. Without savings held in formal institutions, insurance, or access to emergency credit, informal sector actors are highly vulnerable to shocks such as pandemics, inflation, or natural disasters. Furthermore, the inability to access productive financing hinders the growth of small businesses in the informal sector, limiting their ability to absorb a wider workforce or contribute to increasing national income. In this context, expanding access to formal financial services is a key factor in transforming the informal sector into a more productive, stable, and sustainable one (Dell'Anno, n.d.).

Overall, the informal economy in developing countries is a complex phenomenon that reflects structural limitations within the formal economic system. While often negatively perceived as unregulated and difficult to monitor, this sector actually reflects the resilience and creativity of communities in the face of systemic limitations. Efforts to strengthen financial inclusion and provide a gradual and inclusive transition path to formalization are crucial to ensuring that the contributions of the informal sector are recognized, valued, and strengthened for more equitable and sustainable economic development. This approach requires not only policy reform but also a deeper understanding of the socio-economic realities faced by informal sector actors on the ground.

### **CBDCs: Design, Purpose, and Potential**

Central Bank Digital Currencies (CBDCs) have become one of the hottest topics in the global monetary policy landscape. With the advancement of financial technology and the decline of cash usage in many countries, various central banks have begun exploring the possibility of developing digital versions of their national currencies. CBDCs, defined as digital representations of fiat currencies issued and guaranteed by a central bank, can play a crucial role in strengthening financial system stability, expanding financial inclusion, and adapting monetary policy to the dynamics of the digital age. Examining the design, purpose, and potential of CBDCs is crucial to understanding how this technology can be implemented effectively, particularly in the context of developing countries with large informal economy populations (Kumhof & Noone, 2021).

Technically, the architecture and design of CBDCs can be categorized into two main models: retail CBDCs and wholesale CBDCs. Retail CBDCs are designed for use by the general public as a means of everyday payment, replacing or complementing cash. Retail CBDCs can be account-based, where user identities are recorded in a central system, or token-based, where value is stored and transferred like digital cash. Meanwhile, wholesale CBDCs are intended for financial institutions and are used in interbank transactions, such as large payment settlements or money market transactions. Their technological architecture can be centralized or based on distributed ledger technology (DLT), depending on the need for system efficiency, transparency, and reliability. Retail CBDCs typically require more complex designs because they must consider scalability, user privacy, interoperability with existing payment systems, and protection against cyber risks. Wholesale CBDCs tend to focus more on the speed and security of settlements between financial institutions.

The primary objectives of central banks in developing CBDCs vary, depending on the economic conditions, financial system structure, and policy strategies of each country (Kumhof & Noone, 2021). In developed countries, CBDCs are often viewed as a means to improve payment system efficiency, strengthen financial sector competition, and reduce dependence on private payment systems dominated by large technology companies. In developing countries, the goal of CBDC development is more focused on expanding financial inclusion and reducing cross-border transaction costs. CBDCs can also serve as a tool for central banks to maintain control over the monetary system amid the growing use of unregulated cryptocurrencies and stablecoins.

Furthermore, CBDCs have the potential to strengthen the effectiveness of monetary policy transmission through the use of real-time data and direct control over the distribution of digital money. These objectives make CBDCs a strategic tool, not simply a technological innovation, in navigating the future challenges and opportunities of the financial system.

One of the greatest potentials of CBDCs is their ability to reach populations currently underserved by the formal financial system, particularly those in the informal economy (Huber, 2023). In many developing countries, the informal economy comprises a significant portion of the workforce and economic activity, yet remains outside the reach of traditional banking. Lack of identity documentation, limited infrastructure, and distrust of financial institutions are major barriers to accessing financial services for this group. With an inclusive design, CBDCs can provide a secure, affordable, and easy-to-use payment method, even for individuals without bank accounts. Through integration with mobile and biometric technologies, CBDCs enable individuals to conduct transactions, store value, and receive government assistance directly without intermediaries. This has the potential to strengthen financial literacy, increase the productivity of micro-enterprises, and encourage the transition of the informal economy to a more formal and documented ecosystem (CBDC: Concepts, Benefits, Risks, Design, and Implications by Yibin Mu, Angela Mu: SSRN, n.d.).

However, the success of CBDCs in reaching the informal economy is not without implementation challenges. Overly complex designs or those requiring a stable internet connection can actually widen the digital divide. Furthermore, attention to privacy, data security, and user trust are crucial to ensure smooth adoption of CBDCs. Central banks need to collaborate with the private sector, local governments, and social institutions to ensure that the distribution and use of CBDCs truly respond to the needs of communities in the informal sector. This strategy also includes extensive public education, equitable digital infrastructure development, and policies that support consumer inclusion and protection. Well-designed and inclusively implemented CBDCs have the potential to revolutionize the financial system in developing countries, narrow economic disparities, and create a fairer, more efficient, and more transparent transaction ecosystem for all levels of society.

### **Analyzing the Potential of CBDCs in Encouraging Financial Inclusion**

Central Bank Digital Currencies (CBDCs) have become a strategic topic in the discourse on monetary policy and global economic development,

particularly in developing countries. Amidst various challenges in accessing formal financial services, CBDCs are seen as an instrument with significant potential for expanding financial inclusion. The technology-based approach inherent in CBDCs allows central banks to not only maintain monetary stability but also reach groups of people who have been marginalized from the formal financial system. Financial inclusion extends beyond the provision of bank accounts, but also encompasses sustainable access to safe, efficient, and affordable savings, credit, fund transfers, and various other financial services. In this context, CBDCs can be a game-changer for populations in the informal sector, remote areas, and vulnerable groups often underserved by conventional financial institutions.

One of the main potentials of CBDCs in strengthening financial inclusion lies in their ability to simplify and optimize the distribution of social assistance and government subsidies (Rachmad, n.d.). In many developing countries, social assistance programs still face various obstacles, such as funding leaks, distribution delays, and inaccurate beneficiary data. By utilizing a CBDC architecture directly connected to the national digital identity system, governments can distribute financial assistance precisely, in real time, and without intermediaries. Every individual registered in the system can receive assistance directly into a digital wallet connected to the CBDC, without the need for a bank account or relying on a third party. This approach not only increases the efficiency and accountability of aid distribution but also creates an initial connection between citizens and the digital financial system that has the potential to develop into broader economic participation.

Beyond social assistance mechanisms, CBDCs also open up opportunities for people to gain easier access to basic financial services such as savings, payments, and even credit. By providing an official digital payment instrument issued by the central bank, CBDCs can serve as a bridge into the financial ecosystem for people previously excluded from banks or non-bank financial institutions. CBDC-based digital wallets can store balances, conduct daily transactions, and access additional financial services built on the platform. Financial institutions can leverage securely recorded transaction data to more accurately assess individual creditworthiness, creating opportunities for microcredit access that has previously been difficult for small or informal economic actors (Mugamba, 2024b). Thus, CBDCs have the potential to democratize access to capital and promote more inclusive economic growth.

The use of CBDCs is also believed to reduce transaction costs, which have historically been a major barrier to financial inclusion. In conventional

payment systems, particularly in remote areas or the informal economy, fund transfer fees can be prohibitively high and inefficient. CBDCs designed to operate directly between sender and recipient, without relying on a network of expensive intermediaries, can significantly reduce costs. Furthermore, because CBDC transactions are recorded in a decentralized and transparent system, the potential for misuse and corruption can be minimized (Banerjee & Sinha, 2023). This transparency is crucial for more effective public fund management, consumer protection, and regulatory oversight. Furthermore, the digital environment created by CBDCs can increase public trust in the use of technology in everyday economic activities, thereby strengthening the national digital payment ecosystem.

The potential of CBDCs to drive financial inclusion is even greater when combined with the penetration of mobile devices and digital identity systems. In many developing countries, although access to bank accounts remains limited, smartphone and internet penetration has reached significant levels (Shafranov et al., 2024). CBDCs accessible through mobile apps will allow users to conduct financial transactions simply using their mobile phones, eliminating the need for physical banking infrastructure. Digital identities integrated with CBDC wallets also simplify user verification and mitigate the risk of financial crimes such as money laundering or fraud. This paves the way for the creation of a digital financial ecosystem that is secure, inclusive, and adaptive to local needs (Náñez Alonso et al., 2020). More broadly, this strategy also supports the vision of national digital transformation and the realization of a more equitable economic system, both geographically and socially.

This overall potential demonstrates that CBDCs are not simply monetary innovations, but rather a new foundation for an inclusive financial system transformation. Through designs responsive to the needs of vulnerable communities, supported by digital infrastructure, and synergy with social policies, CBDCs can become a strategic tool in addressing unequal access to finance. However, realizing this potential depends heavily on how CBDCs are designed, regulated, and implemented. The involvement of various stakeholders, from regulators and industry players to local communities, is key to building a system that is not only technologically efficient but also socially just. With the right approach, CBDCs can be a long-term solution to support sustainable and inclusive economic development, particularly in countries that face significant challenges in integrating all levels of society into the formal financial system.

### **Challenges of CBDC Implementation in the Informal Economy**

The implementation of Central Bank Digital Currencies (CBDCs) in developing countries with a large informal economy presents significant challenges. One of the most fundamental challenges lies in the relatively low level of digital literacy and technology adoption among informal economy players. Many individuals in this sector are unfamiliar with using digital devices such as smartphones for financial transactions. They also often lack experience with banking applications or digital wallets, which are prerequisites for CBDC use. Low digital literacy relates not only to the technical ability to use devices but also to an understanding of the benefits, risks, and workings of the digital financial system as a whole (Foster et al., 2021b). Consequently, although CBDCs are designed to increase financial inclusion, there is a significant potential that some segments of society will be left behind due to their inability to keep up with the digital transformation.

In addition to technical and educational barriers, social and psychological dimensions also play a crucial role in determining the success of CBDC implementation. Privacy concerns are a major concern, particularly among informal economy players who are accustomed to cash transactions due to their unrecorded and anonymous nature. CBDCs, which inherently have a digital footprint and can be monitored by monetary authorities, are perceived by some as a form of control that could diminish financial freedom. Fear that transaction data could be accessed and analyzed by governments or other parties has given rise to significant social resistance. Trust in the institutions managing these systems remains a problem in many developing countries, particularly where the relationship between citizens and financial institutions or the state is shrouded in historical uncertainty and uncertainty. Therefore, even if the technological infrastructure can be put in place, social resistance arising from issues of trust and privacy can pose a serious barrier that is difficult to overcome through technocratic approaches alone.

Digital inequality is also a major risk factor, potentially creating new digital exclusions in an otherwise inclusive financial system. Uneven digital infrastructure in rural and remote areas limits access to CBDC-based services (Ridwansyah et al., 2024). In many regions, internet connectivity remains scarce or unstable, while the availability of hardware such as smartphones or computers remains limited. If CBDCs are designed and implemented without considering these realities, groups living in areas with limited infrastructure will be further marginalized. The risk of digital exclusion also relates to other vulnerable groups, such as the elderly, indigenous communities, and people

with disabilities, who typically face barriers to accessing and utilizing digital technology. In this context, CBDCs could indirectly widen social and economic disparities if not balanced with supporting strategies that address limitations in digital access and capabilities within the community.

Dependence on internet connectivity and digital devices is also a crucial issue in ensuring the sustainability and reliability of CBDC systems. Because these systems require a stable network to access and record transactions in real time, the entire digital ecosystem, from internet service providers and device manufacturers to cybersecurity systems, must operate synergistically and without interruption. However, in many developing countries, the availability and quality of internet services remain volatile, with some areas lacking broadband coverage (Ozili, 2022). Furthermore, the issue of hardware dependency cannot be ignored. Many informal economy players lack personal digital devices or still use mobile phones with limited features. In some cases, they even share devices with other family members, making access to CBDCs inconsistent. This dependency makes the system vulnerable to technical disruptions, network outages, or device failure. Without reliable alternatives to offline transactions, CBDC systems may fail to deliver tangible benefits to the groups most in need of inclusive financial access (Oh & Zhang, n.d.).

Thus, the implementation of CBDCs in the informal economy cannot simply rely on technological readiness or efficient system design. It requires a holistic and contextual approach, involving digital education, infrastructure development, and communication strategies that can foster trust and overcome social resistance. Governments and monetary authorities need to collaborate with local communities, civil society organizations, and the private sector to ensure that CBDCs are truly inclusive and empowering instruments. Without strategic interventions that address the root causes, CBDCs risk becoming exclusive tools that benefit only the digitally established, while millions of people in the informal sector are further marginalized in an increasingly digitalized financial landscape.

## **CONCLUSION**

This research demonstrates that Central Bank Digital Currencies (CBDCs) have significant potential to promote financial inclusion in developing countries, particularly in informal economies that have traditionally been underserved by the formal financial system. With the ability to provide access to basic financial services without the need for traditional banking infrastructure, CBDCs can be a transformational tool in bridging the financial

gap, particularly for unbanked populations, informal sector workers, and MSMEs, which are often marginalized from the mainstream financial system.

Furthermore, the literature indicates that the successful implementation of CBDCs in the context of financial inclusion depends heavily on inclusive policy design, digital security, technological affordability, and collaboration between central banks and local stakeholders. Furthermore, educational efforts and increased digital literacy are needed to enable informal communities to understand, accept, and optimally utilize CBDCs. The potential of this technology can also be strengthened by integration with existing digital payment systems, so that CBDCs become not only a means of payment but also a gateway to various other financial services.

In conclusion, CBDCs have the potential to be a catalyst for change for inclusive financial systems in developing countries. However, their success is heavily influenced by the socioeconomic context, policy design, and the technological readiness and digital culture of the community. While they offer many opportunities, there are also structural and operational challenges that must be addressed to prevent CBDCs from widening digital inequality. With a participatory and contextual approach, CBDCs can provide a sustainable solution to the financial challenges facing the informal economy in developing markets.

## REFERENCES

- Armas, A., Ruiz, L., & Vásquez, J. L. (n.d.). *Assessing CBDC potential for developing payment systems and promoting financial inclusion in Peru*.
- Banerjee, S., & Sinha, M. (2023). Promoting Financial Inclusion through Central Bank Digital Currency: An Evaluation of Payment System Viability in India. *Australasian Accounting, Business and Finance Journal*, 17(1), Article 1. <https://doi.org/10.14453/aabfj.v17i1.14>
- Boakye-Adjei, N. Y., Auer, R., Banka, H., Faragallah, A., Frost, J., Natarajan, H., & Prenio, J. (2023). Can central bank digital currencies help advance financial inclusion? *Journal of Payments Strategy & Systems*, 17(4), 433–447.
- CBDC: Concepts, Benefits, Risks, Design, and Implications by Yibin Mu, Angela Mu: SSRN. (n.d.). Retrieved July 15, 2025, from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4234876](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4234876)
- Dell’Anno, R. (n.d.). *Theories and definitions of the informal economy: A survey*. <https://doi.org/10.1111/joes.12487>
- Etim, E., & Daramola, O. (2020). The Informal Sector and Economic Growth of South Africa and Nigeria: A Comparative Systematic Review. *Journal of*

- Open Innovation: Technology, Market, and Complexity, 6(4), Article 4. <https://doi.org/10.3390/joitmc6040134>
- Feyen, E., Frost, J., Natarajan, H., & Rice, T. (2021). What Does Digital Money Mean for Emerging Market and Developing Economies? In R. Rau, R. Wardrop, & L. Zingales (Eds.), *The Palgrave Handbook of Technological Finance* (pp. 217–241). Springer International Publishing. [https://doi.org/10.1007/978-3-030-65117-6\\_9](https://doi.org/10.1007/978-3-030-65117-6_9)
- Foster, K., Blakstad, S., Gazi, S., & Bos, M. (2021a). *Digital Currencies and CBDC Impacts on Least Developed Countries (LDCs)*. <http://hub.hku.hk/handle/10722/301745>
- Foster, K., Blakstad, S., Gazi, S., & Bos, M. (2021b). *Digital Currencies and CBDC Impacts on Least Developed Countries (LDCs)*. <http://hub.hku.hk/handle/10722/301745>
- Fredström, A., Peltonen, J., & Wincent, J. (2021). A country-level institutional perspective on entrepreneurship productivity: The effects of informal economy and regulation. *Journal of Business Venturing*, 36(5), 106002. <https://doi.org/10.1016/j.jbusvent.2020.106002>
- Huang, G., Xue, D., & Wang, B. (2020). Integrating Theories on Informal Economies: An Examination of Causes of Urban Informal Economies in China. *Sustainability*, 12(7), Article 7. <https://doi.org/10.3390/su12072738>
- Huber, J. (2023). CBDC System Design Principles. In J. Huber (Ed.), *The Monetary Turning Point: From Bank Money to Central Bank Digital Currency (CBDC)* (pp. 117–150). Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-23957-1\\_7](https://doi.org/10.1007/978-3-031-23957-1_7)
- Khaing, P. S. (2024). Role of Central Bank Digital Currencies in Bridging the Formal-Informal Economy Divide in Developing Countries. <https://dspace.cuni.cz/handle/20.500.11956/191407>
- Kumhof, M., & Noone, C. (2021). Central bank digital currencies—Design principles for financial stability. *Economic Analysis and Policy*, 71, 553–572. <https://doi.org/10.1016/j.eap.2021.06.012>
- Mugamba, E. (2024a). *Leveraging Central Bank Digital Currencies, Fin-tech, and Cryptocurrencies to Foster Financial Inclusion and Economic Stability in Uganda* (SSRN Scholarly Paper No. 5140309). Social Science Research Network. <https://doi.org/10.2139/ssrn.5140309>
- Mugamba, E. (2024b). *Leveraging Central Bank Digital Currencies, Fin-tech, and Cryptocurrencies to Foster Financial Inclusion and Economic Stability in Uganda* (SSRN Scholarly Paper No. 5140309). Social Science Research Network. <https://doi.org/10.2139/ssrn.5140309>
- Náñez Alonso, S. L., Jorge-Vazquez, J., & Reier Forradellas, R. F. (2020). Detection of Financial Inclusion Vulnerable Rural Areas through an Access to Cash Index: Solutions Based on the Pharmacy Network and a CBDC. Evidence Based on Ávila (Spain). *Sustainability*, 12(18), 7480. <https://doi.org/10.3390/su12187480>

- Oh, E. Y., & Zhang, S. (n.d.). *Informal economy and central bank digital currency*. <https://doi.org/10.1111/ecin.13105>
- Ozili, P. K. (2022). Circular Economy and Central Bank Digital Currency. *Circular Economy and Sustainability*, 2(4), 1501–1516. <https://doi.org/10.1007/s43615-022-00170-0>
- Rachmad, Y. E. (n.d.). *Digital Financial Inclusion: How CBDCs Can Be the Solution?*
- Ridwansyah, Razimi, M. S. A., Sisdianto, E., & Suprianingsih, O. (2024). Central Bank Digital Currency (CBDC): An Innovation in E-Payment for Socio-Entrepreneurship. *PaperASIA*, 40(2b), Article 2b. <https://doi.org/10.59953/paperasia.v40i2b.73>
- Schneider, F. (2022). Estimation of Informal Economy: Figures for Developed and Underdeveloped Countries Around the World. *Revista de Economía Mundial*, 60, Article 60. <https://doi.org/10.33776/rem.voi60.5631>
- Shafranova, K., Navolska, N., Koldovskyi, A., & NULL. (2024). Navigating the digital frontier: A comparative examination of Central Bank Digital Currency (CBDC) and the Quantum Financial System (QFS). *SocioEconomic Challenges*, 8(1), 90–111.