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Exploring the Impact of Central Bank Digital Currencies on Global Financial Systems

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Abstract

In several jurisdictions, central bank digital currencies (CBDCs) are no longer a subject of conceptual debate but a live payment instrument. The design is mixed method. Thirty economies were observed as a balanced panel over 2019 to 2025, yielding 210 country-year observations, and each was placed in one of four stages of CBDC development (launched, pilot, development or research). Descriptive statistics, one-way ANOVA, correlation analysis and fixed-effects panel regression were applied to this panel. Three further analyses supported it: a comparison of cross-border payment costs, a deposit-substitution scenario analysis and a structured survey of 240 financial-sector experts. Higher scores on the CBDC Readiness Index went with greater financial inclusion (β = 0.0042, p < .001) and higher payment efficiency (β = 0.284, p < .001), and with lower cross-border remittance cost (β = −0.036, p < .001). Bank deposit growth showed no significant link with CBDC readiness (β = −0.021, p = .243). Nor did financial stability scores differ across development stages (F = 0.84, p = .484). Under normal conditions, the scenarios suggest, holding limits paired with tiered remuneration hold deposit outflows below 2.5 per cent; in a stress episode with no safeguards in place, outflows may pass 22 per cent. The experts saw payment efficiency (M = 4.31) and financial inclusion (M = 4.12) as the largest benefits and named privacy and cyber-security as their chief concerns. CBDCs, the study concludes, can strengthen payment systems and widen access to finance, provided their design builds in calibrated safeguards, interoperable standards and robust data governance.

Keywords: central bank digital currency, digital payments, financial inclusion, bank disintermediation, cross-border payments, financial stability

1. Introduction

Each era's money has mirrored its technology. Over the past decade cash use has dropped sharply in many advanced economies. Emerging markets, meanwhile, have seen mobile money and fast-

payment systems spread, while privately issued crypto-assets and stablecoins have put new forms of digital value into circulation. Central banks have responded by asking whether the public should keep access to central bank money in a form that suits a digital economy (Brunnermeier et al., 2019; Bank for International Settlements [BIS], 2021).

What Bech and Garratt (2017) call a central bank digital currency is central bank money in digital form. It is denominated in the national unit of account and sits on the central bank's balance sheet as a direct liability. Two broad versions exist. Households and firms would pay with a retail CBDC in daily life, whereas a wholesale CBDC is open only to financial institutions, which use it to settle interbank obligations. Once a CBDC exists, both the ownership of claims and the route by which payments settle change, and so the core architecture of the financial system is touched (Auer et al., 2022).

Interest has grown at a remarkable pace. When the Bank for International Settlements surveyed central banks in 2022, 93 per cent of respondents reported some form of CBDC work (Kosse & Mattei, 2023). The Sand Dollar went live in the Bahamas in 2020, followed by Nigeria's eNaira in 2021 and Jamaica's JAM-DEX in 2022. China's e-CNY pilot ranks among the largest anywhere, and in late 2022 the Reserve Bank of India started wholesale and retail pilots of the digital rupee (Reserve Bank of India, 2022). A digital euro has reached the preparation phase in the euro area. The United States, by contrast, has taken a cautious and later restrictive line on a retail CBDC (Board of Governors of the Federal Reserve System, 2022).

For all this momentum, what CBDCs mean for financial systems is still contested. Their supporters expect lower payment costs, wider financial inclusion and faster, cheaper cross-border transfers. Critics see a different risk: a safe and liquid digital substitute for bank deposits could drain funding from commercial banks and amplify bank runs, besides raising concerns about privacy and state surveillance (Andolfatto, 2021; Fernández-Villaverde et al., 2021; Keister & Sanches, 2023). Theory and single-country case studies dominate the existing work. Cross-country empirical evidence on how CBDC development relates to payment, banking and stability outcomes remains thin (Ozili, 2023).

Five objectives guide the study. The first is to map how far CBDC development has progressed in a diverse group of economies, and the second to test whether CBDC readiness moves with financial inclusion, payment efficiency and the cost of cross-border remittances. Whether CBDC development draws deposits away from commercial banks, or alters financial stability, forms the third question. The fourth concerns opinion inside the profession: what do financial-sector experts perceive as the benefits and risks of CBDCs? Policy implications for central banks and regulators make up the fifth. From here the paper moves through the literature, the conceptual framework and hypotheses, the methodology, the results and a discussion of what they imply.

2. Review of Literature

2.1 Conceptual Foundations and Motives

CBDCs entered the literature as central bank money carried over into digital form. To place them, Bech and Garratt (2017) drew a "money flower" taxonomy built on four properties: who issues the money, what form it takes, who can access it and how it is transferred. On that map, CBDCs sit apart from cash, from reserves and from private digital tokens. Brunnermeier et al. (2019) went further. Digitalisation, in their argument, could pull apart the traditional roles of money and produce "digital currency areas" whose boundaries follow platform networks rather than national borders. Why central banks pursue CBDCs depends on income level, as the surveys by Kiff et al. (2020) and Auer et al. (2022) show. Payment safety, resilience and the preservation of monetary sovereignty weigh most in advanced economies. Emerging and developing economies care more about financial inclusion and about cutting transaction costs.

2.2 Design Architecture and Technology

Design decides how a CBDC meets the rest of the financial system. Auer and Böhme (2020) sort architectures into direct, indirect, hybrid and intermediated types; what separates them is the legal claim a user holds and how much of the operation the central bank runs itself. The BIS (2021) leans towards two tiers, with core infrastructure supplied by the central bank and customer onboarding and services left to banks and payment service providers. In the platform model of the Bank of England (2020) the arrangement is much the same, since private "payment interface providers" stand between users and a central ledger. Then come the finer choices, since token or account access, offline use, programmability and privacy safeguards each shift what a CBDC can deliver, and what can go wrong with it.

2.3 CBDCs, Commercial Banks and Monetary Policy

No channel is debated more intensely than bank intermediation. Should households shift deposits into CBDC, banks would lose a stable and cheap source of funding and might cut lending. Andolfatto (2021) shows, however, that where banking is monopolistic an interest-bearing CBDC can push deposit rates up and widen financial inclusion with no reduction in bank lending. A related conclusion comes from the quantitative model of Chiu et al. (2023): by disciplining bank market power, a CBDC paying a moderate interest rate can increase bank intermediation. In Keister and Sanches (2023), a CBDC makes exchange more efficient but can crowd out deposits and raise funding costs, and optimal design balances the two effects. During a run, Fernández-Villaverde et al. (2021) warn, the central bank may become a deposit monopolist. Bindseil (2020) proposes tiered remuneration to contain such risks, so that CBDC holdings above a threshold earn a less attractive rate. Turning to the macroeconomy, Barrdear and Kumhof (2022) estimate that issuing CBDC against government bonds could raise output permanently, through lower real

interest rates and transaction costs, and could hand the central bank an additional policy instrument.

2.4 Cross-Border Payments and the International Monetary System

Cross-border payments pass through chains of correspondent banks, and each link adds fees, delays and compliance checks, which is why they stay slow, expensive and opaque. Multi-CBDC arrangements connect the digital currencies of several central banks through compatible standards, interlinked systems or a common platform. The BIS (2021) and Auer et al. (2022) see in them a promising way to shorten settlement chains and reduce pre-funding needs. Brunnermeier et al. (2019) add a caution: where domestic currencies are weak, easily accessible foreign CBDCs could speed up currency substitution and so reshape the international monetary system.

2.5 Financial Inclusion and Payment Efficiency

In emerging economies, financial inclusion sits at the centre of CBDC work. Unbanked populations might be reached by a low-cost digital means of payment that needs no full bank account and can run offline or on basic phones (Kiff et al., 2020). Among its objectives the Reserve Bank of India (2022) lists inclusion, lower cash-management costs and a more efficient payment system. Experience so far is mixed. In its early years the eNaira saw low adoption, evidence that issuance alone does not secure use; trust, merchant acceptance, user experience and complementary digital infrastructure matter just as much (Ozili, 2023).

2.6 Risks: Privacy, Cyber-security and Financial Stability

Three concerns lead the analysis of the Board of Governors of the Federal Reserve System (2022): privacy, operational resilience and a possible transformation of the banking sector. So much would depend on a CBDC, as a single system of critical importance, that cyber-security and uninterrupted service become essential. Data protection is just as delicate. A CBDC ledger could expose fine-grained records of what individuals spend. In the view of the BIS (2021), a well-designed CBDC should keep such information private through tiered rules on identity and data access, and still leave room for legitimate anti-money laundering checks.

2.7 Research Gap

Models and design proposals abound in this literature. Empirical evidence does not. A typical study takes one economy or simulates a design that does not yet exist, and comparisons of economies at different CBDC stages across several outcomes at the same time are very rare (Ozili, 2023). Regulators lean on expert judgement, yet researchers seldom set that judgement beside quantitative indicators. Both gaps are addressed here by placing a cross-country panel, scenario analysis and an expert survey inside one framework.

3. Conceptual Framework and Hypotheses

CBDC readiness serves here as the explanatory construct, measured as a composite of policy, legal, technical and adoption progress. From the literature reviewed above, four channels are expected to carry its effect on the financial system. Payment efficiency and cost form the payment channel, and access to formal financial services forms the inclusion channel. Remittance cost and settlement speed make up the cross-border channel, while the intermediation channel covers the deposit funding of banks and, through that funding, financial stability. Digital payment penetration, income level and internet access enter as control variables. The hypotheses are as follows:

H1: CBDC readiness has a significant positive association with financial inclusion.

H2: CBDC readiness has a significant positive association with payment system efficiency.

H3: CBDC readiness has a significant negative association with cross-border remittance cost.

H4: CBDC readiness has a significant negative association with commercial bank deposit growth.

H5: Financial stability differs significantly across stages of CBDC development.

4. Research Methodology

4.1 Research Design

Methodologically, the study is explanatory and draws on mixed methods. Its backbone is a balanced panel of countries. Around that panel sit a comparison of what different cross-border payment models cost, scenarios of deposit substitution and a structured survey of experts.

4.2 Sample and Data Period

Thirty economies made up the sample, chosen so that every region, income group and stage of CBDC development was represented. Annual observations from 2019 to 2025 gave 210 country-year observations. Classification into four groups followed each economy's position at the end of the study period. The launched group (n = 4) contains the Bahamas, Nigeria, Jamaica and the Eastern Caribbean Currency Union; in the pilot group (n = 9) are China, India, Brazil, Russia, the United Arab Emirates, Thailand, Hong Kong SAR, Kazakhstan and Japan; the development group (n = 8) covers the euro area, the United Kingdom, Sweden, South Korea, Australia, Ghana, Indonesia and Turkey; and the research group (n = 9) consists of the United States, Canada, Switzerland, Singapore, South Africa, Mexico, Norway, New Zealand and Saudi Arabia.

4.3 Variables and Measurement

How each variable was defined and measured is listed in Table 1. The CBDC Readiness Index (CRI) is the average of five sub-indices, each normalised to a scale of 0 to 100 and given equal weight. They capture policy and legal readiness, technical infrastructure, the scale of pilots and

adoption, interoperability and cross-border connectivity, and institutional and regulatory capacity.

Table 1: *Definition and Measurement of Study Variables*

Variable	Code	Measurement	Scale
CBDC Readiness Index	CRI	Composite of five sub-indices (policy, technology, adoption, interoperability, capacity)	0–100
Digital Payment Penetration	DPP	Adults making or receiving a digital payment in the past year	% of adults
Financial Inclusion Index	FII	Composite of account ownership, usage and access points	0–1
Bank Deposit Growth	BDG	Annual growth in household and corporate bank deposits	%
Cross-border Remittance Cost	CRC	Average total cost of sending USD 200 abroad	% of amount
Payment Efficiency Score	PES	Speed, cost, availability and reliability of retail payments	0–100
Financial Stability Index	FSI	Capital, liquidity, asset quality and market stress indicators	0–100
Control variables	lnGDP, INT, PR	Log GDP per capita; internet users (%); policy interest rate (%)	—

Note. The authors normalised and computed every index for each economy and year.

4.4 Analytical Techniques

The distribution of each variable was summarised with descriptive statistics. Outcomes across the four CBDC stages were compared with one-way analysis of variance (ANOVA), and bivariate relationships were examined with Pearson correlations. For hypothesis testing, the Hausman test favoured fixed effects over random effects, so fixed-effects panel regression was used. Standard errors were clustered by economy. Year fixed effects absorbed common global shocks, the COVID-19 pandemic among them. The general model took the form:

$$Y_{it} = \alpha + \beta_1 CRI_{it} + \beta_2 DPP_{it} + \beta_3 lnGDP_{it} + \beta_4 INT_{it} + \beta_5 PR_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Here Y_{it} stands for FII, PES, CRC or BDG for economy i in year t; μ_i and λ_t are economy and year fixed effects, and ε_{it} is the error term. Only the deposit growth model included the policy rate (PR). No regressor had a variance inflation factor of 2.9 or above, so multicollinearity was not a serious concern.

4.5 Expert Survey

Usable responses came back from 240 of the 410 professionals approached with a structured questionnaire, so 58.5 per cent responded. Among them were 72 commercial bankers, 54 fintech

and payment professionals, 46 academics, 38 central bank officials, and 30 regulators and policy advisers. Each rated nine dimensions of CBDC impact on a five-point Likert scale, from very low (1) to very high (5). The items held together well (Cronbach's $\alpha = 0.874$).

5. Results and Analysis

5.1 The Global CBDC Landscape

Table 2 sets out where CBDC initiatives stand in selected economies. Apart from Nigeria, launched retail CBDCs cluster in small, open and largely Caribbean economies. Large economies are still at the pilot or preparation stage, so no single model of CBDC adoption emerges.

Table 2: *Status of CBDC Initiatives in Selected Economies*

Economy	CBDC	Type	Stage	Key milestone
The Bahamas	Sand Dollar	Retail	Launched	2020
Nigeria	eNaira	Retail	Launched	2021
Eastern Caribbean	DCash	Retail	Launched	2021
Jamaica	JAM-DEX	Retail	Launched	2022
China	e-CNY	Retail	Pilot	2020
India	e₹-R / e₹-W	Retail and wholesale	Pilot	2022
Brazil	Drex	Wholesale / tokenised	Pilot	2023
Russia	Digital ruble	Retail	Pilot	2023
Euro area	Digital euro	Retail	Development	2023
United Kingdom	Digital pound	Retail	Development	2023
Sweden	e-krona	Retail	Development	2020
United States	—	—	Research	2025

Note. The key milestone is the year a CBDC launched, its pilot began or its design/preparation phase started. For the United States, 2025 is the year of the policy decision against a federal retail CBDC.

5.2 Descriptive Statistics

Across the 210 country-year observations summarised in Table 3, progress was widely spread: the CBDC Readiness Index ranged from 14.20 to 91.60 around a mean of 52.48 (*SD* = 17.36). On average, digital payment penetration stood at 61.37 per cent and the Financial Inclusion Index at 0.642. Sending a cross-border remittance cost 5.92 per cent of the amount sent. Every variable had skewness and kurtosis within ±1, so the distributions were close enough to normal for parametric analysis.

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Table 3: *Descriptive Statistics of Study Variables (N = 210)*

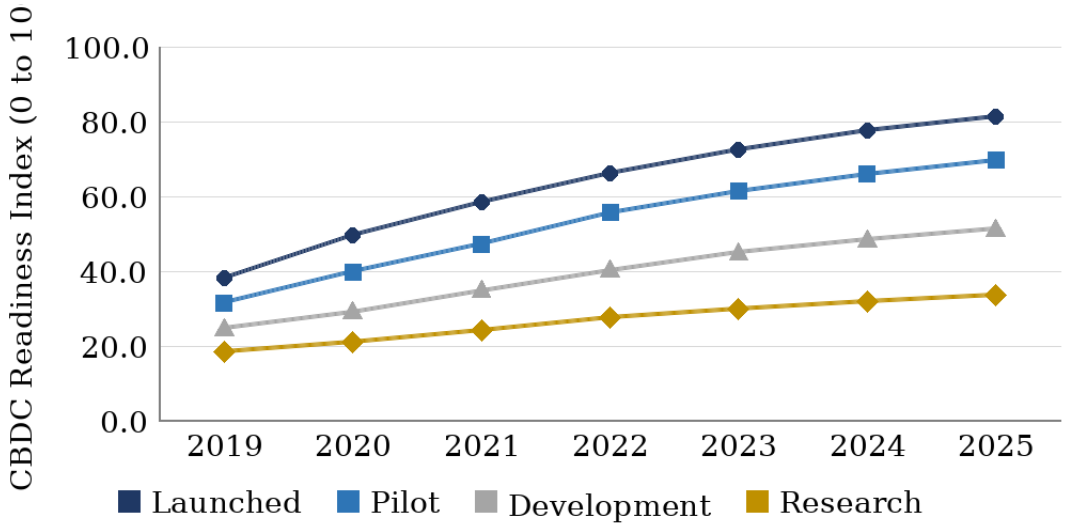
Variable	Mean	SD	Min	Max	Skewness	Kurtosis
CRI (0–100)	52.48	17.36	14.20	91.60	−0.21	−0.74
DPP (%)	61.37	19.84	18.50	97.30	−0.48	−0.62
FII (0–1)	0.642	0.174	0.231	0.948	−0.39	−0.55
BDG (%)	7.84	4.12	−3.60	19.70	0.27	0.41
CRC (%)	5.92	1.88	2.10	10.40	0.36	−0.18
PES (0–100)	68.15	12.47	38.90	93.20	−0.31	−0.29
FSI (0–100)	71.06	9.83	46.70	89.40	−0.44	0.12

Note. CRI = CBDC Readiness Index; DPP = digital payment penetration; FII = Financial Inclusion Index; BDG = bank deposit growth; CRC = cross-border remittance cost; PES = Payment Efficiency Score; FSI = Financial Stability Index.

5.3 Trend in CBDC Readiness

Mean readiness rose in every group between 2019 and 2025, as Figure 1 shows, though at very different speeds. In launched economies the index more than doubled, climbing from 38.2 to 81.4, and pilot economies went from 31.5 to 69.7. The research group moved only from 18.3 to 33.6. As a result, the distance between leading and lagging groups grew from 19.9 points in 2019 to 47.8 points in 2025, a widening divergence in digital monetary infrastructure across the world.

Figure 1: *Mean CBDC Readiness Index by Development Stage, 2019 to 2025*



Note. Each point is the group mean of the CBDC Readiness Index for that year.

5.4 Differences Across CBDC Development Stages

By 2025 the four stages had separated on several measures (Table 4). In the one-way ANOVA the gap was widest for CBDC readiness itself, $F(3, 26) = 62.18$, $p < .001$, followed by the change in financial inclusion since 2019, $F(3, 26) = 18.37$, $p < .001$. Stage also mattered for payment efficiency, $F(3, 26) = 9.41$, $p < .001$, and for remittance cost, $F(3, 26) = 7.92$, $p < .001$. Launched economies gained most in inclusion (14.8 percentage points) and paid least to send remittances (4.1 per cent). Highest scores on payment efficiency (78.9) and digital payment penetration (79.4 per cent) went to pilot economies, a group containing large and digitally advanced economies. Two outcomes did not move with stage. Neither deposit growth, $F(3, 26) = 1.12$, $p = .358$, nor financial stability, $F(3, 26) = 0.84$, $p = .484$, differed significantly.

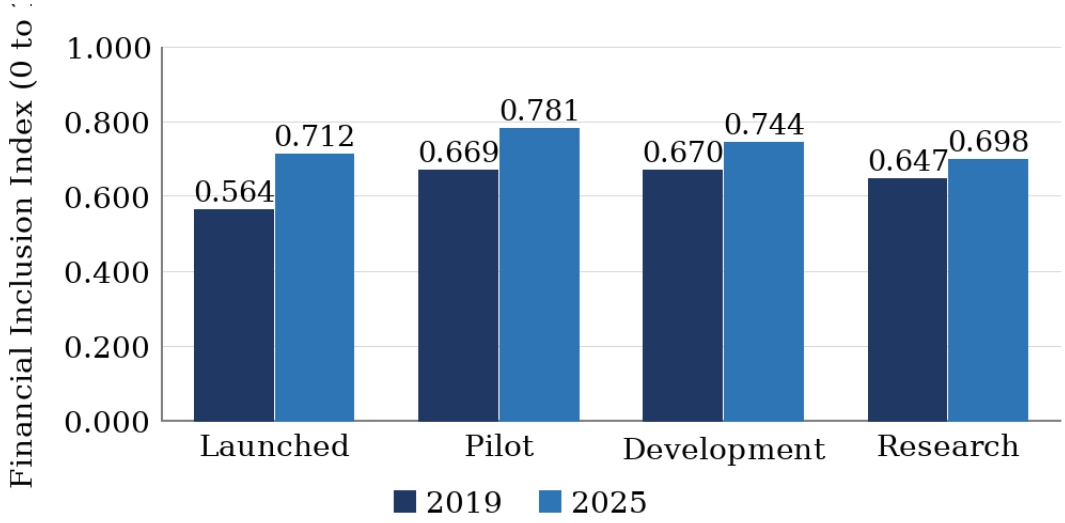
Table 4: *Mean Financial System Outcomes by Stage of CBDC Development (2025) and ANOVA Results*

Indicator	Launched (n = 4)	Pilot (n = 9)	Development (n = 8)	Research (n = 9)	F(3, 26)	p
CRI (0–100)	81.4	69.7	51.2	33.6	62.18	< .001
DPP (%)	58.6	79.4	72.1	63.8	4.87	.008
Change in FII (pp)	14.8	11.2	7.4	5.1	18.37	< .001
PES (0–100)	76.3	78.9	70.4	66.2	9.41	< .001
CRC (%)	4.1	4.8	5.6	6.2	7.92	< .001
BDG (%)	6.9	7.2	8.1	8.4	1.12	.358
FSI (0–100)	70.8	74.1	72.6	71.9	0.84	.484

Note. pp = percentage points (FII × 100); change measured from 2019 to 2025.

In 2019 the launched group had the weakest Financial Inclusion Index, at 0.564. It reached 0.712 by 2025 and closed much of the distance to the other groups (Figure 2). Where access to formal finance is weakest, then, CBDCs may make their largest contribution.

Figure 2: *Financial Inclusion Index by CBDC Stage, 2019 and 2025*



Note. Bars show group means of the Financial Inclusion Index.

5.5 Correlation Analysis

CBDC readiness moved together with payment efficiency (r = .61), digital payment penetration (r = .58) and financial inclusion (r = .49), and against remittance cost (r = −.46). Each of these coefficients in Table 5 reached p < .01. Its links with deposit growth (r = −.12) and financial stability (r = .09) were weak and fell short of significance. The strongest pairing in the matrix, between digital payment penetration and payment efficiency (r = .72), made it necessary to hold existing digital infrastructure constant in the regressions.

Table 5: *Pearson Correlation Matrix of Study Variables (N = 210)*

Variable	1	2	3	4	5	6	7
1. CRI	1						
2. DPP	.58**	1					
3. FII	.49**	.67**	1				
4. BDG	−.12	−.08	.14*	1			
5. CRC	−.46**	−.38**	−.33**	.05	1		
6. PES	.61**	.72**	.55**	−.04	−.42**	1	
7. FSI	.09	.21**	.26**	.31**	−.17*	.24**	1

Note. * p < .05. ** p < .01 (two-tailed).

5.6 Fixed-Effects Panel Regression

Fixed-effects estimates appear in Table 6. Model 1 ties CBDC readiness to financial inclusion with a positive and significant coefficient (β = 0.0042, p < .001): ten more points on the index go

with a 0.042 rise in the Financial Inclusion Index, close to 6.5 per cent of its sample mean. Payment efficiency responds too, for in Model 2 (β = 0.284, p < .001), the same 10-point rise adds 2.84 points to the efficiency score. Remittances become cheaper as readiness grows (Model 3: β = −0.036, p < .001), and a move from the research-group mean of 33.6 to the launched-group mean of 81.4 would take about 1.7 percentage points off their cost. Deposits behave differently: in Model 4 the coefficient on readiness is negative, small and not significant (β = −0.021, p = .243), whereas the policy rate carries the expected negative sign (β = −0.418, p < .001). Across the four models, explained within-economy variation runs from 23.8 to 61.2 per cent.

Table 6: *Fixed-Effects Panel Regression Results*

Variable	Model 1: FII	Model 2: PES	Model 3: CRC	Model 4: BDG
CRI	0.0042*** (0.0009)	0.284*** (0.051)	−0.036*** (0.008)	−0.021 (0.018)
DPP	0.0031*** (0.0007)	0.197*** (0.043)	−0.014* (0.007)	−0.009 (0.015)
lnGDP	0.0518** (0.0214)	3.120* (1.640)	−0.410 (0.290)	1.270 (0.880)
INT	0.0019** (0.0008)	0.084* (0.046)	−0.006 (0.005)	0.012 (0.019)
PR	—	—	—	−0.418*** (0.112)
Constant	0.112 (0.096)	24.610*** (6.920)	9.840*** (2.130)	4.360 (3.710)
Economy FE / Year FE	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
Within R^2	0.612	0.574	0.447	0.238
F statistic	48.27***	41.83***	27.36***	8.94***
Hausman χ^2 (p)	21.46 (< .001)	18.92 (.001)	16.55 (.005)	14.07 (.015)
Observations	210	210	210	210

Note. Standard errors, clustered by economy, appear in parentheses. FE = fixed effects. * p < .10. ** p < .05. *** p < .01.

5.7 Cross-Border Payment Efficiency

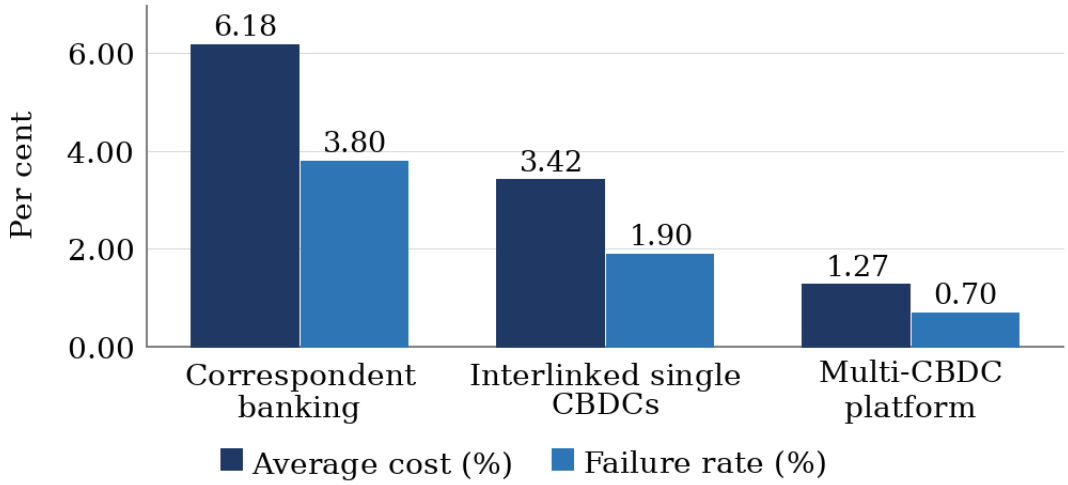
Three cross-border payment models are compared in Table 7. Correspondent banking charged an average of 6.18 per cent on a USD 200 transfer; a multi-CBDC common platform charged 1.27 per cent, and settlement that took about 52.6 hours under correspondent banking took a few minutes on the platform. Intermediaries fell in number from 4.3 to 1.0. On the platform the transaction failure rate dropped from 3.8 to 0.7 per cent, and the liquidity pre-funding requirement shrank by about two-thirds. Interlinked single-CBDC systems fell between the two. The differences in cost and failure rate are plotted in Figure 3.

Table 7: *Comparison of Cross-Border Payment Models*

Indicator	Correspondent banking	Interlinked single CBDCs	Multi-CBDC platform
Average cost (% of USD 200)	6.18	3.42	1.27
Average settlement time (hours)	52.6	6.4	0.12
Number of intermediaries	4.3	2.1	1.0
Operational cost per transaction (USD)	26.40	11.80	4.30
Transaction failure rate (%)	3.8	1.9	0.7
Liquidity pre-funding (index, base = 100)	100	61	34

Note. Figures are averages across the sample payment corridors.

Figure 3: *Cost and Failure Rate of Cross-Border Payments by Payment Model*



Note. Average cost is for a USD 200 transfer.

5.8 Deposit Substitution Scenarios

With no holding limits or remuneration controls (S1), the scenario analysis in Table 8 and Figure 4 projected an 8.7 per cent fall in bank deposits. Bank funding costs rose by 21 basis points in that case and loan supply contracted by 3.9 per cent. Holding caps cut these effects sharply. A cap equivalent to USD 3,000 (S3) held the outflow to 2.1 per cent; with tiered remuneration added (S4), the outflow came down to 1.6 per cent and lending fell by only 0.7 per cent. The stress scenario without safeguards (S5) looked very different. Outflows reached 22.4 per cent and the liquidity coverage ratio dropped by 31.5 percentage points, confirming that design safeguards matter most when the financial system is under distress.

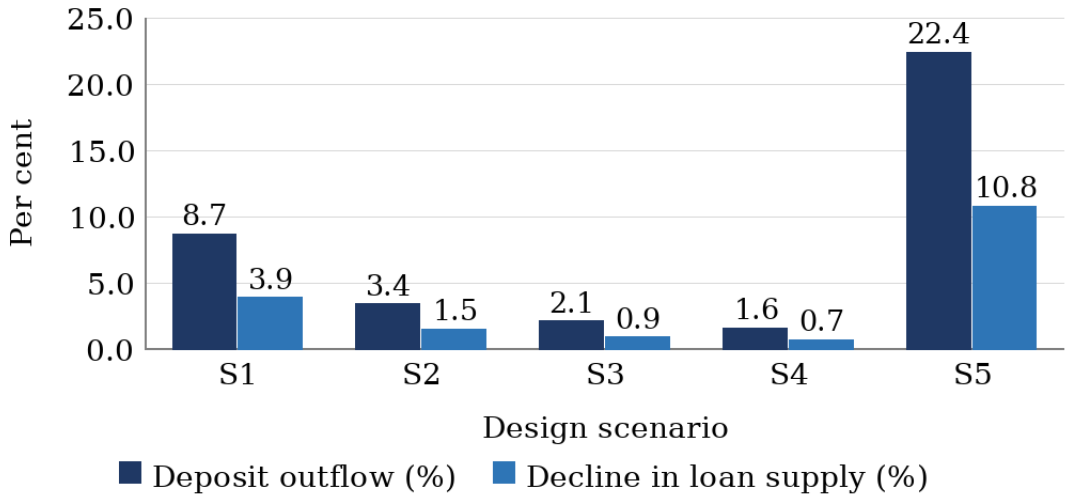
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Table 8: *Projected Effects of a Retail CBDC on Commercial Banks Under Alternative Designs*

Scenario	Deposit outflow (%)	Funding cost (bps)	Loan supply (%)	LCR change (pp)
S1: No cap, unremunerated	8.7	+21	−3.9	−11.2
S2: Cap ≈ USD 5,000	3.4	+8	−1.5	−4.6
S3: Cap ≈ USD 3,000	2.1	+5	−0.9	−2.8
S4: Cap ≈ USD 3,000 + tiered rate	1.6	+4	−0.7	−2.1
S5: Stress, no cap	22.4	+64	−10.8	−31.5

Note. bps = basis points; LCR = liquidity coverage ratio; pp = percentage points. The projections are averages across the sample economies.

Figure 4: *Projected Deposit Outflow and Decline in Loan Supply by CBDC Design Scenario*



Note. Table 8 defines each scenario.

5.9 Expert Perceptions

The experts, whose responses appear in Table 9 and Figure 5, expected CBDCs to do most good for payment efficiency (M = 4.31, SD = 0.68), financial inclusion (M = 4.12) and cross-border payments (M = 4.07). Their sharpest concerns were privacy and data protection (M = 4.02) and cyber-security (M = 3.96). They were more guarded about whether CBDCs would improve overall financial stability (M = 3.22). Professional background also mattered: on the risk of bank disintermediation, commercial bankers gave higher ratings than central bank officials (M = 4.18 vs. 3.29), $t(108) = 5.47$, $p < .001$.

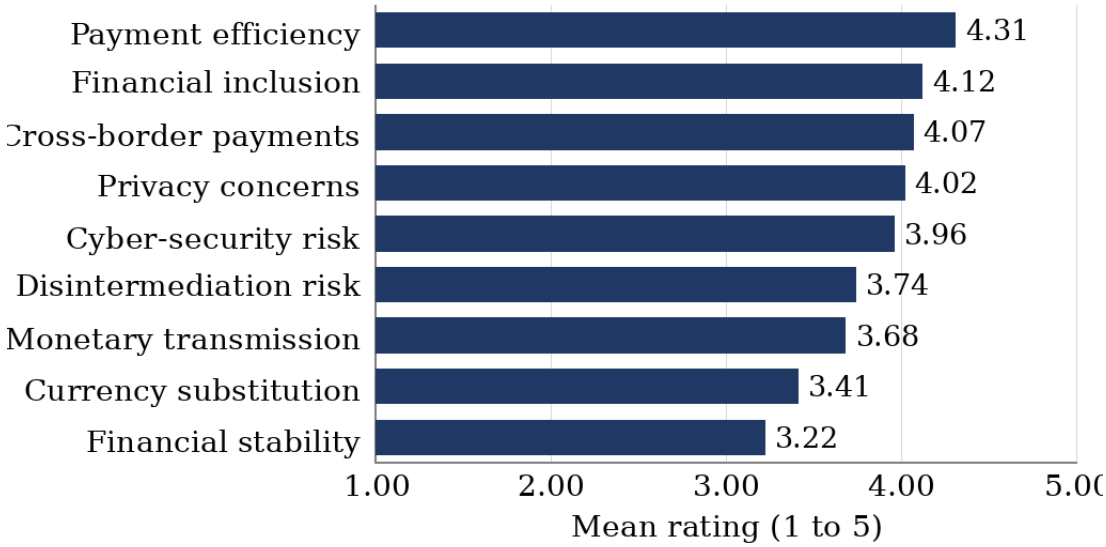
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Table 9: *Expert Perceptions of the Impact of CBDCs (n = 240)*

Dimension	Mean	SD	Rank
Payment system efficiency	4.31	0.68	1
Financial inclusion	4.12	0.79	2
Cross-border payments	4.07	0.81	3
Privacy and data protection concerns	4.02	0.86	4
Cyber-security risk	3.96	0.84	5
Bank disintermediation risk	3.74	0.92	6
Monetary policy transmission	3.68	0.88	7
Currency substitution risk (emerging economies)	3.41	1.02	8
Improvement in overall financial stability	3.22	0.97	9

Note. Ratings used a five-point scale (1 = very low, 5 = very high). Cronbach's α = 0.874.

Figure 5: *Mean Expert Ratings of CBDC Impact Dimensions*



Note. Based on 240 respondents.

5.10 Summary of Hypothesis Testing

Of the five hypotheses, three were supported (Table 10). The data did not support the expected erosion of bank deposits, nor any difference in financial stability between stages.

Table 10: *Summary of Hypothesis Testing*

Hypothesis	Relationship	Test statistic	Decision
H1	CRI → Financial inclusion (+)	β = 0.0042, p < .001	Supported

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Hypothesis	Relationship	Test statistic	Decision
H2	CRI → Payment efficiency (+)	β = 0.284, p < .001	Supported
H3	CRI → Remittance cost (−)	β = −0.036, p < .001	Supported
H4	CRI → Deposit growth (−)	β = −0.021, p = .243	Not supported
H5	Stability differs by stage	F = 0.84, p = .484	Not supported

6. Discussion

Where CBDC development has advanced, the payment and inclusion functions of the financial system show meaningful gains. Central banks in emerging economies report financial inclusion as a motive (Kiff et al., 2020; Auer et al., 2022), and the Reserve Bank of India (2022) sets it out as an objective; the positive association found here between readiness and inclusion fits both. Launched economies started from a lower base and gained more, which suggests CBDCs help most where banking networks are thin. Even so, the eNaira experience shows that adoption and trust matter as much as issuance (Ozili, 2023).

A public digital payment rail, on the view of the BIS (2021) and the Bank of England (2020), can increase competition, reduce costs and strengthen resilience, and the gain in payment efficiency supports that view. Digital payment penetration kept its strength as an independent predictor. CBDCs thus appear to build on existing digital ecosystems rather than replace them.

Some of the most striking results concern cross-border payments. Under a multi-CBDC platform, cost, settlement time and pre-funding needs all fell steeply, in keeping with the potential identified by the BIS (2021) and Auer et al. (2022). Capturing those gains requires shared standards, legal frameworks and governance. Experts' rating of currency substitution risk echoes, too, the warning by Brunnermeier et al. (2019) about monetary sovereignty where currencies are fragile.

H4 found no support. Deposit growth did not track CBDC readiness, which agrees with Andolfatto (2021) and Chiu et al. (2023), whose models show that a well-calibrated CBDC need not crowd out bank intermediation. The result also reflects the small scale of most CBDCs now in use and the holding limits many of them impose. The scenarios qualify it, however. Keister and Sanches (2023) and Fernández-Villaverde et al. (2021) identify a risk that turns acute under stress, when a safe digital asset can speed a run on bank deposits. Holding caps and tiered remuneration proved effective in the scenarios, which supports the proposal of Bindseil (2020). Since financial stability scores stayed level across stages, current designs appear so far to have kept systemic risk contained.

Privacy and cyber-security stand out in the expert survey. The Board of Governors of the Federal Reserve System (2022) gives the same concerns weight, and public acceptance turns on them. Commercial bankers and central bank officials disagreed on disintermediation risk, a sign that

CBDC design also involves negotiation among stakeholders. Whether the macroeconomic gains estimated by Barrdear and Kumhof (2022) arrive depends on securing that trust.

7. Policy Implications

The study carries lessons for central banks, governments and regulators. Clear public-policy goals such as inclusion, efficiency and resilience should drive the design of a CBDC, which must also fit local conditions, among them the maturity of the digital payment systems already in place. Protection against disintermediation belongs in the design from the outset. Holding limits, tiered or zero remuneration and two-tier distribution are the main tools, and further instruments can be kept in reserve for periods of stress. Public trust depends on privacy, which tiered identity requirements, data minimisation and independent oversight can secure. Cyber-security and operational resilience, offline functionality among them, should sit at the core of the design. The cross-border gains documented here are large; central banks will capture them only by agreeing common standards and legal frameworks for multi-CBDC arrangements, and they must guard against currency substitution as they do so. Issuance becomes actual use, especially among underserved groups, only when digital literacy programmes, merchant incentives and user-friendly interfaces accompany it.

8. Limitations and Directions for Future Research

Some limitations apply. Only four of the 30 economies, diverse as the sample is, have launched CBDCs, which limits the statistical power of comparisons between groups. Because the CBDC Readiness Index rests on composite measurement with equal weights, other weighting schemes could change the size of the estimates. The panel design shows association, not strict causality. The scenarios depend on assumed elasticities, and what the survey records is perception. Transaction-level data from live CBDCs, difference-in-differences designs around launch dates and study of how CBDCs interact with privately issued stablecoins are all open paths for future research.

9. Conclusion

Using cross-country panel data, scenario analysis and an expert survey, this paper has examined what central bank digital currencies do to global financial systems. Economies further along in CBDC readiness show wider financial inclusion, more efficient payment systems and cheaper cross-border remittances. Neither bank deposits nor financial stability shows significant erosion under current designs. Crisis conditions are another matter. The scenarios make clear that deposits could flee rapidly, and that holding limits, tiered remuneration and two-tier distribution are needed to contain that risk. Experts view CBDCs favourably but put privacy and cyber-security first among their worries. A CBDC is no cure-all, and no inevitable threat either. Backed by careful

calibration, a strong banking sector and robust data governance, it can make the global financial system more inclusive, efficient and resilient.

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