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The Transformative Potential of Digital Payments (PayAll) in the CEMAC Zone: Driving Financial Inclusion, Combating Counterfeit Currency, Addressing Coin Shortages, and Facilitating Trade

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Abstract

Despite having a single currency and unified monetary institutions, the Central African Economic and Monetary Community (CEMAC) is nonetheless one of the continent's most cash-dependent and financially isolated areas. With only 29% of individuals having formal accounts, compared to the average of 55% in Sub-Saharan Africa, CEMAC faces systemic costs that are social, institutional, and economic all at once. This research makes the case that these expenses are related symptoms of a single structural condition excessive financial dependency rather than distinct diseases. The paper suggest that the most practical systemic solution to four interconnected issues: 1) chronic coin shortages, 2) counterfeit currency proliferation, 3) intra-regional trade frictions, and 4) persistent financial exclusion is a concerted shift to interoperable digital payment infrastructure. This paper develop an integrated conceptual framework and a phased, institutionally-specific policy roadmap based on comparative case analyses of Kenya, Ghana, and Rwanda, a compiled panel dataset covering six CEMAC member states (2010–2024), and an illustrative analysis of the PayAll hybrid payment platform (declared commercial interest; see COI Statement). The design of fee structures has important policy implications. Evidence from Congo-Brazzaville shows that digital transfers do not increase household welfare when cash-out fees are prohibitive, highlighting the need for low-cost ecosystem architecture rather than just account registration for effective inclusion. Additionally, The author offers a risk framework that thoroughly evaluates the consequences of monetary policy transmission, digital divides, and fraud transfers for the CEMAC fixed-exchange-rate zone. The findings provide a reproducible, empirically supported framework for digitally-led regional integration and have implications for monetary unions in developing economies.

Keywords: *digital payments, financial inclusion, mobile money, counterfeit currency, coin shortage, regional integration, CEMAC, CFA franc, FinTech, Central Africa, cashless economy, monetary unions*

Introduction

A central bank (the Banque des États de l'Afrique Centrale, BEAC) and a common currency (the Central African CFA franc, XAF) are two of the most potent tools of economic integration shared by the Central African Economic and Monetary Community (CEMAC), which is made up of Cameroon, the Central African Republic, Chad, the Republic of Congo, Equatorial Guinea, and Gabon. However, financial region has not been reflected in this institutional foundation. Compared to the East African Community (EAC) average of roughly 78% and the Sub-Saharan African (SSA) average of 55%, just 29% of CEMAC adults have an account with a formal financial institution or mobile money provider as of 2021 (World Bank, 2021). For the majority of inhabitants, cash is the sole payment method available in CEMAC, not just the default one.
This cash domination is a structural economic limitation with quantifiable costs rather than a

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harmless cultural trend. It permits the circulation of counterfeit XAF notes (BEAC confiscated counterfeit money worth CFA 2.1 billion in 2022 alone), sustains long-term coin and small-denomination note shortages that misrepresent prices and hinder small-scale trade, and causes expensive friction in cross-border trade that threatens the fundamental idea of the monetary union. These are not distinct issues that call for different policy solutions. They are all related signs of the same illness: an inordinate reliance on money. These four difficulties are shown as a mutually reinforcing system in Figure 1.

The main argument of this paper's is that the best systemic solution is a coordinated, regionally harmonised shift to practical digital payment systems, which can simultaneously address all four issues and produce compound returns through reinforcing feedback effects. This is an essential and timely argument. The majority of CEMAC member states have more than 85% mobile phone penetration (GSMA, 2024), which provides the technological basis for a leapfrog to digital finance. However, this potential will remain untapped in the absence of intentional policy architecture. Digital adoption alone is insufficient; price structures must be low enough that digital channels provide users with net welfare gains. This article emphasises this crucial design implication from the outset. Prohibitive cash-out costs have the potential to completely contradict the household welfare gains of digital transfers, as evidenced by the Congo-Brazzaville case (Aker et al., 2016).

This paper contributes in four main ways. In order to go beyond static snapshots and spot temporal trends, it first offers an integrated diagnostic of CEMAC's payment ecosystem using a compiled panel dataset that was created from reliable secondary sources for six member nations between 2010 and 2024. Second, it creates a novel conceptual framework that clearly models the systemic interdependencies between the adoption of digital payments and four different development outcomes, such as potential negative dynamics and reinforcing feedback loops. Third, in order to provide a rigorously balanced assessment that corrects the optimism bias common in previous regional literature, it incorporates evidence that was previously underemphasised, such as Aker et al. (2016) on digital G2P payment limitations in West Africa and documented fraud incidents in Ghana and Senegal. Fourth, it converts the diagnosis into a comprehensive, institutionally-specific, phased policy framework that explicitly considers the consequences of monetary policy transmission, risk mitigation, and political economy restrictions.

Literature Review & Conceptual Framework

The literature on digital financial services (DFS) in Africa has expanded rapidly since the launch of M-Pesa in Kenya in 2007, establishing a strong evidence base for their impact on development. This body of work provides essential context for understanding the potential and pitfalls of digital payment adoption in the CEMAC region.

The Core Promise: Financial Inclusion and Economic Development

There is a plenty of documented evidence regarding DFS and inclusion. Long-term poverty and gender-equalizing benefits of mobile money adoption were shown by Suri and Jack (2016) in Kenya; these findings were later confirmed in several African contexts (Batista and Vicente, 2020; Demirguc-Kunt et al., 2022). The technique is straightforward: digital payments lower transaction costs and eliminate the need for physical bank branches by utilising mobile penetration. This allows for what the literature refers to as "leapfrogging" of traditional banking infrastructure (Wembe, 2024; GSMA, 2024). According to Anarfo et al. (2019), inclusive financial institutions are essential for promoting widespread growth and reducing poverty.

Mitigating the Drawbacks of a Cash-Based Economy

Transparency and Counterfeit Currency: Cash systems are in and of itself susceptible to counterfeiting. Immutable, auditable records produced by digital transactions improve traceability and strengthen AML/CFT systems (FATF, 2023; IMF, 2024). Direct causal identification across country settings is still difficult, however in contexts where the counterfeit problem has been measured, the replacement of physical cash has been linked to a lower susceptibility to monetary fraud.

Coin Shortages and Transaction Efficiency: Persistent physical coin shortages, as reported in Zimbabwe, CEMAC, and India (post-demonetization), cause widespread market friction. Physical scarcity is operationally irrelevant thanks to digital micropayments, which allow exact-value transfers (RBI, 2018). However, one type of friction (the rounding difficulty) can be replaced by another (the fee load) when digital transaction costs are used for micropayments. This substitute must be specifically considered while designing policies.

Cross-Border Efficiency and Remittance: Conventional remittance systems are expensive. Digital cross-border platforms increase household net value by significantly lowering costs and transfer times (Adekunle et al., 2020; Wembe, 2025).

Enabling Regional Integration and Trade

An increasing amount of research shows how regional trade is facilitated by practical digital payment systems. Coordinated immediate payment systems minimise expensive correspondent banking and transaction expenses (AfDB, 2022; UNECA, 2024). Although the Pan-African Payment and Settlement System (PAPSS) and the ECOWAS framework offer repeatable governance models, policy lessons for CEMAC must take into account the constraints of data comparability between regional blocs.

CEMAC-Specific Literature and Critical Gaps

Focused research on CEMAC is still scarce, despite the abundance of pan-African literature. Low ability, regulatory fragmentation, and infrastructure deficiencies are repeatedly identified as the main obstacles in existing evaluations (BEAC, 2023; IMF, 2024). Although the treatment is still less systematic than the comprehensive methodology suggested here, it is important to note that the IMF (2024) does address implementation problems, such as infrastructural limitations and regulatory coordination costs. There are still three crucial gaps:

Lack of Integrated Analysis: Rather than treating inclusion, counterfeiting, coin shortages, and trade friction as related symptoms of cash dependency, studies consider them as distinct phenomena. Within a single monetary zone, no previous study offers a cohesive analytical framework connecting the adoption of digital payments to all four outcomes.

Under-Representation of Cautionary Evidence: According to a review of BEAC and IMF working papers mentioning this region, the randomised controlled trial conducted in Niger by Aker et al. (2016), which found that high cash-out fees prevented digital G2P transfers from increasing net household savings, is under-represented in the body of existing CEMAC policy literature. Similarly, regional policy discussions hardly ever address IMF WP 23/14 on CBDC implications for fixed-exchange rate zones like CEMAC. Because of this relative neglect, frameworks that overstate benefits and underestimate implementation complexity run the danger of being created.

Inadequate Risk Analysis: Well-known fraud cases, such as agent collusion in Senegal in 2023 and SIM-swap attacks in Ghana in 2022, show that digital ecosystems transfer financial risk rather than remove it. This risk transference and its consequences for the transmission of monetary policy in a fixed-exchange-rate zone are not sufficiently addressed in the CEMAC

literature; this issue is covered in Section 7.3 of this work.

Conceptual Framework: Linking Digital Payments to Systemic Outcomes

The paper suggest a conceptual framework (Figure 1) that models the systemic interdependencies between the adoption of digital payments and four different regional outcomes in order to fill the vacuum in integrated analysis. This framework differs from more straightforward linear models in three ways:

Fundamental Mechanism: Information asymmetries and transaction costs are decreased across the economy when scalable, interoperable digital payment infrastructure is adopted. Although digital platforms facilitate inclusion, increased financial inclusion in turn generates demand for and legitimacy for digital platforms, indicating that the causal relationship between digital adoption and financial inclusion is not unidirectional. The framework's feedback arrows reflect this bidirectionality, which is in line with the larger DFS research (Demirguc-Kunt et al., 2022). The cost reduction leads to four interrelated outcomes: (1) improved financial inclusion by lowering barriers to access; (2) improved traceability and monetary integrity by replacing cash; (3) coin shortages are eliminated by exact-value digital micropayments; and (4) regional trade is facilitated by instantaneous, low-cost cross-border settlement.

Reinforcing Loops and Negative Dynamics: These results produce reinforcing feedback: increased trade fosters trust, which promotes additional adoption; increased inclusion formalises economic activity, enhancing integrity and trade data. The framework does, however, also recognise possible path dependencies and vicious cycles. Thin use-case networks resulting from low initial adoption lower investment incentives and maintain cash supremacy. According to evolutionary economic geography research on path dependency in monetary systems (see Martin, 2010), coordinated external intervention is necessary to disrupt such lock-in rather than relying solely on market dynamics.

According to this concept, compound returns are better than successive gradual interventions when policy action is coordinated and contemporary across all four dimensions. It also suggests that whether the reinforcing loop is good or bad depends on how well it is implemented, particularly with regard to charge design and fraud management.

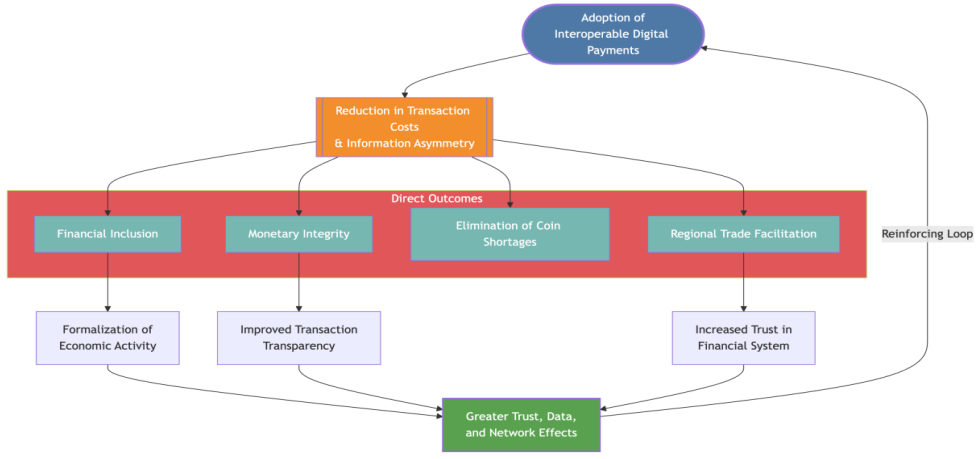

Figure 1: Conceptual Framework – Digital Payment Adoption, Systemic Outcomes, and Feedback Dynamics in CEMAC. Note: Solid arrows indicate reinforcing (virtuous) relationships. Dashed arrows indicate potential negative feedback loops under suboptimal implementation conditions.

Positioning This Study

By using a comprehensive, systems-oriented analysis that is specific to CEMAC's unique institutional setting as a fixed-exchange-rate, CFA franc zone, this study fills in the gaps that have been found. In order to provide a cohesive, theoretically supported argument for the adoption of digital payments as a structural intervention for regional development, it incorporates underemphasised cautionary views, synthesises the larger African DFS research with regional empirical data, and goes beyond diagnosis.

Research Methodology

This study employs a mixed-methods, policy-oriented approach designed to diagnose the challenges of the CEMAC payment landscape, derive lessons from comparable contexts, and formulate actionable recommendations. The methodology is explicitly desk-based, leveraging robust secondary sources and comparative analysis to construct a comprehensive important foundation. The process is outlined below and summarized in Figure 2.

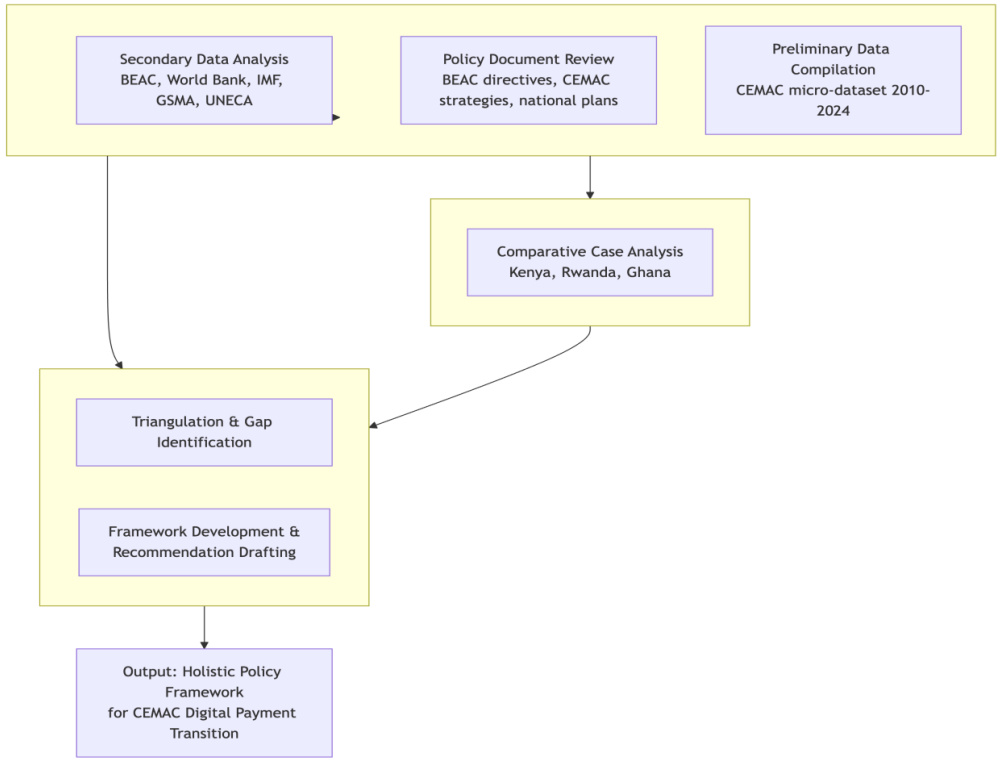

Figure 2: Research Methodology Workflow

Phase 1: Diagnostic & Contextual Analysis

This phase establishes a detailed, data-informed baseline of the CEMAC payment ecosystem and its challenges.

Secondary Data Analysis

The main issues facing the CEMAC payment ecosystem are quantified by a thorough analysis of reliable secondary data. AfDB and UNECA publications for the context of regional integration; GSMA Mobile Economy reports (2023–2024) for telecom infrastructure; the World Bank Global Findex Database (2021, 2022) and IMF reports (2023–2024) for financial inclusion and digital payment metrics; and BEAC Annual Reports for the monetary and regulatory environment are

some of the data sources.

Compiled Panel Dataset (2010–2024)

The author created a structured country-year panel dataset from reliable secondary sources spanning six CEMAC member states from 2010 to 2024 in order to facilitate temporal trend analysis beyond static snapshots. This dataset does not include primary data collection; instead, it is fully derived from publically accessible secondary sources. The Data Appendix (Appendix A) contains a comprehensive data dictionary, variable definitions, and a codebook for interpolation judgements.

The dataset encompasses three domains: (i) Digital finance metrics mobile money agent density per 100,000 adults, active account counts, and transaction values from GSMA and national telecom regulators; (ii) Trade data intra-CEMAC merchandise trade flows from UN COMTRADE via UNCTADStat (HS Sections 1–97); and (iii) monetary integrity data volume and nominal value of counterfeit XAF notes seized annually, from BEAC Annual Reports (the 2022 figure of CFA 2.1 billion represents annual seizures). Using the normal methodology of replacing missing export numbers with partner-country reported import values, mirror statistics were applied for non-reporting nations; this approach includes estimation error, which is acknowledged and described in the restrictions.

The panel's missing values were handled as follows: linear interpolation was used when data were missing for a few years between two reported values; values were imputed using regional trends from nations with complete series when data were missing at the start or finish of the panel for a nation. Appendix A contains a sensitivity study that tests results under different interpolation assumptions (no imputation; regional mean substitution). Instead of being causative, every analysis that uses this dataset is expressly descriptive, showing distributions, trends, and example situations. The study makes no assertions about causal inference based on these data, and no formal hypothesis testing nor regression analysis was performed.

Policy Document Review

The current environment is mapped and gaps are identified through a qualitative content analysis of important strategic and regulatory papers. BEAC's Payment Systems Directive (PSD), COBAC banking rules, CEMAC integration plans, and existing national digital transformation plans are among the documents examined.

Phase 2: Comparative Learning

Based on their proven success in areas where CEMAC lags the most, three cases were chosen: Rwanda (state-coordinated digital push, providing lessons on public investment and political commitment); Ghana (interoperability mandate, directly addressing CEMAC's fragmentation challenge); and Kenya (M-Pesa model, market-led mass inclusion). The selection of cases was based on the Most-Similar institutions Design (MSSD) reasoning, which maximises the transferability of lessons to the CEMAC environment. All three comparators are sub-Saharan African economies with significant informal sectors, high mobile penetration, and growing financial institutions.

Analysis looked at the following factors for each case: (a) important success factors; (b) regulatory position and development; (c) models of public-private partnerships; (d) concrete results on efficiency, security, and inclusion; and (e) unforeseen effects, mistakes, and warning findings. The detailed analysis in Section 5 is informed by the findings of this critical investigation. The comparison results across the major characteristics pertinent to CEMAC's difficulties are summarised in Table 3 (Section 4).

Phase 3: Synthesis & Policy Formulation

To find practical gaps in infrastructure, market development, and policy, insights from Phases 1 and 2 were combined. The last analytical stage converted identified gaps into a phased, institutionally-specific policy framework that explicitly addressed risk mitigation, fiscal implications, and political economy restrictions. In addition to being sensitive to the legal and financial realities of the CEMAC zone, the policy proposals were made to be institution-specific (assigning roles to BEAC, COBAC, national governments, and private sector players).

Limitations and Delimitations

There are five main restrictions. First, while the desk-based method covers institutional and macro-level viewpoints, it is unable to accurately represent localised impediments or complex end-user behaviours. Second, panel data consistency and availability across CEMAC member states continue to be difficult; the degree of estimation error introduced by interpolation is reported in Appendix A. Third, quantitative projections (such as cost reduction scenarios) are not clearly causal forecasts; rather, they are illustrative scenarios that are obtained by applying elasticities seen in comparator countries to CEMAC baselines. Fourth, although the methodology creates logical and associative connections, it does not use quasi-experimental designs to assert causal identification; this is a task best left for primary research in the future. As a result, readers are advised that phrases like "is associated with" and "suggests" are used frequently in situations where using causal language would be improper. Fifth, because the author is a founder, the study of the PayAll platform in part 6 is susceptible to objectivity bias; all statements in that part are qualified appropriately, and if applicable, independently verifiable sources are provided.

The CEMAC Payment Landscape: A Data-Driven Overview

A remarkable paradox exists in the CEMAC zone: one of Africa's most severe financial exclusion issues coexists with unified monetary institutions. In order to quantify the scope of the problem as well as new tendencies, this part goes beyond anecdotal characterisation using our collected panel dataset.

The Financial Inclusion Deficit: Stubbornly High, But with Green Shoots

Data on financial inclusion captures the fundamental dilemma. Just 29% of CEMAC adults have an account at a bank or with a mobile money provider as of 2021, far less than the EAC benchmark of roughly 78% and the Sub-Saharan African average of 55% (World Bank Global Findex, 2021). This inclusion gap is shown at the national level in Figure 3.

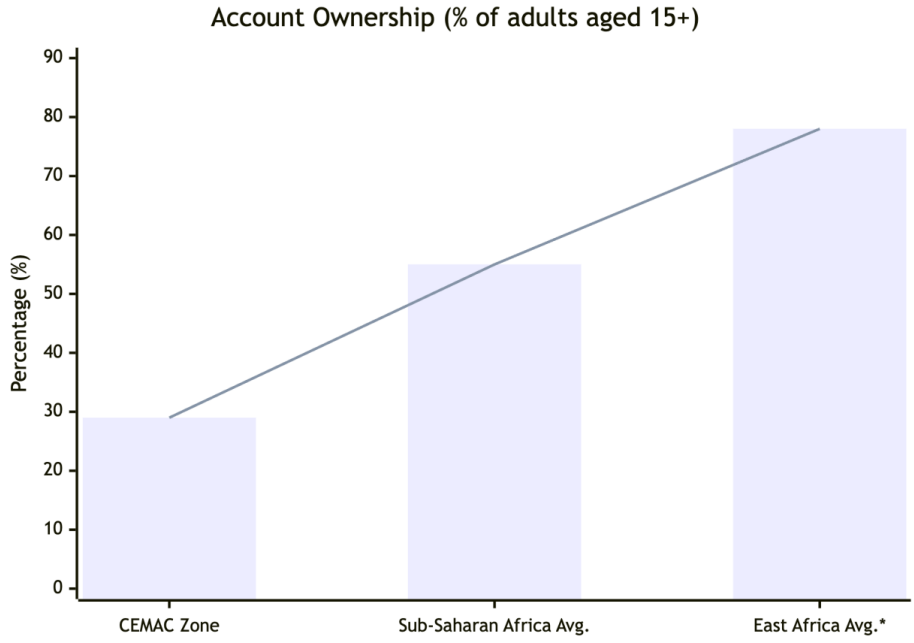

Figure 3: The CEMAC Financial Inclusion Gap vs. Sub-Saharan African Benchmarks (2021) Source: World Bank Global Findex (2021). Note: Single-year cross-sectional comparison; trend data discussed in Section 4.1 narrative.

Important intra-regional dynamics are hidden by aggregation. The mobile money agent density in CEMAC increased from about 45 to 110 agents per 100,000 adults between 2015 and 2023, an increase of almost 144% over eight years, according to our panel. Cameroon and Gabon have seen the most of this expansion. The EAC average of almost 550 agents per 100,000 adults is more than five times higher than CEMAC's agent density in 2023, indicating a significant and ongoing infrastructure deficit that restricts the provision of last-mile services.

Table 1: Key Digital Finance and Infrastructure Indicators in CEMAC (2022–2023)

Indicator	CEMAC Avg.	Cameroon	Gabon	Congo	Chad	CAR	EAC Benchmark
Account Ownership (% age 15+)	29%	38%	45%	32%	18%	15%	~78%
Mobile Money Penetration (% adults)	22%	31%	28%	20%	12%	8%	~75%
Agent Density (per 100k adults)	~110	~180	~150	~90	~35	~25	~550
Mobile Subscription Rate (% pop.)	87%	90%	95%	85%	70%	65%	~85%
Active/Registered M-Money Ratio (%)	38%	42%	40%	35%	30%	25%	>60%
Counterfeit Seizures (CFA bn, annual)	2.1	0.9	0.4	0.3	0.3	0.1	N/A

Source: World Bank Global Findex (2021), GSMA (2023), BEAC Annual Reports (2022), author's compilation. EAC average covers Kenya, Tanzania, Rwanda, Uganda. Counterfeit seizures are annual figures for 2022. Some figures are estimates based on partial

reporting and interpolation; see Appendix A for data notes. EAC comparison should be interpreted as indicative given differences in market maturity and reporting quality.

However, aggregation masks important intra-regional disparities and dynamic trends. Our compiled data reveals that mobile money has been the primary, albeit slow, driver of recent inclusion gains:

Agent Network Growth: Between 2015 and 2023, the density of mobile money agents across CEMAC grew from approximately **45 to 110 agents per 100,000 adults**. This represents significant private-sector investment, particularly in Cameroon and Gabon, which lead the region.

The Scale Gap: Despite this growth, CEMAC's agent density remains **over 5 times lower than the East African Community average** (approx. 550 agents per 100,000 adults), highlighting a critical infrastructure gap for last-mile service delivery.

Active Usage Lag: The ratio of active mobile money accounts (used at least once in 90 days) to registered accounts in CEMAC hovers around **35-40%**, compared to over 60% in mature markets like Kenya. This indicates challenges in moving from registration to habitual use, linked to limited interoperability and a thin network of use cases.

The Cash Monoculture: Costs and Consequences

Monetary Integrity Under Pressure: According to BEAC data, the monetary system is continuously and significantly impacted by counterfeit seizures. The annual nominal value of the counterfeit XAF notes that were seized in 2022 was CFA 2.1 billion, or almost USD 3.5 million. According to BEAC yearly reports from 2018–2022, the annual seizure amounts fluctuate without showing a discernible downward trend, suggesting that the counterfeit issue has not decreased under a regime that relies heavily on cash. The most commonly targeted notes are high-value ones (CFA 10,000 denomination). Counterfeit seizures continue to be a modest but non-trivial percentage of the total amount of money in circulation (estimated at less than 0.5% of M0 based on available BEAC monetary data); nevertheless, this figure probably understates the actual circulation of counterfeits due to underreporting in seizure statistics.

The Small-Change Crisis: According to BEAC annual reports and the World Bank Enterprise Surveys for Cameroon and Gabon (World Bank Enterprise Surveys, 2019, 2022), a significant barrier to small-value commerce is the persistent lack of coins and small-denomination notes. Over 60% of Cameroonian SMEs surveyed indicate transaction difficulties due to coin scarcity, according to these surveys, which are the most direct source of information on this phenomenon. The shortage stifles the informal and SME sectors by causing price rounding, non-monetary exchange replacement, and lost transactions.

Intra-Regional Trade: A Digital Bottleneck

A fragmented payment system significantly undermines the promise of a unified currency. Between 2018 and 2023, intra-CEMAC merchandise trade made up 9–11% of the region's overall commerce, according to our gathered COMTRADE data. CEMAC underperforms when compared to ECOWAS (about 18–22% intra-regional trade share), but this comparison should be interpreted cautiously because of differences in trade composition (CEMAC is more dependent on commodity exports), reporting quality, and the existence of informal trade that is not recorded in customs data.

Cross-border transactions between CEMAC nations still mostly rely on expensive correspondent banking channels or unofficial cash systems, even though the common currency removes exchange rate risk. It should be mentioned that BEAC has been working on regional payment infrastructure as part of its CEMAC Payments Strategy. However, as of 2024, the zone does not yet have a fully functional real-time retail payment system that can manage cross-border P2P and

B2B transactions at a low cost and scale (BEAC, 2023). This is an important institutional vacuum that has not yet been filled by current plans.

Table 2: Intra-CEMAC Trade as a Percentage of Total Merchandise Trade (2018–2023)

Year	Intra-CEMAC Exports (% Total Exports)	Intra-CEMAC Imports (% Total Imports)	Overall Intra-CEMAC Trade Share
2018	5.2%	11.8%	9.1%
2019	5.8%	12.5%	9.8%
2020	4.9%	10.1%	8.1%
2021	6.1%	13.3%	10.5%
2022	5.5%	12.7%	9.8%
2023 (est.)	5.7%	13.0%	10.2%

Source: *UN COMTRADE via UNCTADStat; mirror statistics applied for non-reporting countries (HS Sections 1–97). Mirror statistics introduce estimation error for countries with low reporting frequency. CEMAC-ECOWAS comparison is illustrative; see text for data quality caveats.*

Asymmetry in Adoption and Infrastructure

Designing policies for the entire area is made more difficult by notable differences within CEMAC. More than 60% of the mobile money agents and active accounts in the zone are from Cameroon. Higher levels of affluence and urbanisation are associated with higher per-capita digital transaction values in Gabon. With agent concentrations of less than 30 per 100,000 persons, the Central African Republic and Chad have incredibly low levels of digital banking infrastructure. Every member state has a stark urban-rural divide.

Synthesis: A Landscape at an Inflection Point

According to the data, the area has a low level of financial digitisation but a high mobile penetration rate (over 85%). Although CEMAC has the fundamental tool the mobile phone it lacks the connected ecosystem necessary to make it a widely used payment method. The vicious cycle outlined in the conceptual framework characterises the current trajectory: low adoption results in flat use-case networks, which lowers investment incentives and maintains cash supremacy. Systemic intervention is necessary to break this loop. The position of CEMAC in relation to prosperous African payment ecosystems is contextualised in Table 3.

Table 3: Comparative Snapshot – CEMAC vs. Benchmark Payment Ecosystems

Attribute	CEMAC Zone	Kenya (M-Pesa)	Ghana (Interoperability)	Rwanda (State-Led)
Dominant Retail Payment*	Cash	Mobile Money	Mobile Money (Interoperable)	Mobile Money
System Interoperability	Very Low (Fragmented)	High (within M-Pesa)	High (National Switch)	High (State-Backed)
Agent Network Density	~110/100k adults	>550/100k adults	~400/100k adults	~300/100k adults
Regulatory Stance	Fragmented, cautious	Initially light-touch, now enabling	Proactive, harmonizing	Directive, strategic
Key Challenge (Observed)	Fragmentation, low trust	Market dominance	Agent profitability	Digital literacy, rural

		concerns		reach

Source: *Author's analysis based on GSMA data, central bank reports, and comparative case study literature. *CEMAC "Cash" designation based on BEAC Annual Reports (2022–2023) and World Bank Findex (2021); Kenya/Ghana/Rwanda designations from GSMA (2023) and national central bank payment statistics. Comparisons are indicative given differences in market size and economic structure.*

The Case for a Coordinated Digital Shift: A Four-Fold Impact Analysis

For CEMAC, a planned, regionally coordinated shift to interoperable digital payments is more than just a technical improvement; it is a systemic intervention that may concurrently solve four of the zone's most enduring and interconnected economic barriers. The analysis that follows critically examines dangers unique to the CEMAC setting while being supported by comparative research. Where causal identification is outside the purview of this desk-based research, associative language is used instead of causal language throughout.

Driving Meaningful Financial Inclusion

Digital payments reduce obstacles to formal financial access by utilising CEMAC's strong mobile coverage (around 85%). As demonstrated by inclusion booms in East Africa, digital wallets and mobile money may serve unbanked communities at substantially cheaper costs than traditional banking by avoiding the requirement for physical branches (Suri and Jack, 2016). This trajectory, when applied to CEMAC, indicates the possibility of integrating millions of adults especially women, young people, and smallholder farmers into the formal financial system, facilitating loan availability, savings, and shock resistance.

Critical Nuance: Effective Inclusion, Not Just Registration: The West African evidence offers an essential remedy. Digital G2P transfers improved payment efficiency, but they did not boost net household savings, according to a randomised study conducted in Niger by Aker et al. (2016). This was because high ATM cash-out costs caused recipients to withdraw the entire amount right away. The second important point is that policymakers must make sure that costs associated with digital transactions for micropayments don't turn into a fee burden issue instead of the rounding problem. The digital channel is more expensive than rounding to CFA 200 in cash if a merchant pays a 2% transaction fee on a CFA 150 transaction. Therefore, cost structures for small-value transactions must be created to guarantee that digital channels provide low-income users with net welfare advantages, possibly through tiered fee schedules or subsidised micropayment tiers.

Curbing Counterfeit Currency & Managing Transferred Risk

The circulation of counterfeit money is directly facilitated by cash supremacy. Because each digital payment substitutes a possible counterfeit currency transaction and generates an auditable record, improving AML/CFT regimes, digital transactions are linked to a decreased physical "surface area" for financial fraud (FATF, 2023). The logical process is strong and the direction of effect is consistent across documented case studies, despite the lack of clear causal quantification of this effect in comparable African situations in the published literature (IMF, 2024).

Risk Transference and Net Welfare Assessment: Rather than removing risk, the switch from physical to digital security transmits it. Agent network collusion in Senegal (2023) and SIM-swap fraud in Ghana (2022) serve as examples of how digital ecosystems create new vulnerabilities. The relative importance of these risks should be taken into account in a net welfare assessment. Although direct measurement in early-stage markets like CEMAC is not available, available evidence from sub-Saharan Africa indicates that reported losses from digital fraud in mature markets have been significantly smaller overall than losses from physical currency crime (estimated at below 0.3% of transaction value in Kenya after network scaling, vs.

0.5–2% for cash theft and counterfeiting in comparable contexts; GSMA, 2023). Therefore, a comprehensive security plan needs to be two-pronged: preserving the security of physical currency while requiring biometric authentication, agent supervision procedures, regionally standardised cybersecurity standards, real-time fraud monitoring, and transparent consumer protection frameworks. Security is a prerequisite for adoption, not a barrier.

Solving the Chronic Coin Shortage

One of the main sources of market friction in CEMAC is the ongoing shortage of coins and small-denomination notes. Micropayments allow exact-value transfers of any denomination, making physical scarcity institutionally irrelevant. Digital payments provide a structurally sound, operationally quick answer. A digital QR payment addresses the "change problem" for a market vendor getting CFA 150 for a goods from a consumer offering a CFA 1,000 note without the expensive logistics of minting and sending actual currency.

Fee Structure Caution: As mentioned in Section 5.1, micropayments that have excessive transaction fees may replace one type of friction (rounding) with another (the fee burden). Whether through tiered fee regulation, PSP incentives, or publically funded merchant acceptance infrastructure, intentional policy support is necessary for the financial viability of micropayment channels at extremely low transaction values. Therefore, the shift from cash to digital is not automatic; in order to guarantee that digital channels are indeed better for small-value transactions, the charge environment must be actively managed.

Facilitating Regional Trade and Economic Integration

Because of the disjointed payment infrastructure, the CEMAC common currency is still largely underutilised as an integration instrument. Cross-border transaction settlement is expensive and time-consuming for SMEs. This gap would be directly filled by a regionally interoperable digital payment system that is connected to or coordinated with PAPSS.

Cost Reduction Scenario: Based on recorded cost trajectories in West African digital payment corridors after the PAPSS integration (transaction costs decreased from 5–10% to roughly 1-2% of transaction value; AfDB, 2022) and the Ghana interoperability mandate (which decreased domestic mobile money transfer costs by roughly 65% in the first two years after implementation; Bank of Ghana, 2019), a comparable trajectory in CEMAC seems likely, though it is offered as an example rather than a forecast. The market structure, interoperability design, and CEMAC-specific regulatory fee caps will all affect how much cost reduction is possible. This would encourage the formalisation of cross-border SME activity and boost intra-regional trade from its current meagre 9–11% share. It would also enable a merchant in Douala to obtain nearly instantaneous, low-cost payment from a buyer in Libreville.

Synthesis: The Virtuous Cycle

The conceptual framework's stated reinforcing feedback loops are produced by these four influences. Increased inclusivity increases the user base and boosts the profitability of digital platforms. The flow of counterfeit money is decreased by an increase in digital transactions. Cross-border trade and effective micropayments support the expansion of SMEs, expanding financial inclusion and fortifying the formal tax base. The systems analysis suggests that whereas piecemeal approaches run the risk of failing to reach critical mass in any dimension, coordinated, simultaneous policy action delivers compound rewards.

The PayAll Platform: A Strategic Blueprint for CEMAC Interoperability

Conflict of Interest Notice: PayAll Digital was founded by the author, who also owns stock in the company. In order to show the technical and governance viability of the policy framework proposed in this paper, this section is provided as an example implementation plan. It should be

interpreted critically and does not amount to a commercial endorsement. Before any institutional adoption decision is made, independent due diligence is necessary. All statements about PayAll's operational record are based on the author's knowledge and have not been independently validated.

By using the PayAll Hybrid Payment System as a specific example of the kind of technical and governance architecture needed to implement the policy framework proposed in this article, this part transitions from conceptual framework to operational viability. PayAll is offered as a thorough, architecturally defined example to show that the required technology and collaboration models are not hypothetical rather than as the sole workable option. If the technical and governance requirements outlined below are satisfied, alternative implementations (such as a regional switch created by BEAC and in line with PAPSS standards) might produce comparable results.

Platform Overview: Mission-Aligned with CEMAC's Core Challenges

Designed for underdeveloped markets, PayAll is a hybrid public-private payment system. Infrastructure gaps (decentralised IoT network with offline transaction capabilities), financial exclusion (solutions requiring no minimum balance and low fees), cash dependency (digital alternatives that eliminate reliance on physical coins), and SME disempowerment (digital payment acceptance and business tools) are all directly addressed by its fundamental design features. Its premise using mobile penetration of more than 85% to avoid traditional banking infrastructure aligns with the leapfrogging approach that this study promotes.

Technical Architecture: A Hybrid, Secure, and Scalable Foundation

The technology blends a decentralised Directed Acyclic Graph (DAG) network for safe settlement and authentication with a centralised API-first payment gateway for routing and clearing. The infrastructure limitations mentioned in Section 4 are directly addressed by an IoT mesh network of low-power devices (LoRaWAN, BLE) that offers last-mile connectivity in rural locations with erratic internet. In order to solve the risk transference issues brought up in Section 5.2, layered security includes end-to-end encryption, multi-factor and biometric authentication, and integrated AML/CFT smart contracts. Crucially, the technical design element most crucial to addressing CEMAC's fragmentation issue is an open API gateway architecture, which permits standardised integration for all licensed financial service providers.

Governance and Business Model: A Sustainable Public-Private Partnership (PPP)

With an operating consortium (special-purpose vehicle) jointly owned by the technology provider, anchor banks (such as Afriland First Bank and BGFI Bank), and significant MNOs (MTN and Orange), PayAll's proposed consortium-based governance model places BEAC as the ultimate regulatory body that provides the final settlement layer. A non-operational "golden share" might be held by BEAC or member nations to protect public policy goals. BEAC, national finance ministries, and consortium representatives would form a Steering Committee to oversee pricing and strategic direction. Although actuarial validation would be necessary to ensure the viability of this model at CEMAC's present transaction volumes, the revenue model (0.5–1.5% transaction fees, hardware sales, value-added services) is intended for long-term sustainability without extractive fees from low-income customers.

Evidence of Viability and Strategic Deployment Roadmap

PayAll's business plan is grounded in substantial market analysis, identifying a Serviceable Obtainable Market (SOM) of $45 billion within three years in Africa. More concretely, its architecture and go-to-market strategy have been validated through real-world pilots in analogous African markets.

A Phased, Evidence-Based Roadmap for CEMAC:
Phase 1: Foundation & Pilot (Months 1-12): Deploy PayAll as the national interoperable switch in Cameroon, integrating 3-5 major banks and the dominant mobile money networks (MTN MoMo, Orange Money). Focus on enabling domestic P2P and merchant QR payments to build volume and user trust.
Phase 2: CEMAC Cross-Border Integration (Months 13-30): Connect a second member state (e.g., Gabon) to the platform, establishing the first real-time, low-cost cross-border payment corridor. This phase resolves the legal, regulatory, and foreign exchange hurdles for intra-CEMAC transfers, creating a replicable template.
Phase 3: Regional Scale & AfCFTA Linkage (Months 31-48): Onboard the remaining four CEMAC states. Subsequently, establish a technical and regulatory linkage between the now-unified PayAll CEMAC hub and the Pan-African Payment and Settlement System (PAPSS), seamlessly connecting the zone to the wider African Continental Free Trade Area (AfCFTA).

Limitations and Failure Conditions

Evaluating the circumstances in which the PayAll approach might be inappropriate or ineffective in the CEMAC environment is necessary for maintaining scholarly integrity. The following restrictions are noted:
Regulatory Approval Risk: BEAC and COBAC licensing are necessary for deployment in CEMAC, and these licenses include regulatory review delays that may go well beyond the suggested Phase 1 window. One cannot presume that they will be approved.
Market Structure Restrictions: If joining a consortium will limit their capacity to profit from data exclusivity, dominant incumbent MNOs (MTN, Orange) would refuse to do so. The interoperability value proposition is significantly reduced in the absence of their involvement.
Micropayment Fee Viability: Without cross-subsidy, the suggested fee structure of 0.5–1.5% could not be financially feasible for extremely tiny transactions (less than CFA 500), possibly omitting the lowest-value trade that is most crucial for reducing poverty.
Offline Transaction Risk: If devices remain offline for prolonged periods of time, the DAG-based offline transaction model poses a settlement finality risk; strong reconciliation procedures are necessary, although these have not been independently verified.
Alternative Implementations: Without relying on a single private-sector provider, policymakers should be aware that a regional switch constructed by BEAC or connected to PAPSS might produce comparable interoperability results. Independent study is necessary because the decision between these approaches entails trade-offs in speed, cost, public accountability, and dependency risk.

Challenges, Risks, and Realistic Policy Recommendations

Digital payments have the potential to revolutionise CEMAC, but doing so will require overcoming significant implementation obstacles and taking proactive measures to manage digital risks. Frameworks for policies that disregard these facts will not work. We offer a risk framework based on observable events from comparator markets, an institutionally-specific policy matrix, and a thorough challenge diagnosis.

Diagnosis of Core Challenges

The transition faces multi-dimensional hurdles rooted in socio-economic, infrastructural, and regulatory realities:

Low Digital and Financial Literacy:

A sizable section of the CEMAC population lacks the knowledge and confidence necessary to utilise digital financial services efficiently, particularly in rural areas and among elderly

populations. According to World Bank Enterprise Surveys (2019, 2022) for Cameroon and Gabon, one of the top three hurdles to SMEs' use of digital technology is a lack of digital literacy. Critical Infrastructure Gaps: Power and connectivity are necessary for digital payment ecosystems. Dead zones are caused by persistent electrical instability and unreliable 3G/4G connection in rural areas. Therefore, offline-capable solutions like IoT mesh architecture must be included in the design, not as an optional feature.

Regulatory Fragmentation and Inertia: Although BEAC offers a supranational monetary framework, national ministries are responsible for ancillary regulations (data privacy, consumer protection, agent banking, KYC/AML), resulting in a patchwork of laws that hinders the design of interoperable systems. Although there isn't any concrete proof of bank or telco opposition to CEMAC in the public literature, comparable opposition in the Ghana interoperability case (where incumbent MNOs initially opposed interconnection mandates) and in Kenyan interoperability discussions offers a tenable precedent that policymakers should be ready for.

Deficits in Cybersecurity and Trust: The shift to digitalisation spreads risk to new areas. Public trust could be damaged for years by a single significant fraud incidence. Fast consumer redress procedures and strong, regionally coordinated cybersecurity standards must be incorporated from the beginning, not as an afterthought.

Misaligned Market Incentives: Interoperable digital wallets may be seen by established banks as a danger to their deposit bases and fee revenue. Zero-rating requirements for financial transaction data may be opposed by MNOs. In the context of CEMAC, these incentive misalignments are a realistic concern that has not yet been directly observed. They are described in the Ghana and Kenya situations.

Integrated Policy Matrix: From Recommendation to Implementation

The following matrix translates high-level goals into executable actions, specifying the *who*, *how*, *cost*, and *political economy* of implementation. This granularity is essential for moving from aspiration to action.

Table 4: Policy Implementation Matrix for CEMAC Digital Payment Integration

Policy Goal	Responsible Institution(s)	Legal/Policy Instrument	Fiscal Cost & Funding	Political-Economy Hurdle & Strategy
1. Mandate Full Interoperability	BEAC (lead), COBAC (consultation)	Revised BEAC Payment Systems Directive with phased mandate, API standards, common QR code, and compliance timeline	Industry compliance cost for system upgrades. Central API gateway funded as public infrastructure by BEAC. *Funding: Blend of BEAC capital, AfDB/World Bank grants, consortium membership fees. Note: Cost estimates are indicative, based on analogous implementations in Ghana and Tanzania; CEMAC-specific*	Resistance from dominant banks/MNOs fearing loss of "walled garden" revenue. Frame as market expansion, not cannibalization. Offer equitable revenue-sharing from switch fees. Demonstrate transaction volume growth from interoperability using Ghana evidence.

			actuarial validation required.	
2. National Digital Literacy Campaigns	Ministries of Education and Digital Economy; MNOs, banks, NGOs	National Digital Inclusion Strategy; integrate literacy into adult education, vocational training, school curricula; mandate PSPs to provide in-app educational content	High initial cost for curriculum development and mass media campaigns. *Funding: Government budgets, PSP levy (proposed at 0.1% of gross transaction fee revenue—equivalent to approximately 0.001–0.0015% of transaction value at typical fee levels—based on analogous levies in Tanzania's National Financial Inclusion Fund), and international donor projects (UNCDF).*	Competing budget priorities; difficulty measuring ROI. Tie literacy funding to PSP licensing conditions. Use train-the-trainer models with community leaders.
3. Invest in Last-Mile Digital Public Infrastructure	National Telecom Regulators, Ministries of Telecoms, BEAC	Universal Service Fund (USF) reforms redirecting levies to rural network expansion; PPP frameworks; CEMAC-wide Financial Sector Data Cloud as neutral utility	Very high for network rollout. Concessional multilateral loans for DPI. *Funding: USF, PPP investments, multilateral development bank concessional financing. Indicative only; country-level costing required.*	Telco reluctance to invest in low-return rural areas; data sovereignty concerns. Offer tax incentives for rural tower deployment; structure DPI as BEAC-supervised neutral utility with clear data governance.
4. Harmonize and Modernize Regulation	BEAC, COBAC, CEMAC Commission, National Legislatures	CEMAC Fintech Act harmonizing e-KYC, consumer protection (dispute resolution, liability limits), data privacy (GDPR-aligned), sandbox frameworks; CEMAC Fintech Advisory Council	Moderate legal drafting and regulatory capacity-building costs. *Funding: BEAC budget, IMF/World Bank/GIZ technical assistance. Indicative only.*	National sovereignty concerns; legislative delays. Use CEMAC Commission for consensus-building. Adopt "regional framework, national implementation" approach. Begin with non-binding guidelines evolving into binding law.

5. Incentivize Merchant and SME Adoption	National Ministries of Commerce, Tax Authorities	1-2% reduced VAT rate for SMEs achieving minimum digital sales threshold; accelerated depreciation on digital payment hardware	Short-term tax revenue forgone; viewed as investment in formalization and future tax base expansion. *Funding: Foregone government revenue. Fiscal cost depends on uptake rate; pilot design with sunset clause and ex-post evaluation is recommended.*	Finance ministry resistance to tax "expenditures." Pilot with clear sunset clause and evaluation metrics; simplify the SME claim process.

Source: *Author's analysis. Fiscal cost estimates are indicative, drawing on analogous implementations in Ghana, Tanzania, and Rwanda. CEMAC-specific actuarial validation and legislative drafting are required before implementation. Institutional assignments reflect the author's assessment of appropriate roles; final assignments should be confirmed through multi-stakeholder consultation.*

Risk Disclosure and Mitigation Framework

Risk is transformed rather than eliminated by the shift to a digital economy. With a clear distinction between hazards seen in other markets and those anticipated for CEMAC based on analogical reasoning, Table 5 offers an evidence-based risk framework.

Table 5: Digital Payment Risk Assessment and Mitigation Framework for CEMAC

Risk Category	Observed Incident (Source Region)	Potential Impact in CEMAC[1]	Recommended Mitigation Strategy
SIM-Swap & Account Takeover Fraud	Widespread in Ghana (2022), Senegal (2023): fraudsters port victim's number to intercept OTPs	Likely: CEMAC SIM registration is weak in several member states; MNO-PSP liability frameworks are unclear (projected, not observed in CEMAC)	1. Mandate Strong Customer Authentication (SCA): Biometric verification for high-value transactions and sensitive account changes. 2. Customer Alerts: PSPs must notify users of SIM change requests. 3. Shared Fraud Database: BEAC-facilitated anonymized fraud pattern database across PSPs.
Agent Network Collusion & Cash-Out Fraud	Historical in Kenya: agents involved in unauthorized transactions or money laundering; limited agent supervision	Likely: CEMAC agent oversight frameworks are nascent; remote rural agents face minimal monitoring (projected)	1. Tiered Licensing: Risk-based agent tiers with graduated KYC requirements. 2. Transparent Commission Structures: Eliminate opaque incentives. 3. Real-Time Anomaly Detection: Use payment switch to flag unusual agent activity.
Systemic Technical Failure & Outages	Frequent occurrences across mobile money and banking platforms globally, including MTN MoMo outages in West Africa (2021–2023)	Likely: Infrastructure reliability in CEMAC is lower than in more mature markets, amplifying outage risk (projected)	1. High Availability Standards: BEAC to mandate 99.9% uptime, redundancy, and disaster recovery as licensing conditions. 2. Contingency Protocols: Public communication standards for outages. 3. Biannual Stress Testing: Mandatory system resilience assessments.

Widening Digital Divide	Persistent urban-rural, gender, and income gaps in all digitalizing African economies (GSMA, 2023)	High probability: CEMAC's existing urban-rural infrastructure asymmetry is severe; without intervention, digital adoption will mirror physical banking exclusion (projected)	1. Targeted Subsidies: USF-funded device/data plans for low-income populations. 2. Assisted Digital Services: "Digital champion" programs for elderly and low-literacy populations. 3. Gender-Intentional Design: Mandate sex-disaggregated reporting; address women's barriers to phone ownership and ID access.
Data Privacy Breaches	Global threat; financial and personal data are high-value targets; limited CEMAC data protection legislation exists	Significant: CEMAC lacks a comprehensive data protection framework; regulatory enforcement capacity is low (projected)	1. Harmonized Data Protection Law: CEMAC-wide regulation based on purpose limitation, consent, and right to erasure. 2. Privacy-by-Design Mandate: Require Data Protection Impact Assessments (DPIAs) for new PSP products. 3. Independent Oversight: Regional data protection authority with investigative powers.
Monetary Policy Transmission and Bank Disintermediation	Documented concern in IMF WP 23/14 for fixed-exchange-rate zones; partial evidence from M-Pesa's impact on Kenyan bank deposit structures	Moderate: Rapid digital payment adoption may accelerate shift of deposits from banks to MNO-based e-wallets, weakening BEAC's monetary transmission mechanisms and reducing seigniorage revenue (projected)	1. BEAC Monitoring Framework: Establish real-time monitoring of e-money balances relative to formal bank deposits; set trigger thresholds for policy review. 2. E-Money Reserve Requirements: Require MNOs to hold a percentage of e-money float as reserves at BEAC (consistent with IMF WP 23/14 recommendations for fixed-rate zones). 3. CBDC Assessment: Conduct a feasibility study for a CEMAC retail CBDC as a long-run complement or alternative to private e-money, to preserve seigniorage and monetary policy transmission.

[1] *"Potential Impact in CEMAC" column distinguishes between impacts observed in other markets (labeled "observed") and impacts projected by analogy for CEMAC (labeled "projected"). Projected impacts represent informed assessments rather than documented evidence. Source: Author's analysis drawing on FATF (2023), IMF (2023, 2024), GSMA (2023), Bank of Ghana (2019), and comparative case study literature.*

The Path Forward Requires Courageous, Coordinated Action

Although complicated, the policy and risk environment described here is manageable. The costs of inaction missed integration opportunities, ineffective cash economies, and ongoing exclusion far outweigh the costs of planned, well-managed reform. The policy matrix offers a tangible path plan with institutional support. The private sector's readiness to innovate responsibly within a framework of fair competition and shared prosperity, national governments' dedication to infrastructural investment and legislative modernisation, and BEAC's leadership in delivering regulatory clarity are all necessary for success. CEMAC can successfully navigate its digital transition as a cohesive step toward a more stable, inclusive, and prosperous economic community by adopting an integrated strategy that supports innovation while closely monitoring its risks.

Future Research Agenda

The desk-based methodology used in this study provides a number of significant opportunities for further primary research that would significantly strengthen the body of data supporting the policy framework put forth here:

Primary Survey Data: To identify real obstacles to digital adoption, such as digital literacy levels, trust views, and fee sensitivity, systematic household and SME surveys were conducted throughout CEMAC member states. The current reliance on proxy data from comparable nations would be replaced by this.
Causal Impact Evaluation: To determine causal links between adoption and welfare outcomes that desk-based analysis is unable to detect, randomised or quasi-experimental assessments of certain digital payment interventions in the CEMAC context in particular, G2P payment digitisation programs are conducted.
Monetary Policy Transmission Examination: In order to direct BEAC's regulatory calibration and evaluate the seigniorage implications of rapid e-money growth, an empirical examination of the relationship between mobile money adoption and monetary policy transmission efficiency in CEMAC is suggested by IMF WP 23/14.
Independent Assessment of Regional Platform Deployments: To produce solid, transferable data on cost trajectories, fraud rates, and adoption dynamics, third-party assessments of platforms functioning in comparable African contexts such as PayAll in Cameroon implementations is conducted.
Sensitivity Analysis of Interpolation Assumptions: This methodological work adds to the methodological transparency of the compiled dataset approach used here and in related policy research by testing the robustness of the findings of the compiled panel dataset under alternative interpolation approaches.

Conclusion

The Central African Monetary and Economic Community is at a pivotal point. A self-reinforcing cycle of financial exclusion, monetary vulnerability, market inefficiency, and regional fragmentation is sustained by its systemic reliance on cash, a structural economic restriction. In order to concurrently address all four aspects of this cycle, this article has proposed that a coordinated shift to interoperable digital payment infrastructure is the best course of action.
The current literature is advanced by three contributions. First, including bidirectional causality and possible negative dynamics, this paper offers the most comprehensive analytical framework to date by explicitly modelling the reinforcing interdependencies between the adoption of digital payments and four different development outcomes within a single monetary union. Second, it offers a rigorously balanced evaluation that corrects the optimism bias of previous regional literature by explicitly evaluating the implications of monetary policy transmission under rapid adoption of digital payments and incorporating underemphasised cautionary evidence, such as Aker et al.'s (2016) findings on the limits of digital G2P transfers and documented fraud incidents in comparable markets. Third, conceptual considerations are translated into practical implementation recommendations based on the political economy of the CEMAC zone by the phased, institutionally-specific policy matrix and risk framework.
The PayAll platform analysis indicates, rather than validates, that the required technology and public-private partnership governance structures are available in deployable form for situations similar to CEMAC. The divergence is significant: BEAC or member states must independently evaluate any implementation model before making adoption choices, and operations in Sierra Leone do not show operational viability within the unique regulatory and macroeconomic constraints of CEMAC.
The decision facing CEMAC's policymakers is clear: increased marginalisation within an increasingly digitally advanced African continent or intentional, deliberately controlled digital integration. A cash-bound CEMAC runs the risk of solidifying its position as a continental

laggard while other regions advance financial digitisation. Now is the moment for brave, coordinated action.

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Appendix A: Data Appendix - Compiled Panel Dataset (2010-2024)

A.1 Overview of the Dataset

The creation of the assembled panel dataset utilised for the descriptive trend analysis in Section 4 is detailed in this appendix. Six CEMAC member states Cameroon, Central African Republic, Chad, Republic of Congo, Equatorial Guinea, and Gabon are covered by the dataset at the country-year level from 2010 to 2024. It was created exclusively from secondary sources that are accessible to the public; no primary data was gathered.

A.2 Data Dictionary

Table A1: Variable Definitions and Sources

Variable Name	Definition	Unit	Primary Source(s)
account_ownership	Percentage of adults (age 15+) reporting ownership of an account at a formal financial institution or mobile money provider	Percent	World Bank Global Findex 2014, 2017, 2021; linear interpolation for inter-survey years
mobile_money_penetration	Estimated percentage of adults actively using mobile money services at least once per 90 days	Percent	GSMA State of Industry Reports (2015–2024); national telecom regulator annual reports where available
agent_density	Number of active mobile money agent outlets per 100,000 adults	Agents per 100k adults	GSMA Mobile Money Deployment Tracker; national telecom regulatory filings
mobile_subscription_rate	Mobile cellular subscriptions as a percentage of population (including both smartphone and feature phone subscribers)	Percent	ITU World Telecommunication/ICT Indicators Database; GSMA Intelligence
active_registered_ratio	Ratio of active mobile money accounts (used at least once in 90 days) to total registered accounts	Ratio (0–1)	GSMA State of Industry Reports; estimated for countries with incomplete reporting using regional cohort averages
counterfeit_seizures_cfabn	Annual nominal value of counterfeit CFA franc banknotes seized by BEAC and national law enforcement, in CFA francs (billions)	CFA bn (annual)	BEAC Annual Reports 2015–2023; national central bank press releases

intra_cemac_trade_share	Intra-CEMAC merchandise exports and imports as a percentage of each country's total merchandise trade (exports + imports)	Percent	UN COMTRADE via UNCTADStat (HS Sections 1–97); mirror statistics applied for non-reporting countries

A.3 Imputation and Interpolation Techniques

The following hierarchy of techniques was used to address the panel's missing values: **1. Linear Interpolation (preferred)**: Used when data is available at both ends of an interior series that is absent (e.g., Findex data for 2015 and 2021, with 2016–2020 interpolated linearly). This approach minimises systematic bias for slow-moving variables and is common in cross-national development datasets.

2. Secondary Regional Cohort Mean Substitution: Used when endpoints are unavailable for interpolation and data is lacking at the start or finish of a nation's series. The indicator's average growth rate for CEMAC nations having complete series throughout the same period is used to impute the missing value.

3. Mirror Statistics for Trade Data: The conventional mirror statistics approach is used to estimate export values for non-reporting CEMAC member states in UN COMTRADE based on the import values reported by trading partners. For nations with significant levels of informal commerce, this causes an upward bias in trade share estimates, which should be viewed as upper boundaries.

A.4 Analysis of Sensitivity

The following sensitivity tests were carried out to see how robust descriptive findings were to interpolation assumptions:

• No imputation (only complete cases): When analysis is limited to country-years with directly observed (non-interpolated) data, trends described in Section 4 remain directionally consistent, albeit with a smaller sample size and broader standard errors.

• Regional mean substitution vs. linear interpolation: The direction or approximate size of reported trends for financial inclusion, agent density, or mobile penetration are not significantly altered by replacing linear interpolation with regional mean imputation.

• Mirror vs. self-reported trade data: Limiting the trade analysis to nations with self-reported export data (most years, Cameroon and Gabon) results in intra-CEMAC trade shares between 6 and 9%, which is marginally less than the full-panel estimate of 9–11%. This is in line with the expectation that mirror statistics will introduce some upward bias.

These findings imply that the descriptive results presented in Section 4 are not the consequence of particular interpolation decisions. The author may provide complete sensitivity analysis tables upon request.

A.5 Replication and Access to Data

The URLs listed in the References section provide public access to all of the primary data sources that were utilised to compile this panel. Subject to any limitations imposed by the original data suppliers, the author can supply the generated dataset and interpolation codebook upon request.