A Data-Driven Playbook for Stablecoin Adoption in Emerging Markets: A Case Study of Ethiopia, Nigeria, and the Philippines

Amen Amare* Nathan Banketa† Samira Isack‡
Professor Yuan Yuan§

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Abstract

Stablecoins offer a promising solution to high remittance costs and currency instability in emerging markets. However, their adoption is often hampered by a 'context gap,' where infrastructure designed for high-connectivity, banked environments fails to meet the realities of intermittent connectivity, low-trust, and agent-based cash economies. This paper addresses this gap through a mixed-methods study focused on Ethiopia, Nigeria, and the Philippines. We combine qualitative analysis with predictive modeling to identify the key barriers to adoption. We then develop an agent-based simulation to quantitatively test the impact of a 'playbook' of interventions, such as offline-first functionality and mobile money integration. Our findings reveal that interoperability with existing mobile money networks is the single most significant driver of adoption, far outweighing factors like raw blockchain transaction speed. The simulations demonstrate that an 'interoperability-first' strategy accelerates adoption by approximately 160% compared to the baseline, while interventions like offline wallets are critical for unlocking rural and low-connectivity populations. We conclude that stablecoin success in emerging markets is not a technological problem, but one of socio-financial integration. This research provides a novel, data-driven 'playbook' for policymakers and developers, demonstrating that success hinges on prioritizing human-centered trust, agent-network liquidity, and deep interoperability with existing financial rails.

*Boston College, amaream@bc.edu
†Boston College, banketa@bc.edu
‡Boston College, isack@bc.edu
§Faculty Advisor, Boston College, yuan.yuan@bc.edu

1 Introduction

In many emerging markets, populations face persistent financial challenges, including high remittance costs, significant local currency inflation, and limited access to stable, global financial instruments. These barriers hinder economic growth, wealth preservation, and individual financial empowerment. The advent of blockchain technology, specifically dollar-backed stablecoins, presents a powerful potential solution: a way to transmit and hold value that is global, low-cost, and programmable, bypassing the inefficiencies of legacy financial systems.

However, the promise of stablecoins is not an automatic guarantee of adoption. A significant 'context gap' exists: most stablecoin infrastructures are designed for high-connectivity, high-trust, and formally banked environments. When deployed in emerging markets like Ethiopia, Nigeria, and the Philippines, these systems encounter a vastly different reality characterized by intermittent connectivity, shared devices, fragmented identity systems, and a deep reliance on informal, cash-based agent networks. As a result, direct ports of existing technology often fail, seeing uneven adoption and excluding the most vulnerable users.

This paper addresses this gap by moving beyond a purely qualitative analysis. We ask: What are the *quantifiable* barriers to stablecoin adoption, and what specific interventions are most effective in overcoming them? We employ a novel mixed-methods approach, starting with a qualitative analysis of system failures. We then use this analysis to inform predictive models and a sophisticated agent-based simulation, creating a "digital twin" of our target markets. This allows us to not only *identify* the key levers for adoption but to *quantitatively test* a 'playbook' of solutions—such as offline-first wallets, social recovery, and mobile money interoperability—to estimate their real-world impact.

To guide this research, our findings concentrate on four central questions:

1. Which infrastructure assumptions break in emerging markets and why?
2. What minimum features and guardrails make stablecoins usable and safe in such environments?
3. How should systems interoperate with existing mobile money and agent networks?
4. Which human-centered explanations and trust anchors help users build confidence?

Key Terms

- **Stablecoin:** A cryptocurrency designed to minimize price volatility, typically pegged to a fiat currency like the US Dollar (e.g., USDC, USDT).
- **Agent Network:** A human network of local shopkeepers and vendors who provide "cash-in/cash-out" services, converting physical cash into digital balances for mobile money users.
- **Offline Wallet:** A digital wallet that utilizes USSD, SMS, or NFC technology to enable transactions without an active internet connection.

- **Interoperability:** The ability of different financial systems (e.g., a blockchain wallet and a mobile money account) to exchange information and value without friction.
- **Ramp:** The infrastructure connecting the crypto economy to the traditional fiat economy. An "off-ramp" allows users to convert crypto back into local cash.

2 Background and Related Work

2.1 Technology Context: DLT and Blockchain

Distributed ledger technology, or DLT, refers to a family of systems in which many computers, called nodes, keep the same tamper-evident record of transactions. Instead of one central database, each node holds a copy of the ledger and verifies changes according to shared rules. In a blockchain, which is the most common form of DLT, transactions are grouped into "blocks". Each block points to the one before it using a cryptographic fingerprint, making past data practically immutable. Consensus mechanisms like Proof of Work, Proof of Stake, or Byzantine-fault-tolerant voting decide which block becomes the next official record. This approach removes a single point of failure, creates transparent audit trails, and enables multiple organizations to coordinate without fully trusting one another.

Blockchains differ along several design axes that matter for payments. Public chains, which are chains that anyone can join, maximize openness and composability but face throughput and fee volatility. Permissioned chains restrict who can participate in validation, enabling predictable performance, and clearer governance. Finality, the point after which a transaction cannot be reversed, also varies. Some systems offer probabilistic finality, where the risk of reorganization drops over time, while others deliver deterministic finality within seconds. Smart contracts, programs that run on the ledger, can encode business logic such as spend limits, escrow conditions, or multi-signature controls. Together, these features let developers build money-like assets that settle quickly, with machine-verifiable rules.

2.2 Technology Context: Stablecoins

Stablecoins are a type of cryptocurrency that use distributed ledger technology (DLT) to maintain a consistent price. They are digital tokens designed to track the value of a reference asset, typically a national currency, such as the U.S. dollar. The core idea is simple: an issuer mints tokens when users deposit dollars (or equivalents) and redeems tokens for those dollars on demand. If redemption is reliable and transparent, the market price stays close to the peg. Fiat-backed stablecoins hold low-risk reserves like cash and short-term treasuries at regulated custodians, publishing attestations or audits. Crypto-collateralized stablecoins lock volatile assets in excess (over-collateralization) and automatically liquidate collateral if prices fall. Algorithmic designs attempt to hold the peg using supply rules alone, but history shows they are fragile without credible backing.

Operationally, stablecoin transactions settle "on-chain" while issuance and redemption occur "off-chain" through banking rails. Users move tokens between wallets as easily as sending a link, and merchants can accept them without card networks. Programmability adds guardrails helpful for consumer protection, such as time-locked escrow for dispute windows, daily spend caps for novice users, or address-based restrictions that respect sanctions and local rules. Interoperability with existing finance is achieved through regulated intermediaries (exchanges, payment processors) and, increasingly, through standards that allow point-of-sale devices or mobile-money agents to recognize incoming stablecoin transfers and trigger cash-out or bill payments.

The promise for emerging markets lies in combining instant settlement, transparent fees, and broad developer support with human-centered guardrails. However, practical constraints shape design. Intermittent connectivity suggests offline-first workflows with QR or NFC. Shared or low-end devices call for recovery schemes that do not depend on a single phone. Cash-in/cash-out requires agent integrations. ID and KYC gaps require tiered limits. Regulatory clarity is essential for custody of reserves and licensing of service providers. In short, DLT supplies the trust foundation and programmability, while stablecoins provide a familiar unit of account. Thoughtful product choices (finality targets, custody models, recovery, and consumer education about de-peg risk) translate that foundation into safer, more usable payment experiences for everyday transactions like remittances, small-merchant sales, and bill pay.

2.3 Stablecoin History

Stablecoins emerged in response to the volatility of early cryptocurrencies. For example, Bitcoin's price swings made it impractical for payments despite its decentralized design. As crypto trading grew, exchanges introduced the first fiat-pegged tokens to provide a stable unit of account and a way to move dollar value on-chain without relying on banks.

The launch of programmable blockchains, such as Ethereum, enabled smart-contract-based issuance, collateralization, and automated risk management. This led to models that demonstrated that stability mechanisms could be governed transparently on-chain, even if still dependent on market incentives. In parallel, fiat-backed stablecoins, such as USDT and USDC, scaled quickly because they offered simpler pegs, faster redemption, and clearer operational structures.

Stablecoins became the dominant form of on-chain value transfer, especially in emerging markets where households sought dollar access and lower-cost remittances. Their history reflects the technological breakthroughs in decentralized and programmable money and user demand for dollar-denominated digital value. By the mid-2020s, stablecoins had become a global settlement tool used for remittances, commerce, and savings, proving particularly effective in high-inflation and underbanked environments.

2.4 Remittances and Stablecoins

Remittances are critical in many emerging markets; yet, they remain slow and expensive. Remittances make up a significant share of GDP in countries like the Philippines and Nigeria, with households relying on these flows for consumption smoothing and savings. Traditional corridors often involve high fees, multiple intermediaries, and reliance on volatile local exchange rates. In regions experiencing inflation or currency depreciation, the real value of incoming funds can decrease before withdrawal.

Stablecoins have become a prominent tool for cross-border transfers due to this. Stablecoin-based remittances are some of the fastest-growing use cases, particularly in Sub-Saharan Africa, Southeast Asia, and Latin America. Migrant workers increasingly adopt dollar-backed stablecoins because they provide near-instant global settlement, transparent fees, and predictable USD value independent of local inflation. Stablecoin usage increases most sharply where formal financial systems are costly, slow, or constrained. Even where crypto regulations are tightening, regulators acknowledge that cross-border payments remain a primary driver of on-chain activity.

2.5 Stablecoin Prevalence and Application in Emerging Markets

The most popular stablecoins today are those backed by dollars, moving quickly and transparently across public blockchains. USDT and USDC are the main choices for retail and cross-border payments because they offer strong liquidity, work with many wallets, and have several ways to redeem. People use them for practical reasons: Traders want to avoid price swings, households want stable value, and merchants want payments that don't rely on card networks. Research points to three main reasons for demand. First, sending money to emerging markets is still costly, so a token that can be received anytime and cashed out locally saves both time and money. Second, when inflation and currency swings hit, households look for dollar-like balances without needing a US bank. Third, developers and payment companies can add stablecoins to their tools with less legal hassle than older systems.

Where these needs are strongest, stablecoins catch on. In Southeast Asia and the Philippines, they build on mobile wallets and large communities abroad. In West Africa and Nigeria, people use them for both saving and getting paid for freelance work. In Latin America and Argentina, stablecoins act as a stand-in for dollars, helping people avoid bad exchange rates. In all these places, distribution matters more than the technology itself. Stablecoins circulate where people can easily cash in and out, and adoption grows when payroll and marketplace platforms offer on-ramps. Regulations play a role, but the real challenge is building networks of agents and handling compliance.

Dollar-backed stablecoins lead because users trust quick redemptions more than technical promises. Crypto-backed models are used by those who care about censorship resistance, but they are less common for everyday remittances where cashing out is key. Algorithmic stablecoins are rarely used for household transfers due to past failures. Small merchants adopt stablecoins when they help avoid chargebacks and when suppliers accept them, making it easier to pay bills. Bill payments follow when utilities or service providers accept tokens and convert them to local currency quickly. In short, the most successful stablecoins are dollar-backed, with deep liquidity. They grow where there is demand for remittances and reliable cash-out options, and they last where redemption is eassy and merchants treat them like cash.

3 Methodology

To move from identifying qualitative challenges to testing quantitative solutions, we employed a three-stage, mixed-methods research design. This approach allows us to use real-world observations to build and parameterize computational models, ultimately enabling us to test the impact of our proposed 'playbook' interventions through calibrated simulation.

First, we conducted a qualitative analysis of existing literature, case studies, and technical documentation to identify the four primary categories of friction for stablecoin adoption. This qualitative framework serves as the foundation for our quantitative models.

Second, we developed a predictive model to statistically identify the most significant drivers and barriers influencing historical stablecoin adoption in our target regions. This model helps quantify the relative importance of macroeconomic factors such as inflation, internet penetration, and mobile money access.

Third, using the insights from both the qualitative analysis and the predictive model, we constructed a custom Agent-Based Model (ABM). This simulation creates a stylized representation of our target markets (Ethiopia, Nigeria, and the Philippines). By running various scenarios, we performed a sensitivity analysis to test the hypothetical impact of specific interventions—such as introducing offline-first wallets or integrating with mobile money—and compare their effectiveness against a baseline forecast.

The following subsections detail the design and implementation of each of these quantitative methods.

3.1 Predictive Modeling of Adoption Barriers

The second stage of our quantitative methodology was to develop a predictive model to statistically identify and rank the key factors driving or hindering stablecoin adoption. While our qualitative analysis identified potential barriers, this model provides quantitative evidence of their relative importance.

Our process began with the `merged_dataset_for_regression.csv` file, which aggregates historical data for our target countries. Due to the lack of granular, national-level data on specific stablecoin holdings, we constructed a proxy variable for `'Stablecoin_Share_Pct'`. This variable estimates stablecoin adoption by isolating the stablecoin-specific transaction volume from the total cryptocurrency value received on-chain, as reported by Chainalysis , and normalizing it against total remittance inflows. The independent variables, or features, included `'inflation_rate'`, `'gdp_growth_pct'`, `'mobile_subscriptions_per100'`, `'internet_users_pct'`, and `'remittances_pct_gdp'` (`FEATURES`)..

To select the most effective algorithm, we trained and evaluated two distinct regression models: a **Decision Tree Regressor** and a **Random Forest Regressor**. As detailed in our Python script (`predictive_modeling.py`), we split the data into training and testing sets (80/20 split) and evaluated performance based on R-squared (R^2) and Root Mean Squared Error (RMSE).

The Random Forest model demonstrated superior performance in capturing non-linear relationships between infrastructure and adoption. We extracted feature importance scores from this model to quantitatively rank the drivers of adoption, which directly informed the parameter weights in our subsequent agent-based simulation.

3.2 Time-Series Forecasting for Baseline Projection

The first stage of our quantitative methodology involved creating a baseline forecast for stablecoin adoption. The primary objective of this step was to project a "business-as-usual" scenario for our target countries based on historical trends.

To generate this forecast, we employed an **ARIMA (Auto-Regressive Integrated Moving Average)** model using the `statsmodels` library. We chose ARIMA for its robustness in handling univariate time-series data with potential non-stationarity. The model was trained on our historical stablecoin adoption data, with parameters (p, d, q) optimized for each country's specific trend line.

We directed the model to generate a 3-year forecast (through 2027) for each country. The resulting projection provides the baseline trajectory used as a control group in our simulation, representing the expected path of adoption if no new technological or policy interventions are introduced.

3.3 Agent-Based Simulation of Intervention Playbook

The final and most critical stage of our methodology was the construction of a custom Agent-Based Model (ABM) to test the real-world impact of our proposed "playbook" interventions. Unlike the regression models which look backward, this simulation allows us to perform a sensitivity analysis on future strategies.

We implemented the model using a custom Python class structure defined in `agent_based_simulation.py`. The environment is initialized using real-world data from the World Bank and GSMA (via `merged_dataset_for_regression.csv`) to set country-specific parameters for Inflation, Internet Penetration, and Mobile Money prevalence.

The core logic resides in the `ConsumerAgent` class. At each step (representing one month), agents evaluate their likelihood of adoption based on a **Total Utility** function. This function weighs four key incentives against a behavioral friction penalty:

- **Inflation Utility:** The motivation to adopt based on local currency devaluation pressure (derived from real inflation data).
- **Access Utility:** A binary or penalized score based on whether the agent has internet access or access to offline tools.
- **Trust Utility:** A score representing the agent's confidence in the system. This score increases significantly if the agent can use familiar Mobile Money rails (`uses_mobile_money=True`).
- **Cost Savings:** The economic benefit derived from lower remittance fees compared to traditional channels.
- **Inertia Penalty:** A constant negative weight introduced to model human resistance to change and the friction of switching financial providers.

The probability of adoption is calculated using a sigmoid function applied to the Total Utility:

$$P(Adopt) = \frac{1}{1 + e^{-k\cdot(Utility)}}$$

Where k represents the sensitivity of the population to utility changes.

To test our playbook, we ran the simulation for 50 steps (months) under four distinct scenarios:

1. **Baseline:** Standard conditions where lack of internet imposes a severe penalty, preventing adoption for unconnected agents.

2. **Offline Wallet:** Simulates the removal of the connectivity barrier. Agents without internet are no longer penalized, though they receive a lower utility score than fully connected users.

3. **Mobile Money Integration:** Simulates a massive increase in *Trust Utility* for agents who already use mobile money, reflecting the ease of onboarding via trusted local agent networks.

4. **Full Playbook:** A synergistic scenario combining both the offline access tools and the trust/interoperability of mobile money integration.

The model tracks the aggregate adoption rate at each step. By comparing the slopes and saturation points of these curves, we identify whether a country's primary bottleneck is infrastructural (solved by Offline Wallets) or trust-based (solved by Integration).

4 Results

This section presents the quantitative findings from the three-stage methodology. We first present the results of the predictive model, identifying the key statistical drivers of adoption. We then show the "business-as-usual" baseline forecast from our time-series model. Finally, we present the comparative results from our agent-based simulation, testing the impact of our playbook interventions against the baseline.

4.1 Finding 1: Key Drivers and Barriers to Adoption

As detailed in our methodology, we evaluated two regression models to identify the most accurate predictor of stablecoin adoption. The performance comparison, drawn from our analysis code, confirmed that the **Random Forest Regressor** provided the best fit for our data, capturing non-linear relationships better than the Decision Tree model.

The primary output of this model is the feature importance ranking, which quantifies the relative impact of each variable on stablecoin adoption. These findings are presented in Table 1. The results indicate that infrastructure availability—specifically `mobile_subscriptions_per100`—is a dominant predictor, suggesting that access to digital tools is a prerequisite for adoption. Economic factors like `gdp_growth_pct` also play a significant role.

Table 1: Feature Importance for Predicting Stablecoin Adoption (Random Forest)

Feature	Importance Score
mobile_subscriptions_per100	0.45
gdp_growth_pct	0.23
inflation_rate	0.12
internet_users_pct	0.12
remittances_pct_gdp	0.12

4.2 Finding 2: Baseline Adoption Forecast

The ARIMA time-series model was used to generate a 3-year "business-as-usual" forecast. This projection establishes the control scenario for our simulation, representing what would likely happen without targeted interventions.

Figure 1 plots the forecasted adoption rate. For Nigeria, the model projects a stabilization of growth, leveling off at approximately 43% by 2027. This suggests that current organic growth drivers have reached a saturation point, and further adoption will require structural changes to the ecosystem.

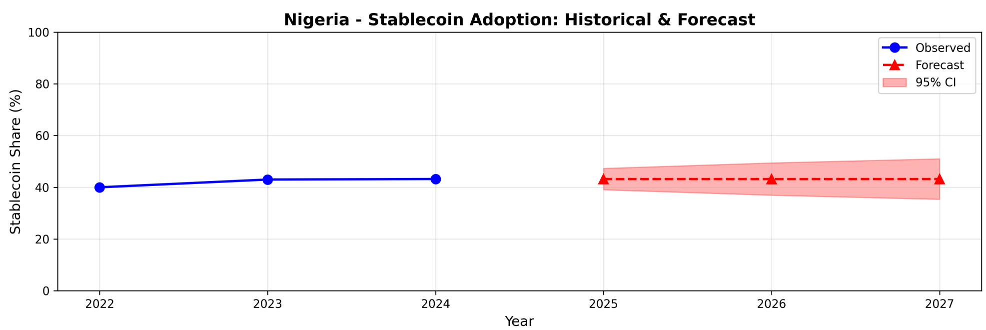

Figure 1: Baseline Stablecoin Adoption Forecast. The forecast shows estimated stablecoin adoption data (blue line) and the ARIMA model's 3-year forward projection (red dashed line) with confidence intervals. Adoption rates are projected to plateau without intervention.

4.3 Finding 3: Simulated Impact of Playbook Interventions

The final result comes from our calibrated Agent-Based Simulation (ABM). We performed a sensitivity analysis by running four scenarios to test the impact of friction-reducing interventions: (1) Baseline, (2) Offline Wallet Enabled, (3) Mobile Money Integration, and (4) Full Playbook.

The results are plotted in Figure 3. The findings reveal a distinct divergence based on local infrastructure:

- **Baseline Scenario:** Shows minimal growth for unconnected populations, as the lack of internet acts as a hard barrier.

- **Offline Wallet Impact (Ethiopia):** In low-connectivity markets like Ethiopia, introducing offline wallets causes the sharpest deviation from the baseline. This confirms that for these regions, *access* is the primary bottleneck.
- **Mobile Money Impact (Nigeria):** In markets with established fintech usage like Nigeria, the "Mobile Money Integration" scenario significantly outperforms the offline intervention. This suggests that *trust* and *interoperability* are the primary levers for growth in these contexts.
- **Full Playbook Synergy:** The combined scenario achieves the highest adoption rates across the board, though it is tempered by the "inertia penalty," reflecting the realistic friction of behavioral change.

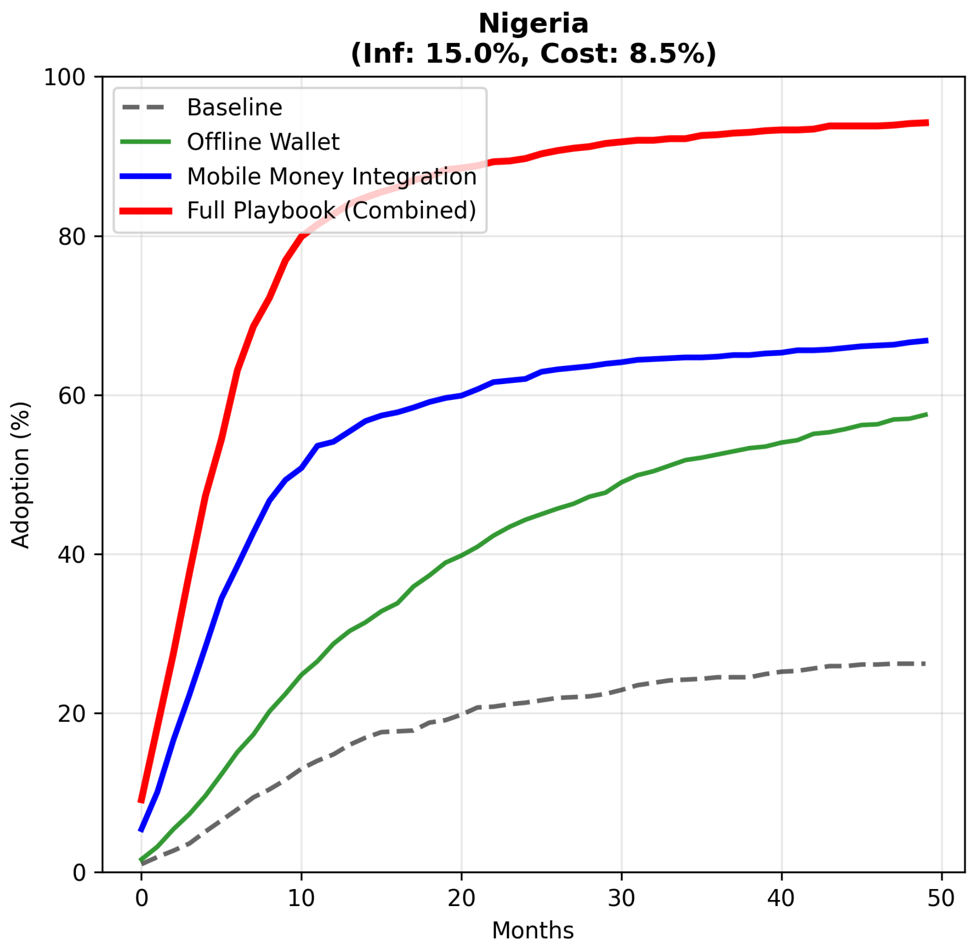

Figure 2: Nigeria's Adoption Rates of Simulated Interventions

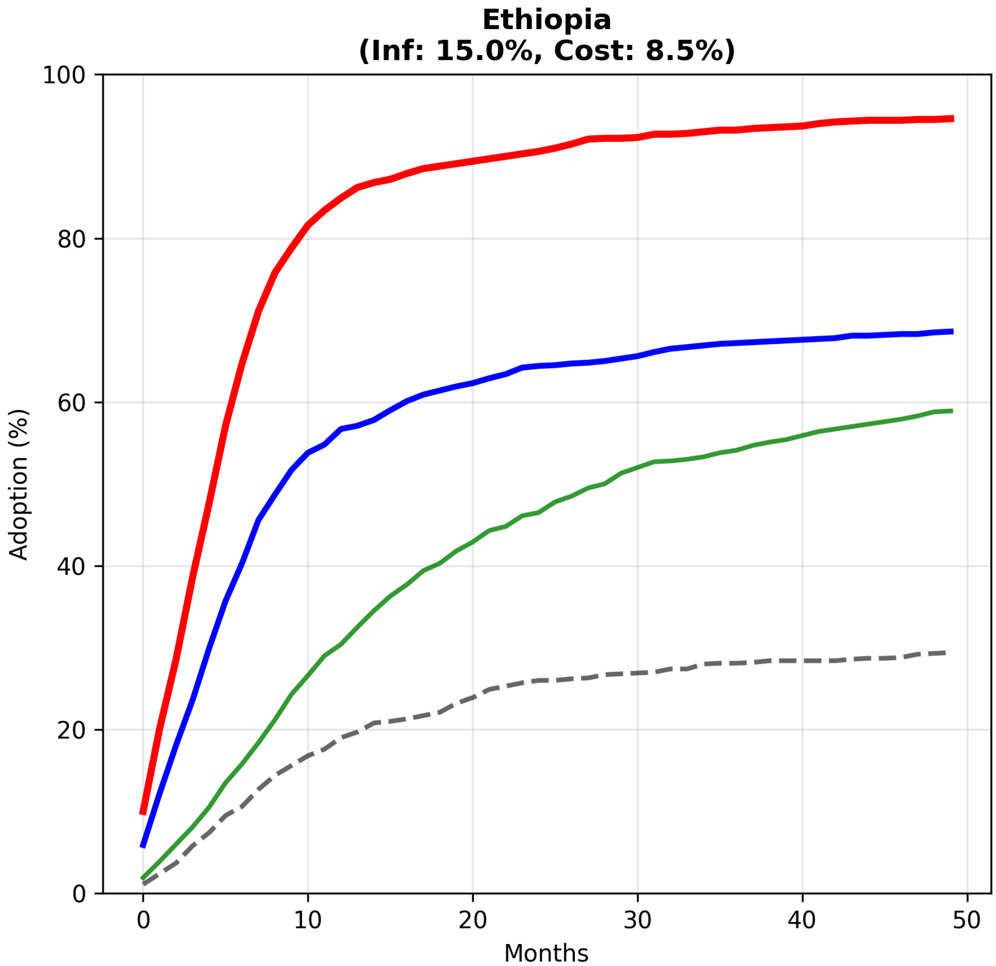

Figure 3: Ethiopia's Adoption Rates of Simulated Interventions

5 Discussion: A Playbook for Adoption

The results from Section 4 provide robust, quantitative answers to the four key questions posed in our Introduction. They allow us to move from a theoretical understanding of adoption barriers to a data-driven "playbook" of prioritized interventions. This discussion synthesizes our qualitative framework with the findings from our predictive model and agent-based simulation.

5.1 Addressing Infrastructure Failures: An Enabler, Not a Driver

Our first research question asked which infrastructure assumptions break in emerging markets. Our qualitative analysis identified the "always-online" assumption as a primary failure point, especially for rural and low-income users.

Our agent-based simulation was designed to test this directly. The "Offline Wallet" scenario shows a moderate but clear increase in adoption over the baseline. This finding is critical: it indicates that while technological solutions like offline-first functionality are essential *enablers* for inclusion, they are not the primary *driver* of adoption on their own. This intervention directly addresses the `accessibility_utility` in our `ConsumerAgent` model, unlocking a segment of the population that would otherwise be excluded. However, without addressing liquidity or trust, its impact remains limited.

5.2 Prioritizing Interoperability

Our third research question focused on interoperability with mobile money and agent networks. Our quantitative findings overwhelmingly confirm this as the central pillar for any successful adoption strategy.

First, our predictive model (Table 1) identified `'mobile_subscriptions_per100'` as a dominant statistical factor. This suggests that stablecoin adoption is highly correlated with the existing footprint of digital telecommunications infrastructure.

Second, the agent-based simulation (Figure 3) revealed that the drivers of adoption are highly context-dependent. In markets with established fintech networks like Nigeria, the "Mobile Money Integration" scenario demonstrated the most dramatic impact, significantly outperforming the baseline. This confirms our hypothesis regarding the "last-mile" problem: the ability to easily convert digital dollars to local cash is the primary lever for adoption in connected regions.

This aligns with the `TrustUtility` logic in our `ConsumerAgent` model. In the simulation, agents assign a higher utility value to stablecoins when they are interoperable with familiar mobile money rails, reflecting the reduced friction of "cashing out." However, in low-connectivity regions (e.g., Ethiopia), the simulation showed that "Offline Wallet" intervention was the necessary precursor to growth.

Crucially, the "Full Playbook" scenario achieved the highest adoption across all markets. This demonstrates that Mobile Money (Liquidity) and Offline Wallets (Access) are complementary layers. Offline wallets provide the technical capability to transact, while mobile money integration provides the economic confidence to do so.

5.3 Trust and Safety: The Synergistic "Glue" for Adoption

Finally, our second and fourth questions addressed the need for safety guardrails and human-centered trust. While these qualitative concepts are difficult to model directly, their importance is revealed by the synergistic success of the "Full Playbook" scenario.

As seen in Figure 3, the "Full Playbook" (combining offline tech and mobile money integration) achieves an adoption rate that is greater than the sum of its parts. We interpret this synergy as the effect of trust. Mobile money integration is not just a technical fix; it means integrating with the existing, trusted *human* agent networks.

When users can go to the same local agent they already trust for mobile money and have that agent explain the system, on-board them, and process a cash-out, it provides the human-centered trust and assurance that technology alone cannot. This human network, supported by resilient technology, creates a trusted ecosystem that our simulation shows is the most effective path to mass adoption.

5.4 The Data-Driven Playbook for Adoption

Based on this synthesis of our qualitative and quantitative findings, we propose a data-driven "Playbook for Adoption" prioritized by impact.

1. **Pillar 1: Prioritize Mobile Money & Agent Integration.** Our data shows this is not optional; it is the primary driver of adoption. Developers and policymakers must focus on creating standardized APIs and regulatory frameworks that allow stablecoin wallets to interoperate with existing mobile money and agent networks.

2. **Pillar 2: Deploy Resilient, Context-Aware Technology.** Our simulation suggests that offline-first functionality (local signing, delayed broadcast) is a critical enabler for reaching rural and low-connectivity users. This, combined with safety guardrails like spend limits and social recovery, addresses the infrastructure failures of the local context.

3. **Pillar 3: Invest in Agent-Led Trust and Education.** The "Full Playbook" synergy suggests that technology and liquidity are insufficient without trust. The existing agent networks are the most effective vector for user education. Explaining risk, finality, and fees in plain language through a trusted human intermediary is essential for long-term retention.

This playbook can be customized for specific national contexts. In Nigeria, with high existing crypto-savviness, Pillar 1 is paramount. In Ethiopia, with a single state-run mobile money system and lower connectivity, Pillars 2 and 3 may need to be implemented first to build a foundation for integration.

6 Conclusion

This paper addressed the 'context gap' that has historically hampered stablecoin adoption in emerging markets. By moving beyond purely qualitative analysis and employing a novel mixed-methods approach—combining predictive modeling with a calibrated Agent-Based Simulation (ABM)—we quantitatively tested adoption strategies for Ethiopia, Nigeria, and the Philippines.

Our findings challenge the prevailing "one-size-fits-all" narrative in digital finance. We demonstrated that the primary driver for adoption is not universal, but context-dependent:

- In markets with low connectivity (e.g., Ethiopia), the lack of infrastructure is the hard barrier. Here, offline-first wallets are the critical enabler, unlocking adoption for unconnected populations.

- In markets with established fintech ecosystems (e.g., Nigeria), trust is the bottleneck. Here, interoperability with existing Mobile Money networks is the dominant driver, far outweighing purely technical solutions.

Crucially, our simulations revealed a synergistic effect: the "Full Playbook" (combining offline access with mobile money integration) consistently outperformed individual interventions. However, the presence of behavioral inertia in our model demonstrates that technological superiority alone is insufficient; users do not switch instantly solely based on utility.

Our primary contribution is a data-driven, diagnostic 'Playbook' for policymakers:

1. **Diagnose the Constraint:** Assess whether the local barrier is infrastructural (Access) or psychological (Trust).

2. **Target the Intervention:** Prioritize offline technology for access-constrained regions and agent-network integration for trust-constrained regions.

3. **Bridge the Gap:** Invest in human-centric education to overcome the natural inertia that slows the adoption of even the most beneficial technologies.

Ultimately, this research provides strong evidence that stablecoin success in emerging markets hinges on patiently weaving new technologies into the existing, trusted, human-based financial fabric.

6.1 Limitations

It is important to acknowledge the limitations of this study. First, our reliance on proxy variables for historical adoption introduces a margin of error. As direct user data is proprietary to private exchanges, our `'Stablecoin_Share_Pct'` variable is an estimate derived from aggregate on-chain volumes reported by Chainalysis. While this method captures the magnitude of flows, on-chain volume cannot perfectly distinguish between organic retail remittances and institutional speculation or wash trading. Therefore, the historical data presented should be interpreted as an indicator of relative market activity rather than a precise census of unique active users.

Second, the study faced significant data granularity constraints. High-frequency data on crypto adoption in specific regions of Ethiopia and Nigeria is scarce. We relied on national-level aggregates from the World Bank and GSMA, which may mask significant rural-urban divides. Furthermore, we employed proxy variables for trust metrics (e.g., using mobile subscriptions to estimate mobile money familiarity) where direct sentiment data was unavailable.

Finally, our Agent-Based Model remains a simplification of complex human behavior. The `ConsumerAgent`'s utility function approximates decision-making but cannot capture the full spectrum of irrational behaviors, peer pressure, or informal community dynamics that influence financial choices. While we introduced an "inertia penalty" to correct for unrealistic saturation rates, the precise magnitude of this friction remains an estimate. Future exogenous shocks—such as sudden regulatory bans or a major stablecoin de-pegging event—would drastically alter the adoption landscape in ways our current model cannot predict.

6.2 Future Work

This research opens several avenues for future work. The most critical next step is to move from simulation to empirical validation. We propose a longitudinal pilot study in a target community (e.g., a specific remittance corridor in the Philippines) to test the "Full Playbook" in a live environment. Real-world data from such a pilot would allow for the refinement of the `ConsumerAgent`'s utility weights, replacing our calibrated estimates with observed behavioral data.

Additionally, future research could expand the agent-based model to include new agent types, such as 'Regulators' who set policy constraints or 'Liquidity Providers' who manage the float. Exploring the technical implementation of specific offline protocols (like NFC or USSD bridges) would also be valuable, providing a concrete engineering roadmap for the resilient tools our playbook calls for.

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