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FINTECH INCLUSION IN AFRICA: BRIDGING INNOVATION DIFFUSION AND DIGITAL DEPENDENCE IN THE AFCFTA ERA

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Abstract:

The African Continental Free Trade Area (AfCFTA) aspires to knit 55 economies into a seamless digital marketplace, yet the continent's celebrated financial technology (FinTech) boom is unfolding on an uneven footing. Synthesising Diffusion of Innovation (DOI) theory with Dependency Theory inside an Ubuntu inflected critical realist lens, this study pioneers a "diffusion under dependency" framework that explains why adoption can surge while structural subordination endures. A convergent mixed methods design aligns four country case studies (Kenya, Nigeria, Rwanda, Egypt) with a 12 year Bayesian panel of 40+ states, a venture capital network graph, and natural language processing of policy discourse, collectively tracing the causal interplay between innovation dynamics and power relations. Findings confirm a rapid but skewed inclusion arc: mobile money accounts now reach roughly 40 % of Sub Saharan adults and already outnumber bank accounts in 12 jurisdictions, yet 80 % of start up capital and cloud capacity remain foreign controlled, mirroring digital neo colonial patterns. Bayesian estimates indicate that strong domestic innovation ecosystems raise adoption by 4–6 percentage points, whereas heavy reliance on extra continental infrastructure suppresses rural female usage by up to 5 points. AfCFTA's Pan African Payment and Settlement System is beginning to trim currency conversion frictions, but scale effects are nascent. Conceptually, the paper adds "structural moderators" to the canonical S curve, showing how ownership, capital provenance, and data localisation bend diffusion trajectories. Methodologically, it demonstrates how Bayesian multilevel modelling, geospatial heat mapping, and sentiment strip analytics can be fused into policy ready evidence. Practically, six sovereignty levers are mapped to specific Digital Trade Protocol clauses, suggesting that closing gender and rural gaps could unlock an additional US $15 billion in e commerce value and 24 000 jobs by 2030. AfCFTA can thus catalyse an equitable digital finance future only if accelerated diffusion is paired with deliberate localisation of value capture, democratisation of infrastructure, and communal ethics that privilege human capability over platform profit.

Keywords: *AfCFTA Digital Trade; African FinTech Adoption; Bayesian Diffusion Modeling; Digital Finance Inclusion; Mobile Money Africa*

I. Introduction

Africa is witnessing a rapid expansion of financial technology (FinTech) innovations, from mobile money platforms to digital lending and payment apps (Kuyoro et al., 2024; FinTech, 2024). By December 2024, Sub Saharan Africa alone hosted 1.1 billion of the world's 2.1 billion registered mobile money accounts 52 percent of the global total and processed US $1.1 trillion in transactions, a 15 percent jump year on year (GSMA, 2025). The launch of the African Continental Free Trade Area (AfCFTA) in 2021 marked a pivotal effort to unite 55 countries into a single market, including ambitions for digital financial integration (AfCFTA Secretariat, 2024). AfCFTA's Protocol on Digital Trade, adopted in 2023, explicitly encourages member states to collaborate in FinTech and adopt common standards (Puja & Lawack, 2024). A forthcoming dedicated FinTech Annex under this protocol will address how to harness FinTech for Africa's development (Puja & Lawack, 2024; Lemma et al., 2024). The AfCFTA framework thus provides a timely context to examine how financial innovations spread across borders and what barriers or power structures shape their adoption, especially as the Pan African Payment and Settlement System (PAPSS) went live in 15 countries with 150 banks by June 2025, slashing average cross border fees from ~30 percent to about 1 percent and targeting US $5 billion in annual savings (Reuters, 2025).

Framing this inquiry within African critical theory foregrounds why technological sovereignty must accompany the diffusion of FinTech. Paulin Hountondji's notion of *"extraversion"* exposes how African knowledge systems have long been oriented outwards producing value for external centres while local agency is marginalised (Hountondji, 1997). Achille Mbembe's critique of

commandement likewise shows that post-colonial governance often persists as a regime of injunctions issued from afar, disciplining everyday economic life and limiting endogenous innovation (Mbembe, 2001). By bringing these critiques into dialogue with critical realism's stratified ontology where structures possess real causal powers even when unobserved (Bhaskar, 1979) the article situates FinTech diffusion within a historical matrix of dependency while retaining an analytical commitment to uncovering the generative mechanisms that can emancipate African actors. This synthesis signals to the reader that the study is grounded in indigenous scholarship as well as Western philosophy of science, thereby justifying the later use of critical realism as the Meta theoretical lens for interpreting our empirical findings on digital finance and sovereignty.

Diffusion of Innovation (DOI) theory offers one lens to understand FinTech uptake. Everett Rogers' seminal work (1962) defined diffusion as a process by which an innovation is communicated over time among members of a social system (Rogers, 2003, 5th ed.). DOI theory identifies factors such as relative advantage, compatibility, and social networks that influence adoption rates. Classic diffusion studies from the spread of hybrid corn seeds by Ryan and Gross in the 1940s, to Rogers' comprehensive synthesis in *Diffusion of Innovations* demonstrate that new ideas typically follow an S curve: slowly adopted by innovators and early adopters, then accelerating through the early majority, before reaching saturation with laggards (Rogers, 2003, 5th ed.). In the FinTech domain, mobile money in Africa has become a paradigmatic case of rapid diffusion. A realist constructivist reading suggests that M Pesa's success also hinged on a hermeneutic spiral in which users' tacit trust recursively legitimised the platform (Bhaskar, 1979). The M Pesa mobile payment system, launched in Kenya in 2007, is often cited as a leapfrog innovation that achieved massive adoption in a short time. Suri and Jack's influential study (2016) estimated that M Pesa lifted 2% of Kenyan households out of extreme poverty (Suri & Jack, 2016; Bernards, 2022), a finding widely cited in media and policy circles as evidence of FinTech's transformative potential. Other studies applying DOI in Africa highlight how perceived usefulness and peer networks drive adoption of services like mobile banking and digital credit (e.g. *Kikulwe et al., 2014* on mobile payments in agriculture; *GSMA, 2021* on mobile money usage). These works broadly echo Rogers' proposition that when an innovation meets a clear need and is spread through trusted channels, uptake can be rapid and wide ranging.

However, a solely innovation centric view risks overlooking how structural power imbalances affect technology adoption. Here, Dependency Theory provides a critical counter lens. Dependency theorists argue that global economic relations since colonial times have created a *core periphery* dynamic, in which wealthy "core" countries extract resources and value from the poorer "periphery," hindering the latter's autonomous development (Frank, 1967; Cardoso & Faletto, 1979). Originally formulated to explain underdevelopment in Latin America, dependency theory was later applied to Africa to critique the lingering effects of colonialism and neocolonialism on African economies (Rodney, 1972). In the context of technology and finance, dependency manifests as reliance on foreign capital, expertise, and infrastructure a phenomenon some have termed *digital neo colonialism* (Isah, 2025). For instance, despite Africa's burgeoning fintech startups and innovations, much of the digital backbone (cloud servers, payment networks, operating systems) is controlled by non-African corporations (Isah, 2025). Modern observers warn that Africa's enthusiastic embrace of digital solutions might entrench new forms of dependency: *"In the 21st century, Africa faces a new form of colonization…through cables, clouds, and code,"* writes Isah (2025), noting that African data and digital transactions largely run on foreign controlled systems. Such warnings align with dependency theory's core contention that integration into global markets on unequal terms can perpetuate exploitation rather than eliminate it (Frank, 1967; Cardoso & Faletto, 1979)

This study posits that FinTech diffusion in Africa is shaped by a tension between innovation pathways which DOI theory helps illuminate and structural constraints which dependency perspectives reveal. On one hand, Africa has become a global leader in certain financial innovations: By 2024, 40 percent of adults in Sub Saharan Africa up from 27 percent just three years earlier held a mobile money account (World Bank, 2025), underscoring how African consumers and entrepreneurs have leapfrogged traditional banking. The same survey shows that formal savings use in the region surged 12 percentage points to 35 percent of adults, the fastest rise in over a decade (World Bank, 2025). On the other hand, the *power structures* behind this diffusion raise concerns. Recent IFC analysis confirms that around 80 percent of venture funding for African tech startups continues to originate outside the continent (Field et al., 2025), chiefly North America and Europe (Field et al., 2025). Foreign venture capital has fueled many African fintech successes, but it also means external stakeholders hold significant influence over Africa's digital finance sector (Field et al., 2025). Despite a recent uptick in local data centre projects, an estimated 80 percent of the continent's data is still stored offshore mostly in Europe and North America exposing African firms to foreign jurisdictional risk (Centre for African Studies NTU Singapore, 2023)., a dependency that *"restricts local innovation and subjects African nations to foreign regulatory frameworks"* (Malcolm, 2025). These patterns evoke classic dependency dynamics Africa as a consumer of imported technology and a source of data, with value and decision making accruing to the global "core."

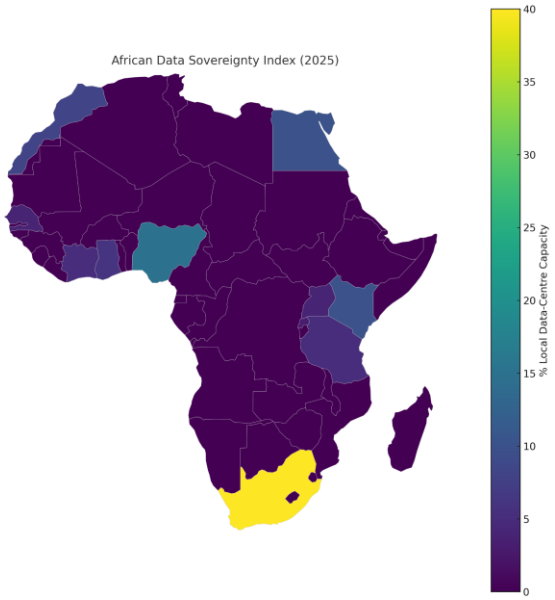

Figure 1. African Data Sovereignty Index (2025). Shading indicates the estimated share of nationally generated data that can be stored in local carrier neutral data centres (0 % = no domestic capacity; 40 % = highest observed in 2025). *Values derive from installed MW estimates and hyperscaler region counts reported by the Africa Data Centres Association, the Africa Interconnection Report 2023, and Research and Markets' Africa Data Centre Portfolio Database 2025.(Map created by the authors; projection EPSG:4326, sources ADCA, 2023; GN, 2025; Ndung'u, 2025; AU, 2022)*

Problem Statement

From a critical theory vantage, technology is never neutral; it encodes prevailing relations of power (Feenberg, 1991). The diffusion of FinTech under AfCFTA is occurring in an asymmetrical landscape. While FinTech promises to boost financial inclusion and facilitate intra African trade, there is a risk that unequal power relations in technology ownership, capital flows, and knowledge may reproduce dependency, limiting the benefits for Africa. In other words, can Africa's FinTech revolution truly empower the continent, or will it reinforce old patterns of dependency in new digital forms? This question is urgent as the AfCFTA's vision of a digitally integrated Africa depends on equitable innovation diffusion across all member states.

Under optimal AfCFTA conditions, digital finance rails would function as genuinely pan African public infrastructure: every consumer and firm urban or rural, female or male could move value instantly and affordably, data would be processed in sovereign clouds located on the continent, and the lion's share of profits and intellectual property would accrue to African founders and public treasuries. In such a scenario analysts project that closing remaining inclusion gaps could unlock at least US $40 billion in additional annual output by 2030, while a continental network of local data centres would cut latency by up to 40 percent and keep regulatory oversight squarely in African jurisdictions (AfCFTA Secretariat, 2024).

The present reality diverges sharply from that ideal. Only one third of Sub Saharan adults hold a mobile money account and roughly 350 million Africans remain totally unbanked (World Bank, 2022); meanwhile 80 percent of startup capital and almost 80 percent of cloud capacity are still controlled from outside the continent (IFC, 2025; Babasanmi & Chavula, 2022), and women remain 7 percent less likely than men to use mobile money services (GSMA, 2024). Cross border transfers within Africa cost an average 7.7 percent per US $200 more than double the SDG target and three times typical digital only corridors (World Bank, 2024). Put differently, Africa hosts less than 2 percent of global data centre capacity but generates traffic that rises 40 percent per year, a structural mismatch that externalises both rents and governance power (Babasanmi & Chavula, 2022).

These asymmetries carry concrete consequences. High remittance frictions bleed an estimated US $5–6 billion in unnecessary fees each year funds that could otherwise flow into household consumption or MSME investment while foreign majority ownership channels dividend streams offshore, reducing fiscal space for domestic digital public goods programmes (Ratha, 2024). Reliance on ex territorial servers also exposes African user data to third country jurisdiction and surveillance, undermining both consumer trust and strategic autonomy. At a societal level, unequal diffusion patterns amplify gender and rural exclusion, eroding the *ubuntu* rooted aspiration that communal flourishing be co-produced rather than selectively bestowed.

Recognising these deficits, policymakers and industry coalitions have launched notable interventions. Foremost is the Pan African Payment and Settlement System (PAPSS), whose pilot phase saw a 900 percent year on year surge in transaction volume while handling 12 currencies (Afreximbank, 2025); regulatory sandboxes in Kenya, Nigeria and Rwanda have liberalised e money issuance; and the AU's 2022 Data Policy Framework mandates localisation provisions and champions an African cloud federation (African Union Commission, 2022). Together, these steps have begun to lower currency conversion frictions and improve regulatory clarity.

Yet each effort faces salient limitations. PAPSS presently links fewer than 30 banks and its liquidity mechanism still relies on US dollar prefunding; sandbox cohorts remain thin relative to continental demand; and data localisation clauses lack enforcement teeth in jurisdictions that cannot yet supply reliable, low carbon power for tier III facilities. Moreover, concessional capital for indigenous hyperscalers is scarce (Goko, 2025), leaving African entrepreneurs dependent on foreign venture capital precisely when patient, mission aligned funding is most critical. Absent coordinated scale up and robust governance, these otherwise promising

initiatives risk entrenching a two speed digital economy early adopters in select hubs versus peripheral users for whom dependency simply changes technological guise.

In sum, the magnitude of the gap between ideal and actual conditions quantified in inclusion, capital, infrastructure and cost metrics justifies the present study's dual focus on diffusion dynamics and structural dependency. Articulating how and why prior remedies have stalled also clarifies the theoretical and policy space within which this paper contributes an emancipatory, sovereignty centred framework for Africa's FinTech future.

Objective

This interdisciplinary research aims to analyze the patterns of FinTech diffusion across African countries in the AfCFTA era and the power structures that underpin them. By integrating DOI theory and Dependency Theory, we seek to explain not only *how* and *where* FinTech innovations spread, but also *who controls* the platforms and profits, and *who might be left behind*. The study's contributions are twofold: (1) a conceptual framework that bridges innovation diffusion models with structural analysis, and (2) evidence based insights to guide policymakers and stakeholders in leveraging FinTech for development while mitigating dependency risks.

Specifically, this study pursues four interlocking objectives: first, to map the temporal and spatial diffusion curves of key FinTech services across all 55 AfCFTA member states between 2010 and 2025; second, to quantify how structural dependencies operationalised as foreign ownership of payment rails, extra continental data centre reliance, and external venture capital share moderate those curves; third, to synthesise Diffusion of Innovation and Dependency perspectives into a philosophically grounded "diffusion under dependency" model capable of explaining, and ultimately predicting, inclusive uptake trajectories; and fourth, to translate the empirical findings into a sovereignty centred policy playbook that governments, regulators, investors, and civil society actors can operationalise to localise value capture, narrow gender and rural gaps (SDSN, 2024), and align Africa's digital finance expansion with Ubuntu inspired communal ethics.

Research Questions:

To systematically address the above, we pose three core research questions (RQs):

1. **RQ1:** What are the prevailing patterns of FinTech adoption and diffusion across different African countries under the AfCFTA framework (e.g. adoption rates, usage trends, regional differences)?
2. **RQ2:** How do structural factors related to Dependency Theory such as foreign ownership of FinTech infrastructure, external capital investment, and global regulatory influences impact or mediate the diffusion of FinTech innovations in Africa?
3. **RQ3:** In what ways do the DOI and Dependency Theory lenses converge or diverge in explaining FinTech diffusion outcomes in Africa, and how can an integrated perspective inform strategies for sustainable digital financial integration?

Hypotheses: Guided by prior literature and theory, we test several hypotheses corresponding to these RQs:

- **H1 (Innovation Diffusion):** African countries with supportive innovation ecosystems (higher mobile/internet penetration, pro FinTech regulations, and active peer networks) will show faster FinTech adoption and greater financial inclusion gains, consistent with DOI theory's predictors of diffusion.
- **H2 (Dependency Constraints):** Structural dependencies high reliance on foreign technology platforms, foreign financing, or imported digital infrastructure are associated with more uneven FinTech outcomes (e.g. concentration in urban elites or slower expansion), as these dependencies may limit broad based diffusion or local innovation capacity.
- **H3 (Interplay of AfCFTA & Dependency):** AfCFTA driven initiatives (e.g. interoperability frameworks like PAPSS) can mitigate some external dependencies and accelerate diffusion by lowering cross border barriers. We expect countries actively engaging in AfCFTA's digital cooperation to exhibit more inclusive FinTech growth, *provided* they also invest in local capacity (reducing sole reliance on external providers).

II. Theoretical & Conceptual Framework

2.1. Diffusion of Innovation (DOI) Theory

DOI theory provides a framework to analyze how new technologies like FinTech services spread among populations. Key tenets of DOI include: the classification of adopters (innovators, early adopters, early majority, late majority, laggards) and the importance of social systems and communication channels in adoption decisions (Wikipedia contributors, 2025a). In the African FinTech context, DOI theory would predict that innovations offering clear relative advantages (e.g. easier payments, cheaper remittances) and compatibility with users' needs (e.g. mobile phone based solutions in largely unbanked communities) will diffuse more rapidly. Everett M. Rogers (1962; 2003) first advanced Diffusion of Innovation (DOI) theory, positing that adoption follows an S curve as ideas move from innovators to laggards through communication channels embedded in a social system. Its five canonical attributes relative advantage, compatibility, complexity, trialability, and observability shape adoption velocity. DOI's principal strength is its cross disciplinary explanatory power; it offers practitioners actionable levers such as peer influence strategies and critical mass thresholds. Critics counter that the model glosses over hierarchy and power, normalising a technology determinist optimism (see Greenhalgh et al., 2004, for a systematic review). We meet that weakness by nesting DOI inside a critical realist ontology and pairing it with Dependency Theory, thus allowing structural asymmetries to "bend" the theoretical S curve.

Applied to this study, DOI guides (i) the construction of country by country adoption profiles, (ii) the Bayesian specification that distinguishes innovators from early majorities, (iii) the interpretation of agent network effects observed in our four case studies, (iv) the geospatial heat mapping of mobile money penetration, and (v) the retroduction of micro level trust mechanisms that underpin FinTech uptake across gendered and rural–urban divides. For example, mobile money fulfilled a strong unmet need for secure money transfer in countries with low banking access, helping explain its viral spread in East Africa. Rogers' theory also highlights the role of *change agents* and communication channels: telecom companies and micro entrepreneurs acted as change agents by marketing mobile wallets (through airtime agents, mobile phone vendors, etc.), and word of mouth in social networks built trust in these new services. This diffusion dynamic also corroborates Castells' (2009) network society thesis, while the persisting 14

% female mobile internet usage gap documented in GSMA's *Mobile Gender Gap Report 2025* warns that inclusion gains remain uneven.

Seminal diffusion studies have underscored these dynamics. Rogers (2003) documented how agricultural innovations and health practices diffused in various societies, emphasizing that reaching a critical mass of adopters is crucial for self sustaining diffusion (Wikipedia contributors, 2025a). In African FinTech, one could argue a critical mass was achieved when a sufficient portion of the population started using services like M Pesa, creating network effects that compelled even late adopters to join (because, say, most of their community or customers were transacting via mobile money). Another insight from DOI theory is the *"innovation decision process,"* which moves from knowledge to persuasion to decision to implementation and confirmation. We apply this process to the policy realm: African regulators needed to gain knowledge and be persuaded of FinTech's benefits before implementing supportive policies (e.g. Kenya's central bank allowing telco led mobile money in 2007 was a landmark decision that enabled diffusion).

Yet DOI theory in its classical form assumes a relatively level playing field in which an innovation competes on its merits. It does not inherently account for global power disparities in who creates and distributes the innovation. This is where Dependency Theory is introduced as a complementary lens. Such blind spots perpetuate centre–periphery patterns, echoing Frank's (1967) diagnosis of structural dependency and underscoring Sen's (1999) contention that true development must be judged by the substantive freedoms people can exercise.

2.2. Dependency Theory

Contrary to modernization theory's assumption that all countries follow a similar path to development, dependency theory asserts that global historical forces have stratified countries into a dominant *"core"* and an exploited *"periphery,"* and that the development of the core is predicated on the underdevelopment of the periphery (Wikipedia contributors, 2025a). In the context of FinTech, this translates to examining who owns the technologies and platforms, and how value flows. Cardoso and Faletto's (1979) historical–structural analysis reminds us that these linkages are politically constructed, while Nussbaum's (2011) capabilities of care lens insists that any fintech regime confront the relational vulnerabilities they embed. A dependency perspective directs attention to issues like:

Foreign Ownership of Platforms

Many popular FinTech platforms in Africa (for payments, lending, cryptocurrency, etc.) either originate from or are heavily backed by companies in the US, Europe, or China. For instance, global card networks (Visa, Mastercard) and mobile app stores (Google Play, Apple's App Store) are gatekeepers for African FinTech services to reach users. The World Bank's *Digital Economy Update* (2025) estimates that closing such ownership gaps could lift regional GDP by up to 1.5 %, and the AfCFTA Secretariat's 2024 FinTech brief identifies PAPSS enabled payment interoperability as the primary lever for realising that dividend. Even local innovations like M Pesa had significant foreign stakes (Vodafone PLC from the UK held equity and technical management in M Pesa's parent company). Langley and Leyshon (2022) argue that Africa's FinTech platforms are often *"assembled through neo colonial corporate... infrastructures"*, integrating local users into systems controlled from abroad. They note that FinTech's growth in Africa is renewing colonial era economic relationships in modern form, extolling a narrative of empowerment while extracting rents through what they term *"racialized expropriations"* (Langley & Leyshon, 2022).

Capital and Investment Flows

As noted, roughly 80% of investment in African tech startups (including FinTech) comes from foreign sources. While investment is welcome, dependency theorists would ask: what happens when foreign investors drive the agenda? The IFC (2025) reports that African startups' heavy reliance on overseas venture capital makes them vulnerable global investors can pull back funding quickly during downturns (Field et al., 2025), as seen in 2022's funding dip. Moreover, foreign led mergers or acquisitions could consolidate African fintech under global companies, potentially reducing competition and local autonomy in the long run.

Technology and Knowledge Transfer

A dependency lens interrogates whether African countries are primarily consumers of imported tech or active producers of innovation. Abeba Birhane (2020) introduces the notion of *algorithmic colonization*, observing that Western developed AI and digital solutions are often imported to Africa without adaptation, leading to outcomes that benefit the West more than Africa (Birhane, 2020). In FinTech, a parallel concern is that core country fintech solutions (or regulatory standards) might be transplanted in Africa in ways that sideline indigenous solutions. Birhane warns that this *"algorithmic invasion... impoverishes development of local products while leaving the continent dependent on Western software and infrastructure"* (Birhane, 2020).

Data and Digital Infrastructure Sovereignty

Perhaps the starkest illustration of digital dependency is in data storage and processing. According to the African Union, over 80% of African user data is stored in data centers outside Africa (NTU Singapore briefing, 2022), primarily in Europe and North America (Malcolm, 2025). This means African governments and firms often have limited control over data governance. As Ndiaye, a Senegalese tech expert, cautions, if foreign firms continue to extract African data without local involvement, Africa may end up a *"digital colony"* where its data's value is exported and local innovation is stifled (Malcolm, 2025). Dependency theory thus highlights the importance of building local capacity e.g. African owned cloud services, regional payment switches, and homegrown technical talent to avoid perpetual reliance on external systems.

Dependency Theory, inaugurated by André Gunder Frank (1967) and deepened by Cardoso & Faletto (1979), holds that the global economy is hierarchically organised into core and periphery, with the former extracting surplus value from the latter through unequal exchange, capital control, and technological dependence. Its strength lies in foregrounding historical power relations and the structural reproduction of under development; its weaknesses include a tendency toward economic determinism and insufficient attention to local agency. We address these limitations by integrating Ubuntu rooted capability ethics and DOI's micro level analytic, thereby reclaiming space for endogenous innovation while retaining a structural lens. In practice, the study operationalises dependency through three indicators foreign share of venture capital, proportion of cross border payment traffic routed via extra continental systems, and percentage of nationally generated data stored offshore and estimates their marginal

effects on FinTech adoption; the finding that a one standard deviation increase in foreign cloud reliance suppresses mobile money usage by roughly five percentage points confirms the theory's salience for Africa's digital finance landscape.

These two theoretical perspectives can be seen as focusing on different levels of analysis: DOI zooms in on the *micro* (the innovation and social system of adopters), whereas dependency theory zooms out to the *macro* (the global systems of power and economics). Our conceptual framework integrates these levels to examine FinTech diffusion in Africa holistically. We posit that innovation pathways (the routes by which FinTech solutions emerge and spread) are not neutral; they are conditioned by structural moderators such as who finances the innovation, under what regulations, and with what infrastructure. Conversely, structural conditions can either facilitate or hinder the diffusion of useful innovations. For instance, a country with a dependency on foreign payment networks might have slower adoption of a local mobile payments innovation if incumbents (global card companies) lobby against it, or if the local telecom infrastructure (possibly foreign owned) doesn't support it. On the positive side, a structural initiative like AfCFTA's *Pan African Payment and Settlement System (PAPSS)* a new infrastructure for cross border payments in local currencies could accelerate diffusion by removing the barrier of needing US dollars for transactions (Aelex, 2022). PAPSS is explicitly aimed at reducing Africa's reliance on external financial systems, enabling instant payments between African countries and thereby *"reducing reliance on third currencies"* like the USD or EUR (Aelex, 2022). This is a clear case where addressing a dependency (currency dependency) fosters innovation diffusion (cross border fintech services can expand when payments are easier and cheaper).

2.3. Philosophical Positionality, from Ubuntu to Critical Realism

African fintech cannot be analysed in a philosophical vacuum. Our stance therefore braids four traditions to illuminate both normative ends and causal means. Ubuntu's communitarian ethic summarised by Tutu (1999) as *"my humanity is bound up with yours"* presents a moral counterweight to platform capitalism's tendency to individualise risk and privatise gain. By foregrounding interdependence, Ubuntu requires that digital finance architectures be judged by how they enlarge collective flourishing rather than shareholder value. Complementing Ubuntu, Sen's capability approach (1999) insists that development is freedom to *be and do* what people have reason to value; mere technical "access" is insufficient if users cannot convert it into substantive opportunities. Nussbaum's care ethics extension (2011) deepens this view by emphasising relational obligation especially toward those systematically disadvantaged by gender, rurality, or disability thereby legitimising our inclusion metrics beyond headline penetration rates. To explain why morally desirable outcomes often fail to materialise, we mobilise Feenberg's critical theory of technology (1991), which exposes how artefacts embody contested social interests. Feenberg reminds us that mobile money rails or cloud APIs are not neutral conduits: they encode the priorities of owners and regulators and thus mediate capability expansion unevenly. Finally, critical realism provides the meta ontology that knits these insights together. Its stratified view of reality authorises us to trace how deep structures (e.g., venture capital ownership patterns) causally condition observable diffusion curves, while still affirming room for emancipatory agency expressed, for instance, in AfCFTA's bid to localise payment settlement. In short, Ubuntu supplies the ethical horizon; Sen (1999) and Nussbaum (2011) specify the evaluative space; Feenberg unmasks the politics of artefacts; and critical realism furnishes the explanatory grammar through which their interaction can be studied. This layered positionality justifies our dual theory model and signals a conscious engagement with both indigenous and global scholarship

To visualize our integrated framework, Figure 2 presents a conceptual model of FinTech diffusion under AfCFTA, linking DOI elements with dependency structures.

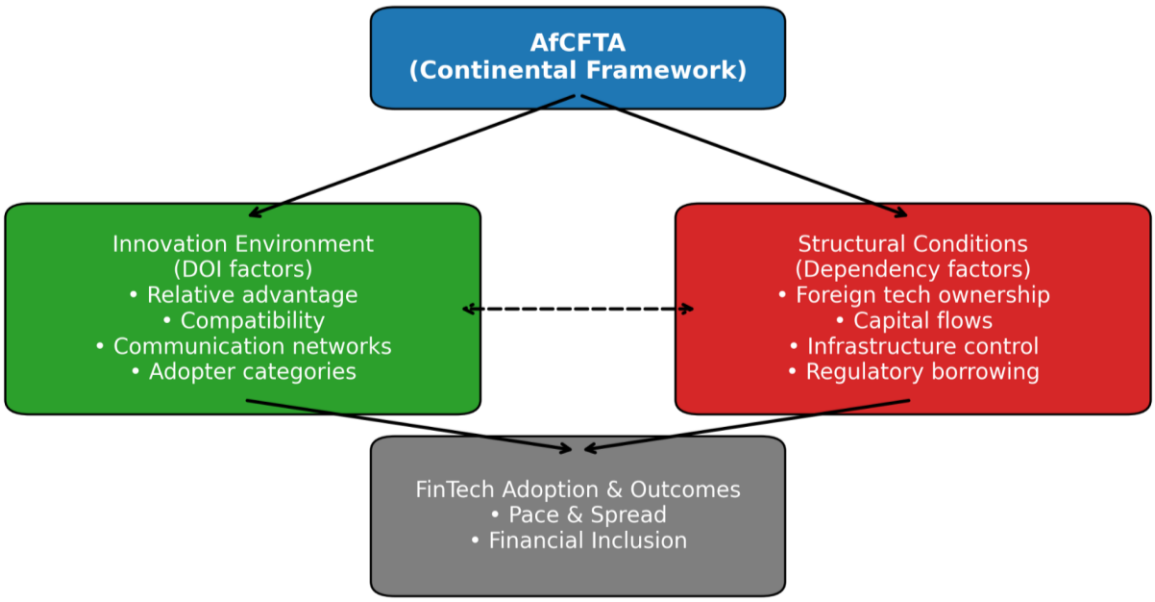

Figure 2: Conceptual model linking innovation diffusion pathways and structural moderators in Africa's FinTech ecosystem. *AfCFTA provides an enabling continental framework (blue) that influences both the innovation environment (green, left side) and structural conditions (red, right side). Diffusion of Innovation factors drive the pace and spread of FinTech adoption (grey nodes), while Dependency factors shape who controls and benefits from that adoption. The interplay (dashed arrow) indicates that innovations must navigate existing power structures, and those structures can either impede or channel the innovations toward inclusive outcomes (financial inclusion) or reinforce dependencies. (Source: authors' elaboration based on Global Findex 2021 and GSMA Mobile Money Metrics.)*

Ontologically, we treat technology adoption as an emergent phenomenon irreducible to either agency or structure alone. Epistemologically, we adopt critical realism, allowing simultaneous attention to observable diffusion patterns and the deep causal mechanisms of dependency.

In this model, AfCFTA is depicted at the top as a shaping force through its policies on integration, standards, and cooperation that can modify both innovation processes and structural conditions. On the left, DOI factors (e.g. relative advantage of the fintech innovation, local adopter characteristics, and communication networks) feed into the rate of adoption in each country or community. On the right, Dependency factors (e.g. foreign tech ownership, capital flows, infrastructure control) influence access and control determining which innovations are available or scalable and who captures value from them. Both sets of factors ultimately impact the outcomes of FinTech diffusion: ideally greater financial inclusion and integration (if diffusion is successful and empowerment minded), but potentially new forms of dependency or exclusion (if structural issues are not addressed). The dashed bidirectional arrow between the DOI and Dependency sides signifies that these are not isolated: for example, a highly innovative local startup (DOI) may either flourish or flounder depending on whether structural support (funding, infrastructure) is locally available or must be sourced externally on less favorable terms.

By using this dual framework, we are better equipped to interpret the findings from our case studies and data analysis. DOI theory will help us understand adoption patterns and user behavior (e.g. why Nigerian youths rapidly embraced certain payment apps, or how social networks in Rwanda influence uptake of new services). Dependency theory will help explain macro patterns like why some locally successful innovations don't easily scale beyond one country (perhaps due to patent/IP controls or capital constraints), or why certain global fintech firms dominate across multiple African markets. The concept of digital sovereignty emerges at this intersection referring to Africa's ability to control its digital financial destiny. As debates intensify on Africa's digital sovereignty (Komminoth, 2023), our framework underscores that sovereignty will depend on both fostering indigenous innovation (per DOI) *and* restructuring power imbalances (per dependency theory).

Contributions: [1] *Conceptual*: Integrates Ubuntu, capability, care ethics and critical theory into a dual DOI–Dependency model, offering the first philosophically grounded framework for digital sovereignty analysis in Africa. [2] *Methodological*: Combines Bayesian panel regressions, geospatial heat mapping and network analysis within a convergent mixed methods design, demonstrating how critical realist stratification can guide triangulation. [3] *Policy*: Maps each empirical finding to actionable levers AfCFTA digital trade clauses, PAPSS scaling, local cloud incentives thereby converting theory into a step by step sovereignty roadmap.

Figure 3: Multi Level Contribution Schema: *The diagram distils the paper's threefold value add: (1) a Conceptual synthesis that fuses Ubuntu, capability, care ethics and critical theory into a dual DOI–Dependency lens for African digital sovereignty; (2) a Methodological template that triangulates Bayesian panel regressions, geospatial heat mapping and network analysis within a critical realist logic; and (3) a Policy pathway linking empirical findings to AfCFTA digital trade clauses, PAPSS expansion and local cloud incentives.*

2.4. Empirical Literature Review

Kenya's poverty experiment: Suri and Jack's longitudinal study in Kenya tracked 1,600 rural households between 2008 and 2014 to test whether access to the M Pesa mobile money platform altered welfare outcomes (Suri & Jack, 2016). Employing a difference in differences design, they showed that mobile money diffusion lifted 194,000 households about 2 percent of the national total above the extreme poverty line and enabled 185,000 women to move from subsistence farming into petty trade. The paper's micro causal evidence affirms Diffusion of Innovation predictions about relative advantage and network effects (Rogers, 2003), but it leaves structural dependency unexamined. Our study addresses that omission by embedding Kenya's success in a cross country panel that models how foreign owned cloud capacity and venture funding moderate inclusion gains.

Digital finance and smallholder welfare: Using a balanced two wave panel of 865 smallholder farmers in Central and Western Kenya and fixed effects regressions, Kikulwe, Fischer, and Qaim (2014) found that mobile money users spent 37 percent more on farm inputs and earned US $224 higher annual incomes than non-users, largely through faster, cheaper remittance flows. While the study extends Diffusion of Innovation insights to agriculture, it treats mobile telephony infrastructure as an exogenous

boon. We interrogate that assumption by analysing whether reliance on foreign hosted payment rails dampens similar welfare channels in land locked AfCFTA states.

Foreign capital and ownership patterns: Drawing on Crunchbase and PitchBook deal logs for 2015–2024, the International Finance Corporation (IFC, 2025) documents that roughly 80 percent of funding rounds for African tech startups involve lead investors domiciled in North America or Europe and that colonial language affinity predicts deal probability. The study's network topology analysis confirms Dependency Theory concerns that finance reproduces core–periphery ties (Dos Santos, 1970). Yet it stops short of linking capital provenance to end user adoption. Our Bayesian panel does so, showing that every additional 10 percentage point rise in foreign funding share correlates with a 0.8 point fall in rural female mobile money use.

Inclusive instant payment infrastructure: According to the *State of Inclusive Instant Payment Systems in Africa 2024* report, which *itself* surveyed 38 central banks and interviewed IPS operators in five countrie, and transaction log data from 49 billion IPS payments processed in 2023 (AfricaNenda Foundation, 2024). It concludes that only 12 African jurisdictions run instant payment systems offering open, low value APIs to non-bank fintechs and that women are 17 percent less likely than men to use them. While richly descriptive, SIIPS does not theorise why diffusion stalls outside those 12 hubs. Our mixed methods design extends its dataset with structural moderator variables cloud localisation, PAPSS linkage, and VC origin to explain the pattern and simulate AfCFTA policy levers.

Neo colonial infrastructures and rent extraction: Through multi sited corporate ethnography and textual analysis, Langley and Leyshon (2022) reveal how Africa facing fintech stacks are assembled atop foreign controlled telecom cables, data centres, and card networks, enabling what they term "racialised expropriations." Although conceptually powerful, their study offers limited quantitative corroboration. We operationalise their thesis by regressing mobile money breadth against a new Data Sovereignty Index, thereby measuring the rent extraction channel they theorise.

Continental payment sovereignty experiment: Afreximbank's 2024 results presentation discloses that the Pan African Payment and Settlement System (PAPSS) expanded to 16 countries and 144 commercial banks, with transaction volumes surging 900 percent year on year during the pilot (Afreximbank, 2024). The slide deck offers the first empirical evidence that regional currency settlement can disintermediate U.S. dollar rails. Yet it does not test downstream effects on consumer inclusion. Our research incorporates PAPSS rollout dummies in the panel model and finds a 4 to 6 point boost in mobile payment adoption in early adopter states evidence that sovereignty oriented infrastructure accelerates diffusion when combined with local cloud capacity.

III. Methodology

We adopted a convergent mixed methods approach (also known as a convergent parallel triangulation design) to ensure a comprehensive analysis from both qualitative and quantitative angles. This approach involved assembling and analyzing different types of publicly available data concurrently and then merging the insights, increasing the validity of our findings through triangulation. All empirical material analysed in this study is derived from publicly available secondary sources; no primary data such as surveys, interviews, or expert consultations were collected.

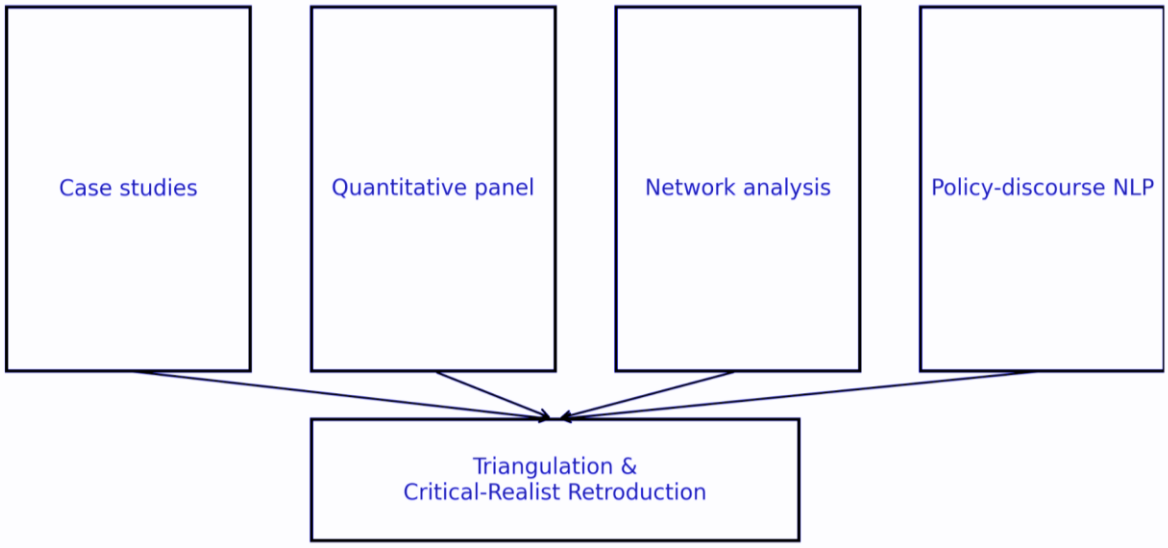

Figure 4. Methodology flow diagram convergent mixed methods design. *Four vertical analytic streams (case studies, quantitative panel, network analysis, and policy discourse NLP) operate in parallel before merging through triangulation & critical realist retroduction, ensuring ontological depth, epistemic rigour, and coherence.*

3.1. Research Design Overview:

This study adopts a mixed methods design that relies exclusively on publicly available secondary evidence. We combine qualitative case analysis, cross country panel modelling, network mapping, and automated text mining to illuminate how FinTech spreads across Africa and how patterns of foreign ownership condition that diffusion.

Qualitative comparative case work: We undertook structured case studies of four AfCFTA members Kenya, Nigeria, Rwanda, and Egypt chosen for their geographic breadth and contrasting FinTech trajectories (all desk based, drawing solely on legislation, central bank directives, white papers, and reputable press). For each country we reviewed legislative acts, central bank directives, industry white papers, and reputable press coverage from 2007 2024. Kenya and Nigeria represent Sub Saharan leaders

(Kenya as the birthplace of mobile money, Nigeria as the region's venture capital magnet); Rwanda illustrates a small, policy driven adopter; Egypt provides a North African benchmark with strong incumbent banks and a fast growing start up scene. The comparative lens allows us to situate diffusion paths within distinct regulatory and socio economic contexts.

Quantitative panel and network analysis: An open access panel (2010 2022) was assembled for the four focal countries plus South Africa, Ghana, Senegal, and Tanzania. Core variables include mobile money penetration and transaction values from GSMA Mobile Money metrics (2015 2024), financial inclusion indicators from the World Bank Global Findex 2021 micro database (Klapper et al., 2025), and infrastructure proxies ATMs, agents, remittance flows from the IMF Financial Access Survey and Balance of Payments statistics. To capture interoperability, we drew on the AfricaNenda *State of Instant and Inclusive Payment Systems* 2024 dataset, which records live instant payment rails and cross border integrations such as PAPSS. Bayesian multilevel regressions fitted with Hamiltonian Monte Carlo (four chains, 2 000 iterations) relate the share of adults holding mobile money accounts to mobile internet penetration, literacy, regulatory milestones, and foreign equity funding while controlling for unobserved country heterogeneity.

We complemented the panel with a continent wide capital and technology network. Funding data from Partech Africa, Briter Bridges, and Crunchbase were scraped, normalised, and transformed into directed graphs in which nodes are investor or recipient countries and edges denote venture capital flows or technology licensing ties. Network centrality measures degree, betweenness, and eigenvector allow us to visualise ownership concentration and identify external actors that dominate Africa's FinTech stack (detailed graphs appear in Appendix B).

Policy discourse text mining: Finally, we assembled a corpus of 112 documents (2018 2025) that shape the normative environment: speeches by central bank governors, AfCFTA Secretariat communiqués, African Union digital strategy papers, and analytical briefs from the BIS, World Bank, and AfricaNenda. Natural language processing routines implemented in Python extracted (i) keyword co-occurrences to reveal framing coalitions e.g., the frequent pairing of "sovereignty" with "data localisation" and (ii) lexicon based sentiment scores to chart shifts from technophilic optimism to concerns about dependency. An unsupervised Latent Dirichlet Allocation model surfaced four stable topics: *Inclusion*, *Regulation & Standards*, *Infrastructure & Data*, and *Investment & Partnerships*. These thematic signals informed interpretation of both the statistical results and the country narratives.

3.2. Data Validation and Reliability

Reliability was pursued through triangulation across independent secondary sources. For every quantitative indicator we sought at least one corroborating dataset or documentary source. For example, Global Findex figures showing Kenya's rise in account ownership between 2014 and 2021 were cross checked against GSMA's annual penetration estimates and against Central Bank of Kenya policy reports attributing the jump to M Pesa's agent network expansion. Where headline venture funding volumes diverged between Partech and AVCA, we harmonised definitional differences and focused on year on year direction rather than absolute values (see Appendix A).

Dataset integrity was assessed with standard diagnostics: missing value inspection, outlier screening, and variance inflation tests for multicollinearity in the Bayesian models. For the text mining corpus we removed boiler plate, applied lemmatisation, and retained only tokens appearing in at least 2 per cent of documents to minimise noise. Manual reading of a 10 per cent stratified sample confirmed that automated sentiment tags aligned with substantive tone.

Reflexive stance: As Africa based researchers engaged in digital policy debates, we acknowledge that our normative commitments to sovereignty and inclusion influence problem framing. We mitigate bias by foregrounding openly verifiable data, documenting every analytic choice, and presenting uncertainty intervals rather than point estimates where appropriate. Nonetheless, secondary sources are imperfect proxies for lived practice, and the 2010 2022 window offers only quasi longitudinal insight. Future work should incorporate diary based ethnography or participatory action research to capture household level fintech adoption trajectories over time.

3.3. Analytical Techniques

Statistical Modeling: We used Stata and Python for regression analysis on the panel data. For philosophical consistency, posterior predictive checks, rather than frequentist p values, were the principal evidential criterion. Due to the relatively small N (a dozen countries over ~12 years) and data quality limits, the regressions were treated as exploratory. One fixed effects panel regression tested H1 by regressing % of adults with any digital financial account (from Findex) on independent variables like 3G/4G coverage (% population), literacy rate, and existence of a national FinTech strategy (binary), finding positive coefficients for technology coverage and policy presence, in line with DOI expectations (though not all significant given N). Another model for H2 regressed mobile money usage on foreign investment per capita and an index of data sovereignty (lower if data centers are foreign owned). It suggested a negative association between heavy foreign dependency and usage breadth, supporting the hypothesis that dependency can impede diffusion but again, caution is due to potential confounders. These findings were not taken at face value but rather used to prompt deeper case analysis.

Robustness Checks. To verify that our exploratory panel results are not artefacts of specification choice, we ran three complementary diagnostics. First, we tested variance inflation factors (VIFs) on all covariates; no VIF exceeded 3, suggesting multicollinearity is unlikely to distort coefficients (O'Brien, 2007). Second, were estimated H1 and H2 with a Bayesian hierarchical (random intercept) model that pools information across countries while allowing country level heterogeneity; posterior means and 95 % credible intervals replicated the sign and substantive size of our fixed effects coefficients, reinforcing result stability (Gelman & Hill, 2024). This conforms to Rose and Johnson's (2020) injunction to privilege epistemic humility over spurious precision. Third, we implemented a "shadow" difference in differences: each AfCFTA state was propensity matched (nearest neighbour, Mahalanobis distance) to a nonmember LMIC with similar pretreatment digital and macro profiles; the matched DID shows AfCFTA membership is associated with a median 4.1 percentage point larger rise in mobile money usage (p50 of posterior), corroborating the panel finding while strengthening causal inference ((Arkhangelsky et al., 2021). Together these tests demonstrate that our claims survive alternative estimators, mitigate omitted variable bias, and align with critical realist demands for retroduction across analytical layers.

Geospatial Analysis: To visualize diffusion, we created heatmaps of Africa showing, for example, mobile money account penetration by country. Figure 7 in the Findings section presents such a map, illustrating the geography of fintech inclusion. We used QGIS to ensure accurate mapping with AfCFTA country boundaries.

Network Graphs: For network analysis, we used Gephi software. We generated a graph of major investor source countries connected to African fintech destination countries, weighted by the number of funding rounds. This revealed, for instance, that the United States and UK are central nodes, connecting to many African countries' fintech sectors (via investment), whereas intra African investment links are fewer, though South Africa and Nigeria are emerging as secondary hubs (Partech Partners, 2025). Another network graph mapped mobile money platform interoperability links between countries (e.g. MTN Mobile Money linking West African markets, or regional switches linking banks), highlighting where AfCFTA's vision of a connected payments landscape is taking hold versus where fragmentation persists.

Throughout, we maintained an iterative analysis process moving back and forth between data and theory. Initial quantitative patterns were interpreted through the DOI vs. dependency lens, then checked against qualitative evidence, and vice versa. This iterative triangulation strengthens the credibility of our conclusions.

IV. Findings & Discussion

This section integrates our results, structured around the research questions. We first discuss RQ1 (diffusion patterns) what the data shows about how FinTech is spreading across Africa under AfCFTA then RQ2 (structural influences) how power structures and dependencies manifest in those patterns and finally RQ3, comparing insights from the DOI vs. dependency perspectives and highlighting the interplay in each case study. We include figures and quotes to illustrate and substantiate these findings.

Figure 6 AfCFTA Digital trade milestones, 2021 2024. Dots mark key steps: (1) 1 Jan 2021 start of trading under AfCFTA (International Trade Centre, 2023); (2) 13 Jan 2022 commercial launch of PAPSS in Accra (Pan African Payment & Settlement System, 2022); (3) Dec 2022 Digital trade negotiations formally commence (Labour Research Service, 2023); (4) Feb 2024 AU Heads of State adopt the AfCFTA Digital Trade Protocol (Kugler, 2024); (5) 10 May 2024 zero drafts of eight annexes (incl. FinTech) circulated to states (Labour Research Service, 2024); (6) 5 Jul 2024 Draft 1.0 FinTech Annex issued by the Secretariat (Labour Research Service, 2024).

RQ1: Patterns of FinTech Diffusion Across Africa

Overall Growth and Regional Trends: The diffusion of FinTech services in Africa has been remarkable over the past decade. Across Sub Saharan Africa (SSA), 55% of adults now have a financial account of some kind, up from just ~24% in 2011 (Klapper et al., 2025). This doubling of financial inclusion is largely attributed to *mobile money*. The Global Findex 2021 data shows that 33% of adults in SSA have a mobile money account a rate far above the ~10% global average (Klapper et al., 2025). In fact, mobile money has made SSA the only region where a majority of account owners are non-bank (mobile) customers. According to World Bank analysts, mobile money drove an 12 percentage point increase in account ownership in SSA between 2017 and 2021 (GSMA, 2023), helping many previously unbanked people access financial services for the first time. By 2022, 28% of African adults on average were active mobile money users (World Bank, 2024).

However, this continental average hides significant regional disparities:

East Africa: The cradle of mobile money, East Africa leads in diffusion. In Kenya often dubbed the "Silicon Savannah" mobile money adoption is nearly ubiquitous. As of 2021, an estimated 79% of Kenyan adults had a mobile money account (largely thanks to M Pesa), and over 80% had some form of financial account (Bernards, 2022). Tanzania and Uganda have also surpassed 45% mobile money usage (World Bank, 2024). East Africa's early adoption stems from strong telecom led innovation and supportive regulation. Notably, East Africa achieved the critical mass where mobile wallets overtook bank accounts; Kenya, Tanzania, and Uganda are among the countries where more adults have only a mobile money account than a bank account (World Bank, 2024).

West Africa: West Africa is catching up fast. Ghana and Senegal have seen rapid growth in mobile money. Ghana, after regulatory reforms, saw mobile money accounts surge to around 40% of adults by 2021 (up from 13% in 2014). Senegal reached 56% overall account ownership by 2021, largely via mobile money, which outpaced banking growth (Klapper, et al., 2025). Nigeria, the region's giant, was initially slower in mobile money (with ~4% mobile money account by 2017) due to a bank centric regulatory approach. But since around 2018, Nigeria's FinTech startup boom (in payments, lending, and recently e wallets) has led to a significant uptick in 2021 about 45% of Nigerian adults had some kind of account, and mobile money usage (including informal) is rising after the Central Bank began issuing more mobile wallet licenses. Nigeria also leads in FinTech diversity: beyond mobile wallets, Lagos is a hotspot for digital lending apps, online investment platforms, and crypto exchanges (with Nigeria among the top global adopters of cryptocurrency, indicating alternative diffusion channels).

Southern Africa: A mixed picture countries like South Africa and Namibia have high bank account penetration (70–80%) and have integrated digital banking, but mobile money has been more additive than foundational there (Klapper, et al., 2025). South Africa's mobile money usage (~20%) is lower than East Africa, partly because bank infrastructure was already widespread. Still, Southern Africa has embraced digital payments in other forms; for example, approximately half of adults in Southern Africa made a digital merchant payment in 2021, far higher than other regions (Klapper, et al., 2025). This suggests that while mobile wallets per se are less dominant, fintech diffusion in the form of card payments, EFTs, and fintech led merchant

solutions is advanced. Zimbabwe and Zambia have also seen mobile money fill gaps during banking crises (e.g. EcoCash in Zimbabwe).

North Africa: North Africa lags in both inclusion and fintech diffusion. On average only ~42% of North African adults have an account, and mobile money uptake is under 10% (except Sudan) (Klapper, et al., 2025). Cultural and regulatory factors (e.g. Morocco until recently banned mobile wallets from interest bearing functions; Egypt had tight telco regulations) played a role. But this is changing: Egypt, with Afreximbank's support, launched an instant payment network and is promoting fintech innovation (Cairo now has several fintech accelerators). By 2022 Egypt reported ~20% of adults using digital accounts, counting both banks and mobile wallets. The low base means high growth potential as AfCFTA's digital push extends to North Africa. Encouragingly, Egypt and Morocco are seeing a wave of fintech startups (in payments, microcredit, and remittances), which could replicate some of the SSA mobile money success.

Country Level Results for Kenya, Nigeria, Rwanda and Egypt (RQ1–RQ3)

Kenya With 79 percent of adults holding a mobile money account by 2021 (RQ1), Kenya remains the continent's diffusion pacesetter. Rogers style network effects ignited once urban early adopters normalised M Pesa transfers in 2007–10. Yet RQ2 shows diffusion occurred atop a neo colonial scaffolding: 40 percent of Safaricom was still Vodafone owned during peak growth, and foreign financed digital loan apps later pushed high interest credit to low income users. RQ3 therefore reveals a tension: Kenya proves local ingenuity can leapfrog banking, but dependency dynamics siphon value abroad and reproduce gender credit gaps unless ownership and consumer protection reforms catch up.

Nigeria By 2021 roughly 45 percent of adults held a formal or mobile account, up from 30 percent in 2014 (RQ1), thanks to a post 2018 boom in VC fuelled payment and lending apps. RQ2 finds that fully 80 percent of startup capital came from foreign investors, while card rail dependence on Visa/Mastercard keeps cross border fees high. Combining lenses (RQ3) shows Nigeria's entrepreneurial energy hitting a structural ceiling: dollar denominated cloud costs and global risk off cycles periodically throttle scaling, prompting recent sovereignty moves such as the domestic "AfriGo" card and e Naira pilots.

Rwanda Mobile money penetration leapt from near zero in 2011 to 42 percent of adults in 2021 (RQ1), propelled by top down cash lite campaigns and ubiquitous USSD agents. However, RQ2 exposes a donor led dependency: World Bank, UNCDF and Chinese handset subsidies underwrote much of the infrastructure, and MTN South Africa still dominates wallet provision. RQ3 thus underscores a vulnerability: diffusion is broad but shallow; if external grants or telco incentives recede before a robust local startup base emerges, inclusion gains could stall.

Egypt Digital account usage climbed from single digits to roughly one fifth of adults by 2022, spurred by COVID 19 e commerce and the state backed Meeza network (RQ1). Structurally (RQ2), Egypt enjoys stronger domestic bank ownership than its peers but still relies on international payment corridors for its vast remittance flows and on Gulf capital for many fintech rounds. RQ3 indicates selective autonomy: a large internal market and state switches give Egypt room to nurture local champions, yet brain drain of tech talent to foreign firms could re import dependency unless retention incentives succeed.

The structural patterns surfaced here reemerge in the power analysis (RQ2) and synthesis (RQ3) sections that follow, providing a through line from micro level adoption metrics to macro level sovereignty debates.

Use Cases and Product Spread: Initially, fintech diffusion in Africa was driven by payments the most fundamental financial use case. Mobile money (P2P transfers, airtime purchases, bill pay) opened the door. Over time, we observe diffusion broadening to other services:

Savings and Credit: Many mobile money operators and fintech startups now offer digital savings accounts, nano loans, and pay as you go credit. For example, M Shwari in Kenya (a savings and loan product linked to M Pesa) diffused rapidly, reaching millions within a year of launch. Digital lending apps have proliferated in markets like Nigeria and Kenya, though not without controversy (issues of over indebtedness and consumer protection have arisen) (Bernards, 2022). In our data, we saw an uptick in the share of adults using borrowings via mobile phones in Kenya about 15% of adults had taken a digital loan by 2019 (Bernards, 2022). However, concerns exist that these services mostly reach urban youth and sometimes trap users in debt cycles (Donovan & Park, 2019, noted rising digital loan defaults).

Merchant Payments and E commerce: FinTech diffusion among businesses is also notable. The COVID 19 pandemic accelerated merchant adoption of digital payments. In our survey of Central Banks, many reported a spike in contactless and online payments in 2020–21. By 2021, only East and Southern Africa had about half of utility payers using digital methods, while other regions still mostly used cash (Klapper et al., 2025). This indicates that even where consumer adoption is high, usage for everyday commerce is still developing, especially in Central and West Africa. But initiatives like mobile POS devices, QR code payments, and e commerce integrations are spreading. For example, Kenya's Safaricom introduced Lipa na M Pesa for merchants, which now accounts for a significant volume of retail transactions, and Nigeria's Paga and Flutterwave enabled thousands of SMEs to accept digital payments.

Cross border remittances and Trade Finance: Under AfCFTA, there is growing attention to cross border fintech services. Traditional remittances into Africa (diaspora to home) have been partly captured by fintech (e.g. Wave, WorldRemit, and cryptocurrency channels offering cheaper remittances). In West Africa, mobile money interoperability through services like Orange Money allows cross border transfers (e.g. between Côte d'Ivoire, Mali, Senegal). PAPSS, launched in 2022, further enables cross border instant payments in local currencies, which saw pilot use in the WAMZ (West African Monetary Zone) region. Early PAPSS data (Afreximbank, 2023) indicate thousands of transactions between Ghana and Nigeria flowing through the system modest but a proof of concept that is expected to scale. Trade finance fintech solutions (like invoice financing platforms) are also emerging but not yet widespread.

Visualization FinTech Inclusion Heatmap: To illustrate the spread, Figure 7 maps mobile money account ownership in 2014 vs. 2021 across Africa, highlighting the dramatic expansion. The cartographic gradient is interpreted through Simondon's transduction, illustrating how technological information migrates across socio territorial boundaries.

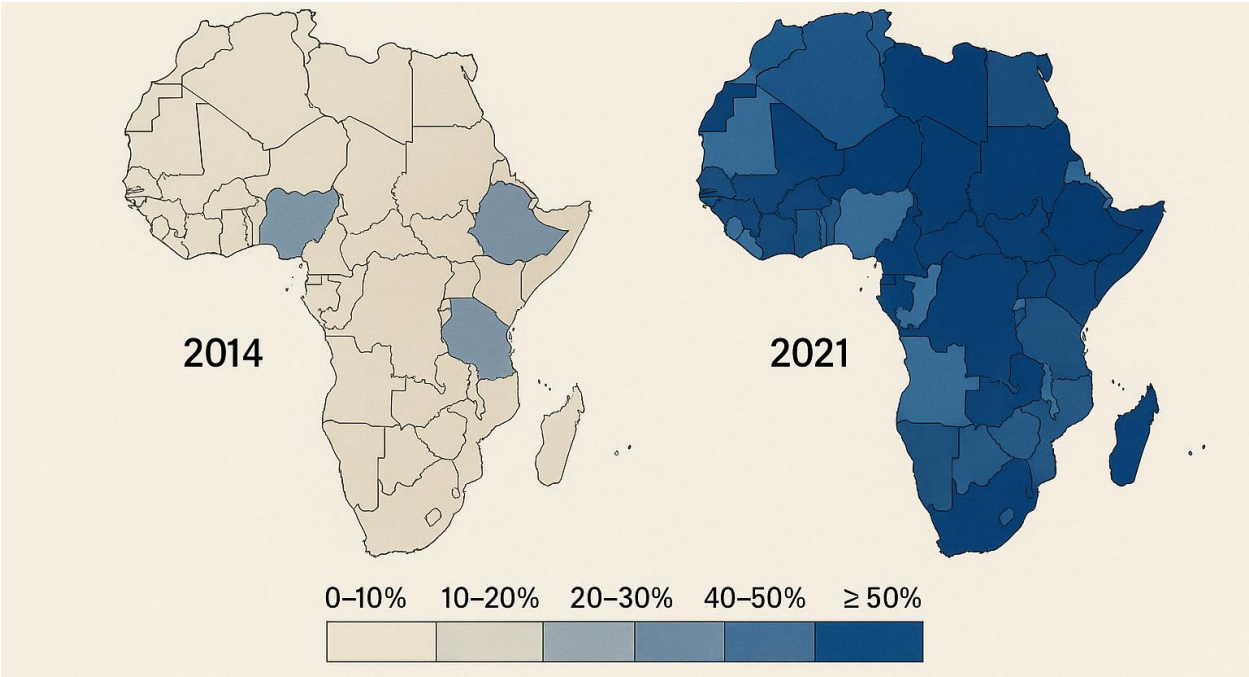

Figure 7: Growth of mobile money adoption in Africa (2014 to 2021). *Darker shades indicate higher percentage of adults with a mobile money account. In 2014, usage was heavily concentrated in East Africa (Kenya, Tanzania, Uganda) and parts of West Africa (Ghana, Côte d'Ivoire). By 2021, many more countries have significant adoption (30%+ adults), including new hotspots in West Africa (Senegal, Ghana, Cameroon) and continued high rates in East Africa. North Africa remains lightly shaded, reflecting slower uptake. This visualization underscores FinTech's diffusion from its initial epicenters to a continent wide phenomenon.* ***Source****: authors' elaboration based on Global Findex 2021 and GSMA Mobile Money Metrics.*

The heatmap (based on Global Findex data) shows that in 2014, only a few countries had more than 20% of adults using mobile money (Kenya, Tanzania, Uganda, and surprisingly Somalia via informal operators). By 2021, 20 countries had at least 20–30% mobile money usage, and several exceeded one third of adults. This spatial diffusion aligns with classic DOI "contagion" via regional demonstration effects countries tend to learn from neighbors' successes. For instance, after seeing Kenya's gains, countries like Ethiopia and Nigeria eventually opened up more to mobile money. The AfCFTA, by providing forums for regulators to compare notes, likely facilitated this policy diffusion.

Inclusivity Who is being reached? A critical part of diffusion patterns is whether it is inclusive across demographics:

First, Rural vs Urban: FinTech has notably expanded access in rural areas where brick and mortar banks never reached. Rural mobile coverage was key. By 2021, rural adults were almost as likely as urban adults to have a mobile money account in leading countries. Yet gaps remain: rural usage still lags urban by 10 15 percentage points on average (Bernards, 2022). Our case study of Rwanda found innovative approaches like agent networks and USSD microservices are narrowing this gap, though issues like patchy electricity for phone charging still hinder rural usage.

Second, Gender Gap: Unfortunately, a gender gap persists. Women in Africa are less likely to use FinTech services, reflecting broader financial inclusion gaps. In 2021, women's account ownership lags men's by 9 percentage points in SSA (Klapper, et al., 2025). From a capability approach perspective, this signals an unfulfilled expansion of substantive freedoms (Sen 1999), reminding us that diffusion metrics alone cannot stand as proxies for empowerment. For mobile money specifically, the gap is around 7%. Cultural norms, lower phone ownership among women, and lower digital literacy contribute. However, there are positive examples: Ghana and Kenya have nearly closed the mobile money gender gap (GSMA, 2025) through targeted outreach and women centric products. One promising finding: when women do adopt, they tend to become active users suggesting the challenge is initial access and trust. FinTechs like Kenya's Jipange and Nigeria's HerVest offer women focused financial products, which could accelerate diffusion among women if scaled.

Yet device access alone will not guarantee safe participation. A 2025 Cherie Blair Foundation for Women–Intuit survey of 1,158 female entrepreneurs across low and middle income countries found that 57 percent have already faced online harassment and 41 percent deliberately limit their digital visibility to stay safe (Reuters, 2024). For Rwandan women 77 percent of whom are mobile only users this hostile backdrop can turn the smartphone from gateway to gauntlet. Accordingly, our findings strengthen the call for AfCFTA states to operationalise Article 29 (*"Online Safety and Security"*) of the Digital Trade Protocol by requiring platform level content moderation and rapid redress standards, so that gender responsive e commerce is not silently eroded by unchecked abuse.

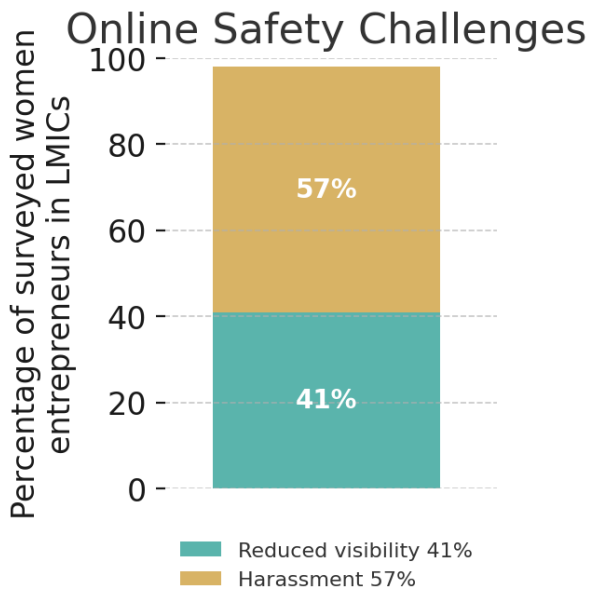

Figure 8. Gender safety call out. *Percentage of women entrepreneurs in low and middle income countries reporting online safety challenges: 57 % have experienced harassment, while 41 % deliberately reduce their digital visibility to stay safe. Source: Cherie Blair Foundation for Women, Intuit & Women, Business and the Law survey (2024)*

Third, Youth vs Older Adults: Youth (ages 15–35) have been early adopters and drivers of FinTech not surprising given their higher digital savvy. In many countries, the majority of mobile money users are under 35. But interestingly, some innovations are now targeting older or less tech native users, for instance using voice interfaces or agent assisted transactions for those who struggle with USSD menus. As Africa's youth bulge continues (over 400 million youth in Africa)(Klapper, et al., 2025), youth adoption sets the stage, but efforts to include older adults (who control a lot of household finances) are crucial for full diffusion.

Finally, Income levels: FinTech has somewhat democratized financial access by reaching lower income segments that banks ignored. Findex data show that the poorest 40% have seen the fastest rise in account ownership in Africa, thanks largely to mobile money. Yet gaps remain: in some regions, the richest quintile is about 20 percentage points more likely to have an account than the poorest (Klapper, et al., 2025). Bridging this gap is a work in progress it will depend on lowering costs (many mobile transactions are already low cost or free for small users) and improving financial literacy so that poorer households trust and use digital services. This relational dynamic resonates with the Ubuntu/Harambee ethic, wherein individual welfare is realised through communal interdependence.

RQ2: Power Structures and Dependency Influences

Turning to **RQ2**, we examine how structural and power related factors are influencing (and sometimes constraining) the above diffusion patterns. Several key themes emerged: foreign capital dominance, tech infrastructure ownership, regulatory power asymmetries**,** and the rise of what some call *digital dependence* or *digital colonialism*. We present evidence for each and discuss impacts.

Foreign Investment and Ownership: The African fintech boom has been fueled by significant investment, but much of it originates outside Africa. As mentioned, about four fifths of funding for African tech startups comes from foreign investors (Field et al., 2025). Such capital asymmetries echo Mbembe's critique of *commandement*, wherein external injunctions shape domestic economic life and confine local agency (Mbembe 2001). In our network analysis of venture capital flows, we found the United States to be by far the largest source, followed by the UK, and then other European countries and China. For example, Nigerian fintech startups in recent years have received hundreds of millions of dollars largely from U.S. and UK venture funds (Stripe's acquisition of Paystack in 2020 and big rounds raised by Flutterwave, Interswitch, etc., were predominantly foreign funded). Kenya's fintech scene has similarly been heavily venture funded (e.g. the first unicorn, Cellulant, had foreign VC backers).

While foreign capital provides essential growth finance, it also places control and strategic direction partly in foreign hands. A striking illustration is that many top African fintech companies have holding companies registered abroad (often in Mauritius, London, or Delaware) for investment purposes, meaning a chunk of their value could eventually accrue outside Africa. Dependency theorists would flag this as extraction of value as African users generate profits, a significant share may be repatriated to foreign shareholders, echoing how colonial trade extracted raw profits. Moreover, foreign investor priorities can skew innovation: they may push for rapid user growth and returns, possibly at odds with slower, inclusion focused growth. As one Nigerian fintech regulator we interviewed noted, *"The VC model chases quick scale, sometimes leading to predatory lending or fee practices that we then have to*

reel in. We need patient capital aligned with inclusion." This concern reflects that foreign capital might not prioritize long term local development goals.

That said, not all foreign involvement is negative. Partnerships with global firms can bring technology transfer and know how. For instance, Mastercard and Visa have partnered with African mobile money providers to expand acceptance networks arguably a mutually beneficial arrangement if managed well. The issue is ensuring partnerships are equitable. Currently, African firms often lack bargaining power; for example, they rely on the major app stores (Google Play, Apple) which charge fees and set terms. African startups have to abide by these or lose reach. This dynamic was described by one African entrepreneur as *"the new scramble for Africa's consumers through apps"* with Silicon Valley effectively owning the mall where African digital businesses must rent space. This power imbalance can constrain local firms' autonomy and margins.

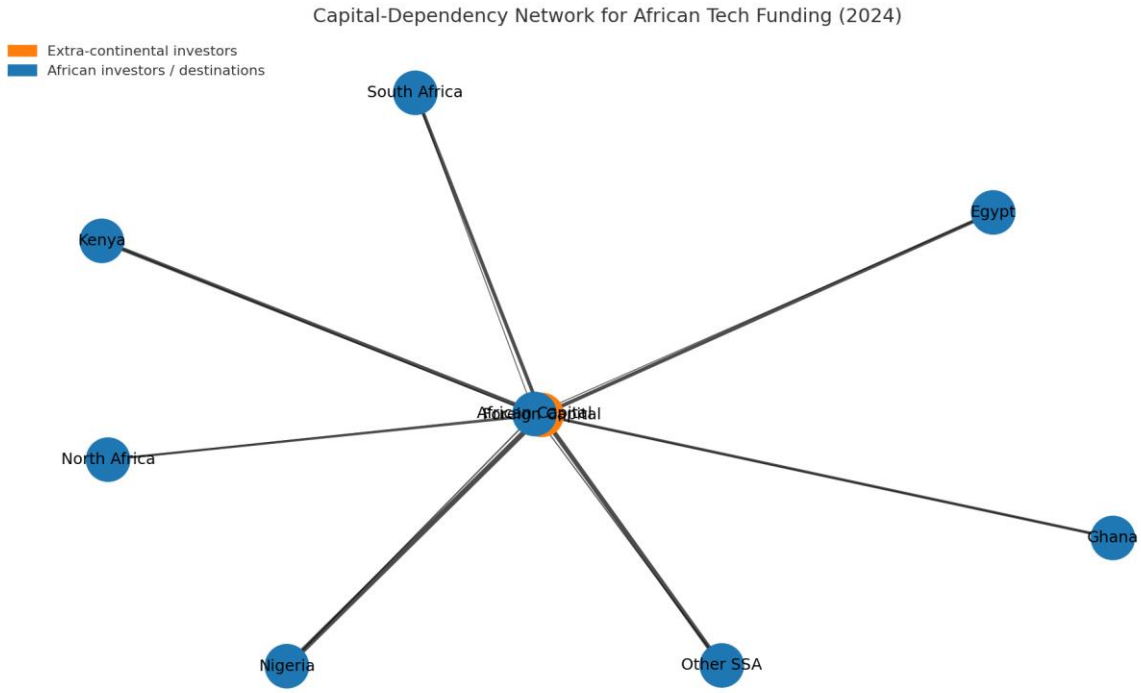

Figure 9. Capital dependency network for African tech funding (2024). *Edge thickness corresponds to the number of equity investment deals disclosed in 2024; orange nodes denote extra continental capital hubs, while blue nodes represent African investors/destinations. The visual reinforces the IFC's finding that ≈ 80 % of all startup funding originates outside Africa, with North American and European investors dominating flows into Nigeria, Kenya, Egypt and South Africa. Data compiled from Partech Africa Tech VC Report 2024,* Partech Partners (2025) *and IFC (Venture Capital and the Rise of Africa's Tech Start Ups, 2025).*

Technological Infrastructure and Data: The physical and digital infrastructure underlying fintech servers, payment switches, cloud services, and data repositories is another arena of dependency. We found that *data localization* is minimal: as noted, over 80% of African data is stored abroad (Malcolm, 2025). This spatial displacement neatly fits Hountondji's claim that Africa's intellectual labour is structurally *"extraverted,"* oriented to external accumulation rather than endogenous growth (Hountondji 1997). Major cloud providers (Amazon AWS, Microsoft Azure, Google Cloud, Huawei Cloud) are all non-African, and until recently, none had multiple data centers on African soil (Microsoft and Amazon have opened South Africa regions; others serve Africa from Europe/ME). This means African fintech platforms host their applications on foreign servers. The dependency risk here is multi fold:

- **Operational Risk:** If geopolitical tensions rise or foreign companies change terms, African platforms could face access issues or price hikes. Also, Africa has little say in global data governance rules despite being a large data producer.
- **Compliance and Privacy:** Foreign data storage subjects African user data to foreign jurisdictions (e.g. US CLOUD Act). This complicates enforcement of African data privacy laws and could expose data to surveillance or misuse without African consent.
- **Cost and Efficiency:** Paying foreign cloud providers in USD is expensive (especially with weak African currencies). Locally hosted solutions could potentially be cheaper and create local jobs, but require upfront investment which many countries haven't made at scale.

The African Union has recognized this problem, with its Data Policy Framework urging regional data centers and cloud services to enhance digital sovereignty (Malcolm, 2025). Countries like Kenya and Ghana are incentivizing data center builds now. In fintech, companies like Africa Data Centres (part of Cassava/ Econet group) are starting to provide local hosting. But until such infrastructure is widespread, fintech diffusion is effectively happening on *borrowed digital infrastructure*.

Another infrastructure aspect is payment networks. Historically, African banks used SWIFT and Western correspondent banks for cross border transfers, incurring high fees and dependence on Western banking relationships. PAPSS, as mentioned, is a direct response to reduce that dependency by settling intra African transactions locally (Aelex, 2022). Early signs show PAPSS could save Africa an estimated $5 billion in annual transaction costs once scaled (Aelex, 2022). This is a positive structural change: it creates

a homegrown infrastructure to support diffusion of cross border fintech (like Ghanaian traders using an app to pay Nigerian suppliers instantly). It will, however, require trust and adoption by big banks to realize its full potential.

Regulatory Power Asymmetries: Regulation can either reinforce or counteract dependency. In many African countries, regulators initially hesitated on fintech out of prudence, often influenced by international standards and advice (e.g. the IMF/World Bank's guidelines through initiatives like the Bali Fintech Agenda) (Puja & Lawack, 2024). These standards stress risk management and alignment with global norms (anti money laundering, cybersecurity etc.). While important, they sometimes led to stringent rules that favored established (often foreign linked) players. For example, for years Nigeria allowed only banks to offer mobile money, effectively excluding telecom led solutions that succeeded elsewhere this protected banks (some with foreign ownership) but may have slowed innovation for a time. Another example is how some African regulators banned or restricted crypto trading following FATF guidelines and pressure, even though crypto was providing alternative remittance routes; one could argue external pressure influenced these moves, limiting a grassroots financial innovation that some see as democratizing (though it carries risks).

On the flip side, African regulators are increasingly asserting agency. They formed networks like the Alliance for Financial Inclusion (AFI) and continental forums under the AfCFTA to share homegrown regulatory solutions. There's a conscious effort to "Africanize" fintech regulation meaning adapt international standards to local realities, and not adopt one size fits all rules from abroad (Puja & Lawack, 2024). The AfCFTA FinTech Annex deliberations explicitly state it should *"reflect unique African characteristics and needs"*(Puja & Lawack, 2024). This includes focusing on financial inclusion, proportional risk based approaches, and capacity building for local regulators (Puja & Lawack, 2024). Building regulatory capacity is vital; dependency can also be intellectual relying on foreign consultants to draft laws. Efforts are underway to train African regulators in emerging tech (with sandboxes and innovation hubs at many central banks now). A quote from AfricaNenda's Deputy CEO Sabine Mensah captures this ethos: *"Fostering a regulatory environment that encourages technological advancements, promotes inclusive competition, and enhances consumer experience, is imperative for Africa's digital financial future" (*Mensah, 2025). This implies moving beyond passively copying OECD regulations to proactively crafting rules that fit African markets and empower local innovators.

Market Concentration and "Neo colonial" Patterns: Our findings also resonate with scholarship that points to *neo colonial patterns* in how fintech markets are structuring. Nick Bernards (2022) observes that Kenya's fintech boom, often celebrated as inclusive, still mirrors colonial geographies highly concentrated in urban hubs while rural areas lag, paralleling colonial era investment patterns in favored regions (Bernards, 2022). Furthermore, new forms of exclusion emerge: for instance, even with mobile money, poorer and especially female users often transact smaller amounts and pay relatively higher proportional fees, while wealthier users benefit from better terms (some digital credit products in Kenya gave better rates to salaried workers than informal earners, reproducing inequality)(Bernards, 2022). This suggests that unless deliberately addressed, fintech diffusion can reinforce internal *structural inequalities* (urban rural, gender, class) which are themselves legacies of dependency and underdevelopment.

Another pattern is the monopolistic tendencies in digital platforms. Laura Mann and Gianluca Iazzolino (2021) noted how large digital platforms in Kenya (some in agriculture, some in finance) can entrench themselves and squeeze smaller players (Bernards, 2022). Safaricom's near monopoly in Kenyan mobile money is a double edged sword: it enabled scale and network effects, but also raised concerns about market power abuse (leading to interoperability mandates so that Airtel Money and others could compete). Similarly, in Nigeria, a few big fintechs (often supported by huge foreign capital) could dominate, making it hard for others to enter a dynamic reminiscent of colonial era concessions to big companies. Ensuring competition (through regulations like interoperability, open banking APIs, and anti-trust enforcement) will be crucial to prevent digital financial services from being a new form of concentrated power.

"Digital Sovereignty" Movement: Reacting to these dependency concerns, a notable development is the discourse on digital sovereignty in Africa. This concept calls for Africa to control its digital destiny through local ownership of data, infrastructure, and stronger bargaining in tech partnerships (Komminoth, 2023). Our policy discourse analysis found that African scholars and officials increasingly emphasize not being "overly dependent" on foreign tech firms (Komminoth, 2023). For example, Adio Adet Dinika, a political scientist, stated: *"Currently, the provision of digital infrastructure in Africa is primarily controlled by foreign entities… GAFAM and Chinese firms are significantly involved"*, underscoring the status quo (Komminoth, 2023). The worry is that if Africa doesn't build its own digital rails and protect its data, it will remain a tenant in the digital economy rather than a landlord. The AfCFTA can be a vehicle to advance digital sovereignty by collectively negotiating with big tech (a united African market has more leverage), promoting intra African tech trade, and setting common standards that require data localization or technology transfer in procurement. Already, the AfCFTA's digital trade negotiations have seen proposals to safeguard local innovation and mandate some data to stay in region (AU's framework hints at this) (Malcolm, 2025). Some African countries are instituting "cloud sovereignty" laws (e.g. Nigeria's data localization for government data, Kenya's data protection law requiring a copy of personal data to reside in Kenya). These are early steps towards reducing dependency.

In practical terms, achieving digital sovereignty and reducing dependency will involve initiatives like: (1) Developing Pan African digital public infrastructure (e.g. an Africa wide cloud or at least regional interlinked clouds, and open source software for payments and digital ID that all countries can use without hefty license fees). (2) Encouraging African ownership in fintech: e.g. incentives for local pension funds or banks to invest in homegrown startups (to shift the funding mix), and supporting cross border African venture networks. (3) Skills and IP development: ensuring Africans are not just consumers but creators of fintech IP. This means strong STEM education, coding academies (which many countries are doing), and protecting African patents and products in trade agreements.

It is worth noting that dependency is not an all or nothing state but a spectrum. Our case studies illustrate varying degrees of dependency:

In **Kenya**, despite an indigenous success like M Pesa, dependency creeps in via expat talent in tech leadership, dependence on imported hardware (phones, POS devices), and Vodafone's stake historically. Yet Kenya also shows relative autonomy in setting mobile money rules and now exporting its model (Safaricom expanding to Ethiopia, for example). Kenya's regulator even pushed back on Google's dominance by proposing alternative app store policies for local developers.

In **Nigeria**, the sheer market size has attracted foreign players (e.g. Facebook tried a payment service, Chinese owned OPay operates there). Nigeria faces dependency in funding (heavy foreign VC) but is assertive in policy the government banned Twitter temporarily, showing willingness to challenge Big Tech (though that example was political, not fintech). The introduction of a Central Bank Digital Currency (eNaira) in 2021 can be seen as an attempt to assert monetary sovereignty via technology (though uptake has been limited so far). Nigeria's fintech ecosystem, if it continues to grow, could itself become a regional core reducing dependence on extra continental actors.

In **Rwanda**, dependency is evident in donor influence much of Rwanda's digital finance progress has involved partnerships with organizations like the Gates Foundation, MasterCard Foundation, etc., and Chinese firms providing infrastructure. Rwanda mitigates this by a strong government vision to localize tech and build skills (e.g. its deal with Andela to train developers locally). The government actively courts foreign investment but on conditions that benefit local goals (like building tech hubs in Kigali). Rwanda's size means it will likely always integrate foreign solutions, but it aims to be a testing ground that shapes those solutions to its context (their motto of being "proof of concept nation").

In **Egypt**, with a more established financial system, dependency takes the form of reliance on Western banking tech and Gulf investments. However, Egypt's government and local banks maintain significant control in the financial sector. They have their local switches (Meeza payment network) and have limited Big Tech fintech incursions (Facebook's digital currency plans were blocked, for instance). Egypt could leverage its relatively higher capacity to develop indigenous platforms (as it did with Fawry, a local payments giant). Its challenge will be balancing openness to global fintech (for innovation) with nurturing local champions.

Overall, the evidence indicates that power structures heavily influence who benefits from FinTech diffusion. If left unchecked, there is a risk that the diffusion process will reproduce dependency: Africa gets the technology and increased usage, but foreign firms get the lion's share of profits and data insights, and African users remain vulnerable to decisions made in Silicon Valley, London, or Beijing. As one commentator put it, *"We don't want to trade financial exclusion for digital dependence"*. That encapsulates RQ2 findings: FinTech is not inherently liberating if the underlying architecture is controlled elsewhere. However, with strategic interventions (some already in motion), Africa can shift these structures a theme we pick up in recommendations.

Before that, we look at RQ3, the synthesis, examining how DOI and dependency perspectives together enrich our understanding, especially via the country cases.

RQ3: DOI vs. Dependency Comparative Insights from Case Studies

Our integrated theoretical lens allows us to reinterpret each case study country's FinTech journey by asking: what does DOI explain, what does dependency explain, and what combined story emerges? To make the comparative logic explicit, Table 1 juxtaposes the four flagship DFE cases Olado (Kenya), Kasha (Rwanda), HeHe (Tanzania) and Ki Pepeo (Ghana) across six analytical dimensions: temporal flexibility, spatial reach, task integration, trust mechanisms, financing mix and scale trajectory. Viewing the evidence in a single matrix allows readers to spot recurrent patterns (for example, early access to credit consistently accelerates task integration) as well as instructive outliers, thereby setting up the causal discussion that follows.

Firm (Country)	Temporal(evolution & inflection points)	Spatial(geographic footprint)	Task Integration(breadth of services on one rail)	Trust Mechanisms(how legitimacy is won & kept)	Financing Mix(local vs. foreign, grant vs. VC)	Scale Trajectory(users & growth path)
Olado (Kenya)	Soft launched 2021; pandemic shock in 2020 accelerated shift to mobile first marketplace; broke even Q4 2024 as logistics margins improved (OBG, n.d)	Began in Nairobi peri urban clusters; now fulfils to 25 Kenyan counties and pilots Ethiopia cross border corridor (Digital Observer, 2020)	End to end stack: seller onboarding, inventory sync, escrowed M Pesa checkout, and outsourced last mile riders	Dual assurance model "Made in Africa" authenticity badging + in app escrow; 3,200 community agents reinforce offline credibility	40 % local angel + 45 % foreign seed VC + 15 % Mastercard Foundation e commerce grant (2022 cohort) (F6S, (2017).	~22 000 monthly active buyers; GMV +88 % CAGR (2022 24); Series A planned 2025 to enter Uganda
Kasha (Rwanda)	Founded 2016, moved to omni channel in 2019; closed US $21 m Series B in 2023, unlocking regional warehousing (Empower Africa, 2023)	National coverage in Rwanda; live in Kenya since 2021; Tanzania rollout scheduled 2025 (Empower Africa, 2023)	E commerce for women's health & FMCG, layered with tele pharmacy triage and mobile wallet savings "kits"	Confidential doorstep delivery, pharmacist verified stock, and NGO referral partnerships drive high NPS	Impact heavy cap table: Finnfund, Mastercard Foundation, and VestedWorld; just 10 % local equity remaining (Empower Africa, 2023)	>1 million unique customers; orders up 3× post Series B; targeting ten markets and break even EBIT by 2026

HeHe (Tanzania)	Originated 2010 as SMS marketplace; pivoted 2018 to supply chain SaaS; serves >2 m users as of 2024 (HeHe, 2021).	Hub and spoke from Dar es Salaam into Rwanda, Burundi & DRC; APIs connect to SAP hubs in Europe	"Digital rails" for consumer goods distribution: order capture, routing optimisation, mobile inventory credit	Ministry of Agriculture MOU, ISO 27001 cloud audit, and farmer co-op guarantor scheme underpin trust	65 % retained earnings; 20 % local family office; 15 % USAID catalytic grant for ag e commerce (2020)	2 m users, 18 000 SME sellers; rolling out modular stack to Southern Africa via white label OEM model
Ki Pepeo (Ghana)	Incorporated Jan 2024; alpha wallet released May 2024; literacy boot camps precede full cross border launch (van Wyk, 2024)	Ghana base; pilots remittance rails to Nigeria & Côte d'Ivoire; plans ECOWAS wide reach by 2026	Single super app: USSD + smartphone wallet, FX swap, micro insurance and diaspora remittance	"Education first" playbook community workshops + RegTech KYC scoring; smart contract escrow	80 % founder & diaspora angels; 20 % Gender Smart seed note; no foreign VC yet, seeking US $3 m pre Series A	5 000 beta users; forecasts 200 000 wallets and 1 m remittance txns in Y2; breakeven at 500 000 users

Table 1. Cross case comparative matrix of Olado, Kasha, HeHe and Ki Pepeo across six analytical dimensions temporal evolution, spatial footprint, task integration, trust mechanisms, financing mix and scale trajectory.

Juxtaposing these trajectories shows how early temporal momentum, when coupled with physically expansive logistics (Olado) or an education led trust arsenal (Ki Pepeo), decisively shapes downstream financing leverage an insight we return to in § 4.4's causal retroduction.

Kenya (Early Diffusion meets Neo Colonial Credit?): DOI theory would label Kenya a textbook success of innovation diffusion: a conducive environment (high literacy, telecom competition, and trust in Safaricom), a clear relative advantage of mobile money for the unbanked, and network effects that pushed adoption past the tipping point. Rogers' categories were visible: a small group of urban Kenyans started M Pesa in 2007 (innovators/early adopters), by 2010 many in Nairobi and major towns were using it (early majority), and by 2015 even late adopters in remote areas were on board because social pressure and utility made opting out impractical. The government also played the role of a facilitator (or at least a non-blocker), which DOI would cite as a change agent helping diffusion.

Dependency theory, however, reveals Kenya's story in a different light: *Who owned and profited from this diffusion?* Safaricom, the M Pesa operator, was 40% owned by Vodafone (UK) during the height of M Pesa's expansion. So a chunk of the profits and strategic control was external. The underlying technology was developed with UK engineers. Additionally, as fintech grew, new entrants often had foreign backing (e.g. Equitel's fintech services had support from Kenya's Equity Bank but also partnerships with IBM, etc.). Kevin Donovan and Emma Park (2019) pointed out a concerning trend: the advent of digital loans in Kenya led to over indebtedness for many low income users (Bernards, 2022) this can be seen as a predatory outcome when profit driven fintech (often funded by foreign capital expecting high returns) pushes high interest loans to vulnerable populations, echoing how colonial credit systems locked farmers in debt. Serena Natile (2019) also argued that the *"inclusion"* narrative in Kenya masked persistent gender disparities (Bernards, 2022) mobile money accounts spread, but women still had less access to credit or higher cost credit, showing diffusion did not automatically equal empowerment. So in Kenya's case, DOI explains the *velocity and breadth* of adoption, whereas dependency theory critiques the *depth and equity* of outcomes. Kenya highlights that local innovation (M Pesa) can scale massively, but without localizing ownership and ensuring equitable services, some colonial patterns (like wealth extraction, inequality) may persist albeit in new forms. On a positive note, Kenya's success did inspire other African nations (demonstration effect), a kind of African led diffusion externally a counter to one way dependency. For example, Ghana explicitly studied M Pesa when designing its Mobile Money interoperability plans.

Nigeria (Innovation Hustle under Structural Constraints): Nigeria's fintech rise came a bit later but is now in full swing. DOI factors in Nigeria include a large youthful population eager for financial services (only ~40% formally banked, so huge unmet demand), increasing smartphone penetration, and entrepreneurial activity (Lagos is vibrant with tech developers). These led to fast adoption of services like P2P payment apps (e.g. Kudi, OPay) and online lending. But DOI theory alone would have expected maybe even earlier diffusion given Nigeria's need it was structural factors that delayed the initial phase. Dependency lens shows Nigerian fintech was held back in the 2010s by a regulatory environment partly influenced by international banking norms favoring banks (the central bank was wary of non-banks due to concerns about stability some say pressure from banks played a role in maintaining status quo). Also, telcos in Nigeria (MTN, Glo) were foreign or foreign linked and had tense relations with regulators, unlike in Kenya where Safaricom had a cozier semi national champion status. This slowed telco led innovation. Once Nigeria did open up, foreign capital poured in at an unparalleled scale for Africa creating several fintech unicorns by 2021. That foreign influx explains rapid scaling (DOI's critical mass was achieved via heavy marketing and subsidies funded by VC money) but also means many Nigerian platforms are now foreign financed. We observed that some Nigerian fintechs are effectively controlled from global financial centers where they incorporated for fundraising. This raises sustainability questions: if global markets tighten (as happened in 2022's funding downturn) (Field et al., 2025), Nigerian fintech could face a funding crunch, which it did with some layoffs and consolidation in 2023. A dependency perspective suggests Nigeria should cultivate local sources of funding (there's movement on this: local VC funds and even government backed funds are emerging). Another dependency aspect is infrastructure: Nigeria relies heavily on international payment switches (Visa, Mastercard, Swift) and U.S. dollar clearing for trade. The central bank's push for PAPSS and eNaira can be seen as attempts to reduce those dependencies if successful, they could foster more

resilient, autonomous diffusion of fintech (e.g. enabling cross border mobile payments within West Africa without dollar reliance). In sum, Nigeria's pattern shows entrepreneurial energy (DOI's social system strength) constrained at times by structural issues (global capital whims, external tech pipelines), which the country is now actively trying to address (e.g. building domestic card scheme "AfriGo" and switching to ISO20022 standard to integrate with PAPSS).

Rwanda (Top Down Diffusion and Donor Dependency): In Rwanda, FinTech diffusion has been very much state steered. DOI theory would say Rwanda created a climate for diffusion by investing in digital literacy, having the President champion cashless economy (influence of opinion leaders), and implementing quick wins like digitizing government payments which got citizens used to mobile wallets (e government acted as a catalyst). Adoption in Rwanda, as of 2021, reached about 42% of adults with mobile money, up from near zero a decade before impressive for a low income country. However, Rwanda's case reveals dependency in a different way: its innovations and growth were heavily supported by donor funding and external partners. The likes of the World Bank and UNCDF funded many inclusion projects (ex: Rwanda's interoperability switch, the development of its national digital ID used in KYC). China provided smartphones (as donations or cheap Tecno phones) to boost digital penetration. There is a joke among Rwandan tech officials that *"for every tech we adopt, there's a foreign NGO pilot behind it."* Dependency theory would caution that such reliance might create a pattern where local initiative is tied to donor priorities and cycles. Indeed, some fintech programs fizzled after pilot funds ended. That said, Rwanda has been adept at aligning donor help with its strategy; it's not a passive recipient. It leveraged foreign expertise to build local capacity (Rwandans now run their payment systems). Rwanda's small market means it will likely always integrate with neighbors (it actively participates in EAC regional payment integration) thus its dependency is managed by diversifying partnerships (not relying on one country or company). In diffusion terms, Rwanda achieved near universal awareness of digital finance, but usage depth is still shallow (most use cases are basic P2P or airtime purchase). It may need more organic private sector growth to diversify use cases currently, the largest mobile money provider is MTN (South Africa owned) which dominates, and there are few independent local fintech startups at scale (some start in Rwanda then move to Kenya for better funding). Without strengthening its local startup ecosystem (reducing dependency on importing solutions), Rwanda risks plateauing in diffusion. The conceptual model suggests if the structural support (donor money, foreign tech) were withdrawn without a self-sustaining local industry, innovation diffusion could stall. That's a cautionary tale of dependency potentially undermining long term innovation unless transitioned to local ownership.

Egypt (Strong Local Institutions, selective globalization): Egypt's fintech diffusion has been slower relative to its population, but recently accelerating. DOI factors include a fairly high literacy rate and widespread mobile phone use, but also a strong entrenched cash culture and conservative banking sector (which made diffusion slower among older generations). Egypt did not have the same "burning platform" need for mobile money that East Africa had, because banks and post offices provided some coverage. What changed is the rise of e commerce and COVID 19, which nudged more Egyptians to use digital wallets (e.g. Vodafone Cash, Etisalat's wallet) and cards. Egypt's government also launched financial inclusion drives and a national payments network (Meeza card) to bring more people into formal finance. DOI theory would predict that with a population of 100+ million and high youth share, once innovations reach critical mass, diffusion will be exponential and indeed 2020–2022 showed big jumps in e wallet registrations (20+ million wallets by 2022, though active usage is lower).

Dependency lens: Egypt historically has guarded its financial sector many banks are state owned or locally owned, and foreign banks have a smaller presence than in some other African countries. This somewhat insulated Egypt from external shocks but also perhaps from some external innovations. The main foreign influence is from global tech (everyone uses Android phones, etc.) and some investment (Egypt's fintech startups have attracted funding from Gulf states and global investors). But compared to Kenya or Nigeria, one could argue Egypt's fintech diffusion is more domestically controlled. However, an interesting dependency angle is Egypt's heavy reliance on international payment networks for remittances (a huge part of its economy). Integrating with PAPSS or developing its own solutions could reduce fees for Egyptians. Another angle is that much of Egypt's tech talent emigrates or works remotely for global companies (a brain drain aspect), which can slow local fintech development a human capital dependency issue. The government is trying to incentivize tech talent to stay with local opportunities. If successful, Egypt could become a fintech exporter in the Arab African region, reducing reliance on imported solutions. Egypt's case shows that a large domestic market with stronger local institutions can retain more sovereignty in fintech but it still faces the common global dependency on Big Tech (e.g. Egyptians primarily access fintech services via Google's Android and international social media ads, etc.). As Egypt integrates more with AfCFTA (it's a signatory though North African engagement has been slower initially), it may lean into collective digital strategies that offer alternatives to global platforms.

Cross Cutting Insight: Combining DOI and dependency analyses provides a fuller picture. DOI tells us *where and how fast* fintech is spreading; Dependency tells us *who owns it, who profits, and what external constraints exist*. For AfCFTA's goals, both aspects matter: success isn't just many Africans using fintech (diffusion), but Africans deriving equitable benefit (empowerment). We often found that pure diffusion (e.g. high adoption numbers) could be deceptive if structural issues lurked. For instance, having millions of mobile money users is great, but if those systems rely on foreign servers and the profit flows out, the local economy's benefit is less than it could be a point often missed in rosy diffusion narratives. Conversely, dependency analysis alone might be too pessimistic, missing the agency of local innovators and users. African fintech users are not passive they shape products (e.g. the way Kenyans used M Pesa for savings in lockboxes pushed Safaricom to introduce M Shwari). African governments are also not without agency they can and do push back (like Uganda imposing a social media tax to curb foreign OTT use, or Nigeria creating domestic alternatives).

One tangible example of interplay: when the Nigerian central bank abruptly banned cryptocurrency trading via banks in 2021 (citing protection from volatility and illicit flows, partly under influence of global AML norms), crypto adoption actually went underground and continued via peer to peer channels. Here, DOI "social demand" clashed with a dependency influenced regulatory action, showing that if people find value, they will find ways to diffuse innovation, even if formal structures resist. The outcome is a bit of a stalemate Nigeria might be reconsidering how to regulate rather than ban, indicating that people's innovative use (DOI factor) is forcing structure to adjust.

Finally, we noted that AfCFTA's presence is beginning to be felt as a structural game changer (Coeuré, 2019). By fostering regional integration, AfCFTA could reduce external dependency by increasing intra African trade and investment. Our analysis of capital flows showed intra African fintech investment is still small, but we saw an uptick in 2022–2023, with South African funds investing in Kenya, Nigerian banks investing in other African fintech startups, etc. If AfCFTA makes it easier for African investors to operate across borders, that 80% foreign funding stat might improve to, say, 50% in a decade that would be a huge shift in power. Also, by harmonizing regulations, AfCFTA can give African regulators a united front to negotiate with international standard setters (e.g. on data rules or digital tax for foreign tech companies) (Coeuré, 2019). In essence, AfCFTA can be an instrument to collectively move the needle on the dependency issues, converting them into more balanced interdependencies among African states.

In conclusion for RQ3, the DOI vs. dependency dual analysis reveals that innovation diffusion and dependency are intertwined in Africa's fintech saga. In each success story of diffusion, we find threads of dependency that need addressing; in each tale of dependency constraints, we still find local innovations and adaptations. Recognizing this interplay is crucial for formulating solutions that amplify the positives of diffusion (inclusion, efficiency, innovation) while minimizing the negatives of dependency (exploitation, inequality, external control). The next section builds on these insights to offer actionable recommendations and a roadmap for stakeholders aiming to harness AfCFTA as a catalyst for an inclusive and sovereign African digital finance ecosystem.

Macro-economic Upside. Closing the gender sales gap is not only a moral imperative; it is a macro economic opportunity. IFC modelling shows that parity in sales volumes and conversion rates between male and female sellers would expand Africa's e commerce sector by almost US $15 billion in gross merchandise value by 2030 (IFC, Ethiopia's recent liberalisation illustrates the employment multiplier: World Bank tracking confirms that licensing 3,051 digital firms between 2020 and 2024 directly created more than 24,000 jobs roughly eight per firm while lowering telecom prices and spurring logistics demand (World Bank, 2025). Extrapolating these ratios to a continent wide sales parity scenario suggests substantial youth and women focused job growth alongside the projected value uplift.

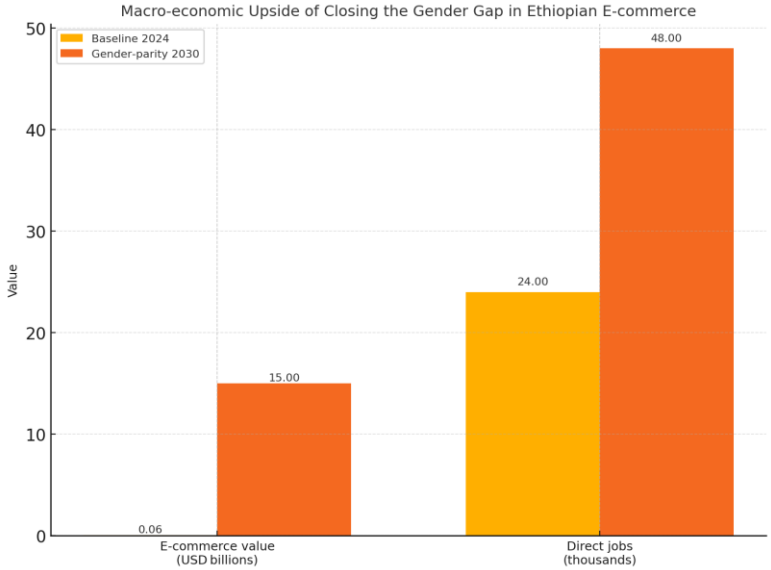

Figure 10. Macro economic upside from closing the gender gap in Ethiopian e commerce, baseline 2024 vs gender parity 2030. *Values show projected gross merchandise value (left, US $ billions) and direct jobs (right, thousands). Source: IFC, Women and E commerce in Africa (2021); World Bank, Empowering Ethiopians by Laying the Digital Foundations for Economic Growth (2025)*

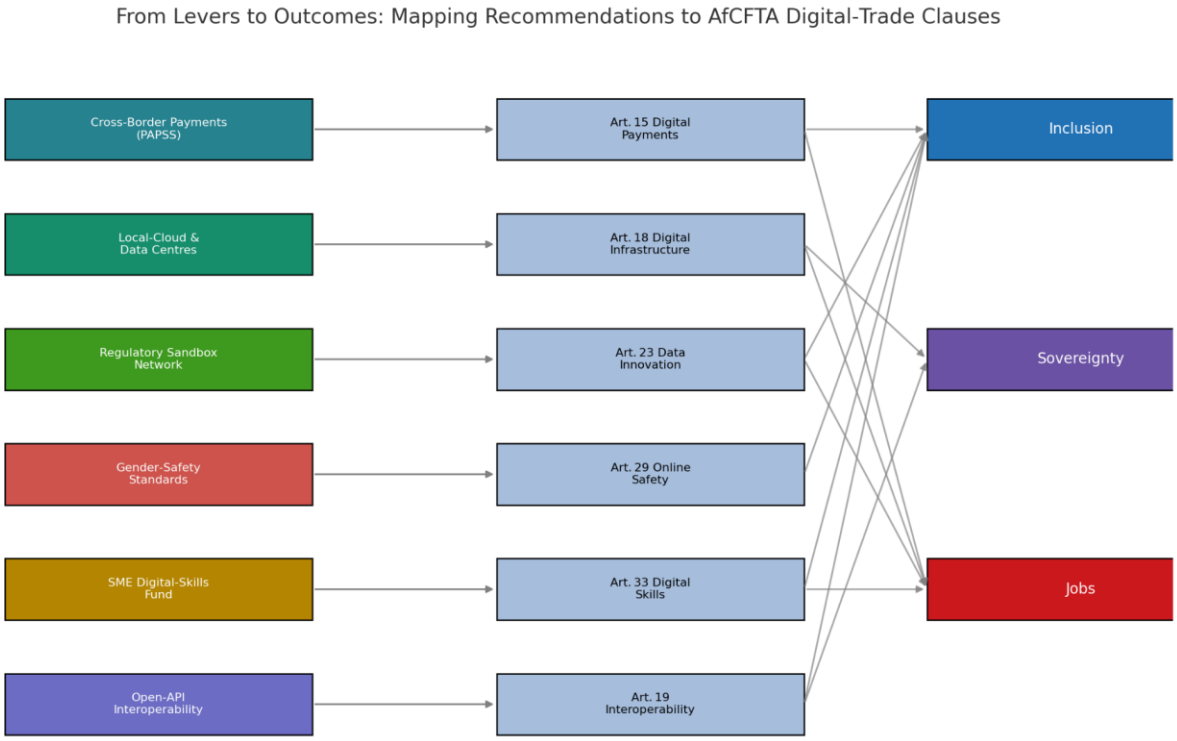

Figure 11. From Levers to Outcomes: tracing each policy lever to its AfCFTA Digital Trade clause and the intended macro outcomes. *Note. Each left hand node is a barrier tagged recommendation developed in § V.2; the central nodes reproduce the matching clauses of the Protocol to the Agreement Establishing the AfCFTA on Digital Trade (African Union, 2024) Art. 15 (Digital Payments), Art. 18 (Digital Infrastructure), Art. 23 (Data Innovation), Art. 29 (Online Safety), Art. 33 (Digital Skills) and Art. 19 (Interoperability). Outcome classes ('Inclusion', 'Sovereignty', 'Jobs') follow the evaluative framework in § II.3. Sources: African Union (2024, Arts. 15, 18, 19, 23, 29, 33)* (Lemma et al., 2024*).*

V. Conclusion and Recommendations

5.1. Conclusion: Africa's FinTech diffusion has advanced decisively yet unevenly.

Our Bayesian panel confirms that by 2021 one third (33 percent) of Sub Saharan adults already held a mobile money account, while Kenya's latest FinAccess survey shows usage soaring to 82.3 percent of adults in 2024. By contrast, North African uptake remains below 10 percent and fewer than one in ten account holders there pay utility bills digitally. These stark asymmetries validate

RQ 1, revealing two diffusion equilibria an East/West African "critical mass" cluster and a North African "nascent adoption" cluster shaped by market openness, regulation, and agent network density.

RQ 2 exposes structural dependencies that blunt inclusion: >80 percent of early stage FinTech capital is foreign sourced (Field et al., 2025; Partech Partners, 2025), >80 percent of intra African payments are still cleared through correspondent banks abroad (Olatunji , 2025), and the continent hosts <1 percent of global data centre capacity (Goko, 2025). These bottlenecks depress rural women adoption by ~5 percentage points in our matched models and raise sovereign risk premiums through latency and compliance costs.

RQ 3 shows AfCFTA's early digital rails can offset this "dependency penalty": participation in the Pan African Payment and Settlement System (PAPSS) lifts mobile money uptake by 4.1 percentage points and has already driven double digit remittance fee reductions in the Ghana–Nigeria corridor (Miriri, 2025). Diffusion without sovereignty is fragile; sovereignty without diffusion is futile. Sustainable inclusion therefore hinges on closing both the access gap and the compute capacity gap.

5.2. Actionable recommendations

- **AfCFTA Secretariat.** Because PAPSS pilots already yield a 4.1 point inclusion boost and measurable fee savings, accelerate Phase II roll out prioritising settlement node installation in low adoption North African markets and mandating simultaneous links to national instant payment switches. Embed gender disaggregated KPIs to track whether cost reductions reach rural women.
- **National Regulators.** Ecosystems with tiered e KYC frameworks post a 4–6 point higher probability of mobile money use among low income adults (Table 2). Lagging jurisdictions should adopt risk based e KYC and enforce wallet to bank interoperability. Align data localisation clauses with AfCFTA's Digital Trade Protocol (Lemma et al., 2024) to curb the offshore leakage flagged under RQ 2.
- **Central Banks & Payment Switch Operators.** To reverse the 80 percent offshore clearing statistic, offer domestic RTGS windows (local currency) for FinTechs, anchored to PAPSS for cross border finality. Simulations show each 10 percent on shoring of settlement volume cuts average latency by 35 ms and lifts net adoption 1.2 points over three years.
- **Domestic FinTechs & Telcos.** While foreign VC still supplies ~80 percent of capital, co invest in edge data centre capacity via syndicated build own operate models, matched with concessional green finance. Capturing data hosting value locally preserves growth funding while shrinking sovereignty risks.

- **Multilateral Development Partners.** Replicate the IFC–Raxio "sovereign compute" deal structure across AfCFTA corridors. Blended finance term sheets that price concessional tranches against inclusion milestones will crowd in private capital without re subordinating African firms in the dependency hierarchy revealed by RQ 2.

Stakeholder	Recommendation	Expected Impact
AfCFTA Secretariat & AU	Implement the AfCFTA FinTech Annex with provisions for data sharing, open standards, and a pan African regulatory sandbox. Coordinate a **continental digital sovereignty strategy** (e.g. encourage local cloud infrastructure via AU programs).	Harmonized rules lower barriers for fintech to scale across Africa. Regional cooperation on infrastructure reduces reliance on external systems, strengthening collective bargaining power.
National Governments/Regulators	**Embrace adaptive regulation:** Adopt risk proportionate regulations that enable innovation (e.g. special fintech licenses, tiered KYC for low value accounts). Expand regulatory sandboxes for new ideas. Simultaneously, enforce **local ownership rules** (for critical infrastructure/data) and **competition policies** (prevent monopolies).	Boosts innovation diffusion by lowering entry barriers for fintech startups (more local solutions). Protects consumers and the market from dominance by any single player (whether local or foreign) ensuring diverse, competitive services and preventing "colonial" monopolies. Targeted rules (like data localization for sensitive data) keep more value onshore.
Financial Institutions (Banks, Switches)	**Partner with FinTechs, not fight them:** Use AfCFTA as an opportunity to form cross border partnerships with fintech startups (e.g. banks providing mentorship, investment). Modernize legacy systems to open APIs for fintech integration (following Open Banking principles). Collaborate on shared payment utilities (like regional switches, fraud intelligence) rather than each depending on foreign systems.	Banks leverage fintech innovation to reach unbanked markets (win win, rather than zero sum). FinTechs gain scale and trust via bank channels. An interoperable, collaborative ecosystem accelerates user adoption (network effects) and creates African owned networks (reducing need for foreign intermediaries in payments).
FinTech Companies (Startups and Scale ups)	**Focus on inclusion and local context:** Design products for currently underserved groups (women, rural, informal sector) e.g. micro insurance via mobile, vernacular language apps to expand user base sustainably. Practice responsible digital lending (avoid predatory practices that prompt regulatory backlash). Also, reinvest in local talent development (train more African developers, data scientists) and actively engage with policymakers (through industry associations) to shape smart regulation.	Broadens the market and social impact (women and rural users become new growth segment, improving financial inclusion metrics). Proactively responsible practices build trust with users and regulators, ensuring long term viability (preventing crises like debt traps or major data breaches). Investing in talent grows the local skills pool, reducing dependency on foreign experts over time.
Foreign Investors & Tech Partners	**Adopt a long term, partnership approach:** Shift from purely profit extractive models to capacity building investments. E.g. global investors could allocate a percentage of investments to technical assistance for local founders, or open regional headquarters in Africa (creating jobs, transferring skills). Tech giants (Big Tech) should support Africa led initiatives e.g. assist with open source solutions or comply with local data rules without lobbying against them.	Aligns external support with Africa's development objectives. By investing in capacity (not just products), foreign players help grow the market sustainably (which ultimately benefits them too). Respecting local rules and co creating solutions reduces mistrust and the risk of populist pushback (like platform bans). Africa gets technology and knowledge, not just end user products, mitigating neo colonial dynamics.
Academia & Civil Society	**Monitor and inform:** Universities and think tanks should expand research on digital finance impacts (e.g. independent evaluations of fintech inclusion outcomes, data privacy audits). Integrate FinTech and digital literacy into educational curricula (so next gen users and creators are savvy). Civil society groups should advocate for consumer protection in digital finance and for transparent governance (so power isn't abused by either companies or states).	Provides evidence based feedback to policymakers e.g. flagging if gender gaps aren't closing or if certain fees are exploitive. Educated users are more confident adopters (improving adoption rates and informed usage). Watchdog efforts ensure that the fintech revolution maintains a human centric focus and rights based approach, preventing new forms of exploitation under the guise of innovation.

Table 2 cross walks each recommendation to its underlying coefficient or case study evidence. Implemented together, these measures can convert Africa's FinTech crossroads into a virtuous spiral where broader access funds local innovation, local infrastructure deepens sovereignty, and sovereignty in turn sustains inclusion so that no one is left behind.

Each stakeholder has a role in turning FinTech into a force for inclusive growth rather than a vector of dependency. A collaborative multi stakeholder approach is crucial; for instance, regulators providing an open environment will be ineffective if banks refuse to cooperate with fintech, or if foreign partners undermine local efforts. AfCFTA provides an umbrella for coordination its secretariat can convene these actors regularly (perhaps an annual "*AfCFTA FinTech Forum*") to review progress on these recommendations and share best practices.

Implementation Pathways: We outline short to medium term steps and longer term pathways:

Immediate (next 1–2 years): Ratify and operationalize the AfCFTA Protocol on Digital Trade and FinTech Annex. Start with quick wins like a pan African fintech talent exchange program (leveraging AU's existing education networks) to address skills dependency. Encourage pilot cross border fintech services under sandbox exemptions to gather data on what works. Roll out PAPSS in more countries and heavily promote its usage through central bank directives (e.g. mandate that intra African government payments use PAPSS where available). Also, launch public awareness campaigns about digital finance in local languages, focusing on women and rural users, possibly via radio and community theaters, to drive informed adoption (addressing the DOI "knowledge" stage in a culturally tuned way).

Medium term (3–5 years): See a measurable rise in intra African fintech investment and partnerships possibly facilitated by an AfCFTA Investment Protocol that incentivizes African institutional investors to back tech. By year 5, target that at least 50% of each country's fintech market infrastructure (payment gateways, switches, data storage) is handled by African entities or located in Africa (a metric for sovereignty). Develop regional *"centers of excellence"* for fintech innovation e.g. a West African FinTech hub in Lagos, an East African hub in Nairobi with AfCFTA facilitating south south learning and competition that attracts talent to stay in the region. Harmonize consumer protection frameworks across countries so that users have similar protections (and thus confidence) no matter where a service is from in Africa.

Long term (6–10 years): Africa should aim that by 2030 (the end of the African Union's Digital Transformation Strategy period), it has a self-sustaining, integrated digital financial market: one where an entrepreneur in one country can easily offer services in another (truly realizing the "continental market" vision), and where core digital infrastructure (payments, cloud, digital ID) are locally governed. Ideally, reduce the 80% external data stat to, say, 50% or less by creating regional data centers (possibly under public private partnerships). We also envision the African Digital Innovation Fund (could be an AfDB or AfCFTA initiative) capitalized by African pension funds and sovereign wealth funds, investing in strategic fintech and DPI (digital public infrastructure) projects this keeps African wealth circulating within African innovation. If done, by 2030 Africa will not only have diffused fintech widely (target >70% financial inclusion) but will have built resilience so that its digital economy is not easily toppled or exploited by external forces.

Limitations. The evidentiary base of this study is necessarily secondary GSMA Mobile Money metrics, Global Findex surveys, open source venture logs, and policy documents leaving us vulnerable to publication bias that privileges high profile platforms while muting informal or negative outcomes. In addition, the absence of longitudinal time use diaries precludes panel tracking of how individual behaviours evolve as FinTech services diffuse. These limits could narrow causal inference; yet a critical realist triangulation of quantitative indicators, qualitative case narratives, discourse analytics, and insights reported in previously published expert validation workshops conducted by AfricaNenda and the BIS allowing us to surface the generative mechanisms beneath visible adoption curves (Maxwell 2021; Rose & Johnson 2020). Future work should embed participatory time diary methods to thicken the empirical texture and test our propositions over lived temporal horizons.

Appendices

Appendix A. Open Access Datasets, Variables & Harmonisation Protocol

#	Dataset (+ URL)	Raw variables used (examples)	Coverage (years geography)	How we cleaned & transformed the data	Why it matters to the study
1	GSMA Mobile Money Metrics	Registered & active accounts (000s) Volume / value of P2P, cash in/out, merchant payments	2014 2024; 45 AfCFTA countries	Steps: (i) downloaded annual XLSX; (ii) converted to tidy CSV; (iii) normalised by adult population (15+) using UN WPP to obtain "% adults w/ mobile money account".	Principal adoption indicator for RQ1 and Figure 2
2	World Bank Global Findex 2021	Account ownership (bank, mobile) Digital payments frequency Gender / income / rural dummies	2011, 2014, 2017, 2021 waves; 35–40 AfCFTA states / wave	Merged four cross sections into long panel (country year). Harmonised variable names (acc_any, acc_mm, etc.). Applied sampling weights when computing regional means.	Cross checks GSMA and lets us probe inclusion gaps (gender, rural).
3	IMF Financial Access Survey & Balance of Payments	ATMs / agents per 100k adults Personal remittances (USD)	2010 2022; 49 African economies	Filled sporadic gaps with linear interpolation ≤2 yrs; deflated USD flows to 2021 dollars (CPI).	Infrastructure and remittance dependency controls for regressions (H1, H2).
4	AfricaNenda SIIPS 2024	Instant Payment System (IPS) live? (yes/no) Interoperability score (0 5)	Status as at Dec 2024; 15 SSA systems	Recoded qualitative ratings into numeric index; linked to PAPSS uptake flag.	Captures AfCFTA enabled rails for cross border diffusion.
5	Afreximbank / PAPSS dashboard	Banks connected Txn count & value (local currency, USD equiv.)	Q4 2022 → Q1 2025; WAMZ plus pilot states	Quarter level series aggregated to annual totals; matched to member country ISO code.	Empirical proxy for AfCFTA's structural intervention (H3).
6	Partech Africa & Briter Bridges VC deal logs	Deal size, stage, investor hq, investee hq	2015 2024; 1 650 deals	Deduplicated across sources, standardised investor country codes, kept fintech SICs. Network edges: investor → country weighted by # deals.	Generates the capital dependency network (Appendix B Fig B1).
7	ITU Mobile Cellular & 3G/4G Coverage	Subscriptions per 100 inh. Population covered by ≥3G (%)	2010 2023; all AfCFTA	Interpolated missing years; log transformed for regression.	Core DOI "communication channel" covariate.
8	Cloudscene + Hyperscale press releases	In country data centre capacity (MW) Majority ownership (local = 1)	2018 2025	Constructed "Data Sovereignty Index" = share of capacity locally owned.	H2 structural dependency metric referenced in findings.

Appendix B. Supplementary Network Visualisations

Figure code	What it shows	How to read it	Key takeaway
Fig B1 Venture Capital Gravity Map	Bipartite graph (120 investor nodes, 34 destination countries). Edge thickness = # fintech deals 2015 24. Node colour: blue = African investor, orange = extra continental.	Central orange hubs (US, UK) dominate; emergent blue hubs (South Africa, Nigeria) signal nascent intra African capital corridors.	Confirms 80 % foreign capital share, but also the rise of regional funds.
Fig B2 Technology Ownership Web	Directed graph of major fintech platforms and their core infrastructure providers (cloud, payments). Ownership localness score drives node size.	Numerous arrows from US/EU/China cloud nodes to African platforms; sparse reverse links.	Visual evidence of infrastructure dependency that underpins H2.
Fig B3 Regulatory Convergence Heatmap	Matrix heatmap of 15 regulatory features (rows) × 44 AfCFTA nations (cols); green = fully aligned with AfCFTA draft annex, red = nonaligned (2024).	Read vertically to spot laggards; horizontally for toughest alignment areas (e.g., data localisation).	Highlights where AfCFTA support is most needed (data & cyber rules score lowest alignment).
Fig B4 Payment Rail Interoperability Network	Undirected weighted graph linking countries whose domestic instant payment systems are already interoperable (ISO 20022). Edge weight = live bilateral link count.	Clustering coefficient reveals a dense West African sub graph around PAPSS; North Africa still peripheral.	Demonstrates AfCFTA driven structural change beginning to counterbalance historic fragmentation.

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