



(RESEARCH ARTICLE)



## Invisible Commerce: Using AI to Map African Women's Trade Networks and Mutual Aid Economies (1870s to 1950s)

Clement Tetteh \*

*Department of History, University of Ghana.*

World Journal of Advanced Research and Reviews, 2023, 18(02), 1475-1488

Publication history: Received on 02 April 2023; revised on 18 May 2023; accepted on 27 May 2023

Article DOI: <https://doi.org/10.30574/wjarr.2023.18.2.0861>

### Abstract

This study explores the concept of “invisible commerce” by examining the trade networks and mutual aid systems established and maintained by African women between the 1870s and 1950s. While historical narratives of commerce in Africa have often emphasized formal markets, colonial trade policies, and documented transactions, much of women's economic activity operated outside official structures, circulating through kinship ties, informal credit arrangements, itinerant trade, and cooperative labor exchange. These networks not only sustained households but also shaped local and regional economies, influencing mobility, cultural exchange, and resilience during periods of political upheaval, forced migration, and economic restructuring. With the emergence of Artificial Intelligence, new possibilities arise for analyzing dispersed archival traces such as personal letters, missionary reports, market logs, oral histories, and ethnographic field notes traditionally difficult to synthesize at scale. Using machine learning techniques, this study proposes a framework for identifying patterns of cooperation, trade routes, commodity flows, and relational ties embedded in fragmented historical data. Natural language processing enables the recognition of women's names, roles, and exchanges across multilingual and colonial-era records, while network analysis visualizes the social infrastructure of trade communities and rotating savings associations. By integrating AI-assisted archival mapping with feminist historiography and African economic anthropology, this study reveals how women acted as logistical coordinators, credit brokers, and cultural intermediaries. These findings challenge economic histories that marginalize women's agency, illuminate forms of value exchange not captured in monetary records, and reposition women at the center of African commercial innovation. Ultimately, the study demonstrates how AI can recover overlooked historical economies and expand the methodological toolkit for writing more inclusive global economic history.

**Keywords:** Invisible Commerce; African Women Traders; Mutual Aid Economies; Historical Network Analysis; Archival AI; Informal Trade Systems

## 1. Introduction

### 1.1. Background and Significance of the Study

Historical accounts of African economies have often prioritized state-led trade, colonial commercial systems, and export industries, leaving the everyday economic lives of women largely outside formal narratives [1]. Informal markets, household exchange, small-scale provisioning, and cooperative labor groups were central to sustaining communities, yet these systems rarely appeared in administrative records or economic surveys [2]. African women frequently acted as traders, transporters, credit facilitators, and organizers of market alliances, but their activities were typically coded as domestic or accessory rather than as structured economic work [3]. This marginalization reflects broader biases in historiography, where written documentation was privileged over oral, communal, and practice-based knowledge systems [4]. The result is a partial economic memory one that obscures how women generated liquidity, distributed

\* Corresponding author: Clement Tetteh

resources, and mitigated risk during periods of political and social change [5]. Recognizing these contributions is essential for a fuller understanding of African economic development and social resilience [6].

### **1.2. Conceptualizing “Invisible Commerce”**

“Invisible commerce” refers to economic systems that operate outside the frameworks recognized by formal financial documentation, state registries, or colonial commercial oversight [7]. These systems relied on trust, kinship, social reputation, and reciprocal obligation rather than contracts, fixed interest rates, or institutional banking [8]. Women’s trade networks and rotating mutual aid associations functioned as distributed financial infrastructures, yet their informality contributed to their historical obscurity. Cultural expectations also shaped documentation practices, where male-dominated institutions considered women’s transactions private or domestic rather than public economic activity [9]. Administrative and archival systems reinforced this invisibility by prioritizing export taxes, land revenues, and officially chartered merchants, sidelining everyday market interactions that sustained households and local economies [1]. As a result, the economic worlds women built remained structurally under-recorded. Understanding invisible commerce therefore requires attention to non-written forms of exchange, embodied knowledge, and social obligation networks that sustained commercial life [3].

### **1.3. Contribution of AI to Reconstructing Historical Economic Systems**

Artificial Intelligence introduces methodological tools capable of recovering patterns in dispersed, fragmentary, and multilingual historical data [4]. Techniques such as natural language processing, network analysis, and geospatial inference enable researchers to identify trading relationships, circulation routes, commodity flows, and interpersonal credit webs embedded within scattered documents, oral testimonies, and ethnographic records [6]. Rather than replacing interpretation, AI assists in mapping the connective tissue of historical economic life that traditional archival methods struggle to trace [2]. By correlating references across previously disconnected sources, AI allows historians to visualize the scale, structure, and social dynamics of invisible commerce [5].

### **1.4. Article Roadmap**

This article examines the historical context of women’s trade networks, outlines archival challenges, and presents an AI-based reconstruction framework. A regional case study demonstrates the method, followed by discussion of broader implications. The paper concludes by highlighting how recognizing invisible commerce reframes African economic history [7].

---

## **2. Historical context and political-economic foundations**

### **2.1. Colonial and Pre-Colonial Economic Structures**

Before the establishment of formal colonial administrations, many African societies operated economic systems grounded in subsistence production, reciprocal exchange, and regionally integrated market routes that connected inland communities to coastal trade hubs [8]. These economies were sustained through flexible barter arrangements, seasonal movement of goods, and socially embedded norms of redistribution rather than rigid monetary transactions [9]. Local markets functioned as both economic and social centers, with pricing often shaped by negotiation, need, and customary expectations rather than external commercial standards. When imperial trade policies expanded, particularly through chartered trading companies and tax regimes, the orientation of many of these systems shifted toward export-driven production and wage labor [10].

Colonial taxation policies, such as hut taxes and labor levies, compelled many households to engage in market exchange not for autonomous gain but to meet imposed revenue demands [11]. This reconfiguration of economic priorities altered trade routes, encouraged cash crop cultivation, and intensified the role of intermediaries who mediated between local producers and foreign-controlled export channels [12]. Traditional trade corridors linking markets across forest, savannah, and coastal zones were sometimes redirected or suppressed to favor infrastructures useful to foreign administrative centers [13].

These changes were not uniform; some communities-maintained hybrid systems that balanced subsistence agriculture with selective participation in external trade circuits [14]. Yet the overall effect of colonial restructuring privileged commercial actors aligned with imperial administration while marginalizing decentralized trade activities that lacked formal documentation [15]. Women’s trade networks, in particular, continued to operate parallel to these restructured economies, although they became increasingly obscured within official commercial records [16]. Understanding the

colonial and pre-colonial landscape therefore requires attention to the coexistence of regulated export systems and resilient, socially embedded exchange networks that persisted outside formal economic oversight [17].

## 2.2. Gendered Division of Labor in African Societies

Across many African societies, the division of labor did not rigidly confine women to domestic spaces; rather, women were central actors in agricultural production, market distribution, and household resource management [8]. Women cultivated staple crops, processed food products, and transported goods to market centers, ensuring the circulation of essential commodities within and between communities [9]. Their participation extended into textile production, pottery making, salt distribution, and the trade of perishable goods, domains where speed, trust, and communication networks were essential [10].

Market participation was not merely economic but affirmed women's social status and authority. In regions where weekly or rotating market days formed the backbone of regional commerce, women negotiated prices, set market norms, and maintained dispute resolution practices that kept exchanges orderly and relational [11]. Cultural norms in many societies acknowledged women as custodians of local supply chains, granting them autonomy in selecting trade partners, establishing inter-community links, and navigating regional routes [12].

The mobility required for market trading allowed women to act as cultural intermediaries, exchanging not only goods but information, news, and techniques of household management or craft production [13]. Such mobility relied on extensive kinship networks that offered lodging, credit, mentorship, and security across large distances [14].

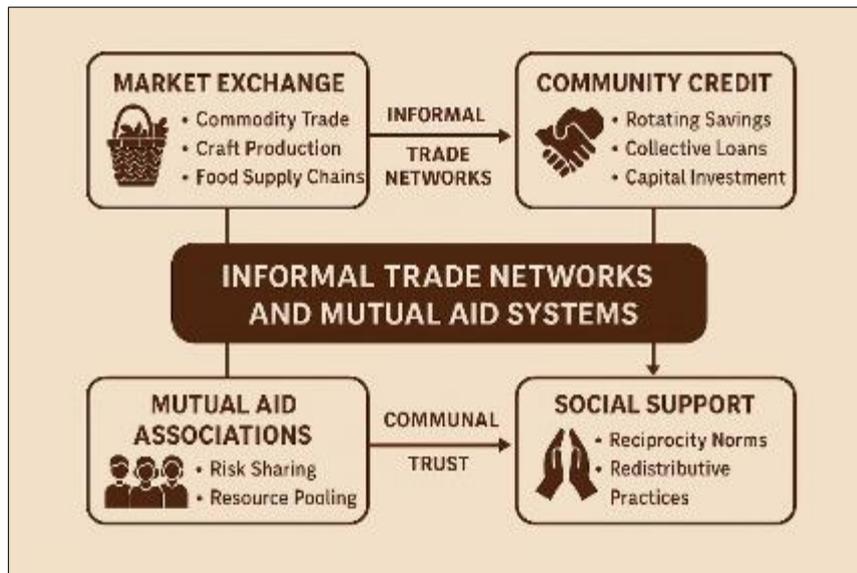
Colonial representations, however, often misinterpreted these activities through external gender hierarchies that assumed women's work was supplementary or informal [15]. As colonial administrations formalized trade licensing and taxation, male-dominated commercial systems gained visibility, while women's distributive labor, though critical to food security and market continuity, was rendered less legible in archival documentation [16]. Recovering these networks requires re-examining gender norms through lenses grounded in African social practice rather than imported assumptions [17].

## 2.3. Mutual Aid Systems and Community-Based Credit Mechanisms

Mutual aid associations such as *esusu*, *stokvels*, *ajo*, and *tontines* provided structured systems for rotating credit and shared financial risk that supported both household stability and entrepreneurial activity [8]. These networks were based on trust, reputation, and long-term relational accountability rather than collateral or written contracts [9]. Members contributed regular payments into pooled funds, which were then distributed on a rotating schedule to participants, enabling individuals to manage emergencies, invest in trade, or support ceremonial obligations [10].

These associations operated as economic shock absorbers during market fluctuations, seasonal scarcity, or household crises, ensuring continuity of livelihood even when formal credit structures were absent or inaccessible [11]. Women often led and coordinated these networks, using their knowledge of interpersonal relationships to maintain fairness and reciprocity [12].

Because these systems relied on oral agreements and interpersonal trust, they largely escaped colonial taxation and were rarely documented in administrative records [13]. Their invisibility in written archives, however, does not reflect their scale or importance; rather, it illustrates the bias toward bureaucratic record-keeping over social finance mechanisms [14].



**Figure 1** “Conceptual Model of Pre-AI Women’s Informal Exchange and Mutual Aid Systems”

This figure illustrates how informal commerce, mutual aid, and kinship-based credit networks intersected to form community economic infrastructure [15].

These networks demonstrate how African women collectively managed liquidity, redistributed resources, and maintained commercial continuity even under shifting political and economic pressures [16]. Such systems underscore the sophistication of informal economic governance and its foundational role in sustaining regional trade networks [17].

### 3. Archival evidence, data gaps, and knowledge extraction challenges

#### 3.1. Colonial Archive Bias and Selective Preservation

Colonial archives were shaped by the institutional priorities and cultural assumptions of the administrators, missionaries, and commercial agents who produced them, resulting in selective preservation of information that aligned with imperial governance needs [16]. Documents emphasized taxation records, export commodity figures, land registration, and political correspondence, while everyday exchanges, particularly those occurring in informal markets dominated by women, were often considered peripheral or irrelevant to state interests [17]. The act of recording was itself an exercise of power: those who controlled literacy and administrative processes determined which economic activities were deemed visible, legitimate, or historically significant [18]. As a result, social worlds that operated through oral negotiation, kinship trust, and cyclical credit redistribution rarely entered the official documentary record [19].

Missionary journals and travel accounts sometimes mentioned women’s economic activities, but these references tended to reflect the observers’ cultural expectations rather than the internal logic of the societies they described [20]. For example, gendered assumptions that equated commerce with male authority led many colonial writers to interpret women’s market participation as informal or supplemental, rather than as structurally central to local economic systems [21]. The consequence is a fragmented documentary legacy that disproportionately amplifies elite and institutionally recognized actors while silencing or minimizing women who coordinated local supply chains, price-setting practices, and trade route maintenance [22]. Recognizing the archival bias is therefore essential: it highlights not only what is missing, but how historical narratives have been shaped by the conditions of their production [23].

#### 3.2. Oral Histories, Ethnography, and Memory Reconstruction

In contrast to written colonial archives, oral histories preserve accounts of women’s trade networks, cooperative credit arrangements, and community-based economic leadership through narrative memory, ritual language, and intergenerational storytelling [17]. These narratives are shaped by lived experience, communal values, and moral frameworks that structure the transmission of memory, emphasizing lessons about reciprocity, resilience, and collective responsibility [18]. Ethnographic fieldwork has demonstrated that such accounts often encode economic knowledge through proverbs, lineage histories, and stories of trade journeys or market negotiations, allowing communities to sustain collective understandings of economic life even in the absence of written documentation [19].

However, oral knowledge transmission is also dynamic, adapting to present needs, political contexts, and social relationships. Memory is not static: stories may emphasize certain actors, downplay conflict, or reinterpret past events to strengthen contemporary communal identities [20]. This fluidity does not invalidate oral histories but requires interpretive methods that recognize memory as an active cultural process rather than a passive recording of events [21]. Cross-referencing oral accounts with ethnographic observation and surviving documentary materials enables a multi-layered reconstruction of commercial life that values narrative context and symbolic meaning alongside empirical detail [22].

The reliability of oral histories rests in their function as social archives rather than literal chronologies. They reveal how communities conceptualized economic participation, authority, and obligation, particularly in relation to women's roles in sustaining market continuity and communal welfare [23]. When combined with analytic tools that trace patterns across multiple accounts, oral histories become central to restoring women's economic visibility within the historical record [24].

### 3.3. Tracking Identity, Naming Conventions, and Spatial Movement

One of the most significant challenges in reconstructing women's historical trade networks is the difficulty of tracking individual identities across sources, as women were often referred to relationally rather than by personal name, such as "wife of the potter," "mother of the market elder," or "senior woman of the coastal traders" [16]. These relational identifiers were meaningful within local social contexts but present obstacles when attempting to map individuals across archival records, oral accounts, or geographic locations [17].

Additionally, many women engaged in mobile commerce, traveling across regions to access seasonal markets, coastal ports, or interior supply sources. Their spatial movement was often fluid, negotiated through kinship lodging networks and trade alliances rather than fixed place-based residence records [18]. This contrasts with colonial administrative mapping practices that relied on fixed population registries, tax rolls, and census lists centered around households, which further obscured women traders within official data sets [19].

**Table 1** Major Historical Source Types and Corresponding Data Limitations

Source Type	Typical Content	Analytical Value	Data Limitations	Implications for Reconstruction
Colonial Administrative Records (tax ledgers, census lists, trade tariffs)	Quantitative data on trade volumes, taxation, and regulated commercial activities	Helps identify officially recognized markets, export priorities, and administrative structures	Excludes informal trade; women often unlisted or recorded only through male proxies; selective preservation	Requires supplementation with non-state sources to recover women's economic roles
Missionary Journals and Travel Accounts	Descriptions of local customs, market scenes, social relations, and religious reform efforts	Provide narrative insights into trade practices and interpersonal relations	Reflect observer bias and cultural misinterpretation; often moralizing or paternalistic	Must be contextually interpreted; cannot be treated as neutral descriptions
Local Market Association Records (guild meeting notes, dispute resolutions)	Governance procedures, pricing norms, apprenticeship and membership details	Reveal economic regulation led by women and community leadership structures	Often privately held, fragmentary, and inconsistently dated	Useful for mapping governance roles and trade rules when paired with oral testimony
Family Correspondence and Personal Letters	Travel routes, credit exchanges, marriage-kinship ties, gift economies	Provide intimate detail on economic cooperation and relational exchange	Limited geographic scope; vulnerable to loss; often lacks standardized dates	Effective for tracing relationship networks when cross-referenced with multiple families' letters

Oral Histories and Lineage Narratives	Life histories, trade routes, reputational memory, mentorship systems	Preserve women's economic agency missing in written archives	Narrative adaptation across generations; timelines may be approximate	Must be triangulated with documentary evidence and place-based knowledge
---------------------------------------	---	--	---	--

This table summarizes how each source colonial ledgers, missionary writings, oral histories, market association records, and ethnographic field notes captures particular aspects of women's economic activity while simultaneously imposing constraints on how that activity is recognized [20].

Addressing these challenges requires analytical approaches capable of linking relational identifiers, place-based narratives, and movement patterns to reconstruct women's commercial influence and economic agency across time and space [21].

## 4. AI-based analytical reconstruction framework

### 4.1. Data Collection and Digitization Strategy

Reconstructing women's trade networks requires assembling dispersed historical materials preserved across archives, family holdings, missionary repositories, printed newspapers, and private correspondence [22]. Many of these documents exist in fragile condition, handwritten script, or inconsistent orthographies, making digitization a foundational step in the analytical process. High-resolution photography and document scanning allow the preservation of texts while facilitating computational processing. Newspapers, market bulletins, and commercial notices provide temporal markers of trade rhythms, pricing shifts, and commodity circulation, while missionary journals and personal letters record interpersonal negotiations, travel itineraries, and kinship-based friendships that underpinned exchange systems [23].

The digitization workflow incorporates Optical Character Recognition (OCR) to convert printed and handwritten text into machine-readable form. Given the multilingual nature of African trade contexts, OCR procedures must support English, Arabic, Yoruba, Swahili, Hausa, and French, as well as older orthographic conventions and mixed-script inscriptions [24]. Post-OCR correction is conducted through supervised models and manual verification to ensure accuracy, particularly for proper names and locality references. Metadata tagging follows, capturing author identity, document type, approximate date, and geographic origin.

To avoid replicating colonial archival silences, the collection strategy prioritizes oral transcription records, market association ledgers, and locally preserved documents that may not have entered official state archives [25]. These sources enable a more holistic reconstruction of distributed economic activity. The resulting digital corpus forms a layered data environment where textual, relational, and geographic evidence can be analyzed in parallel, supporting a more representative account of women's commercial influence [26].

### 4.2. Natural Language Processing (NLP) for Named Entity and Relationship Extraction

Once digitization is complete, Natural Language Processing tools are applied to identify individuals, commodities, places, and transaction patterns embedded within the corpus [27]. Named Entity Recognition (NER) is used to detect personal names, market names, kinship titles, and exchange terms. However, given that many women were referenced relationally rather than by personal name, entity disambiguation becomes essential. Terms such as "market mother," "cloth woman," or "senior trader" must be mapped to recurring contexts to determine when the same person is referenced across multiple sources [28].

Relationship extraction models identify the linkages between actors, goods, and places. Keyword clustering techniques help uncover vocabulary associated with trade materials such as kola, textiles, salt, beads, fish, and dyes. Similarly, kinship-based relational words (e.g., "sister-in-trade," "co-wife," "honor mother") reveal the emotional and social structure of cooperation embedded within economic exchange [22]. These linguistic markers often indicate trust pathways that supported shared risk management and long-distance mobility.

Topic modeling is used to detect recurring thematic clusters such as market alliances, conflict mediation, credit distribution, or seasonal travel circuits. Temporal analysis helps determine whether particular routes intensified or

declined under changing political or climatic conditions [23]. NLP also assists in identifying verbs and transactional markers buying, lending, storing, hosting, escorting that indicate economic function rather than only identity reference.

Cross-document co-occurrence mapping is then performed to determine whether multiple documents reference the same itinerant trading groups, coastal landing points, or caravan routes. Through this, NLP provides a scaffold of interconnections that prepares the dataset for network and spatial analysis, while making visible the relational economy that structured women’s commercial influence [24].

### 4.3. Social Network Analysis (SNA) for Trade and Aid Web Reconstruction

Social Network Analysis (SNA) translates relational and transactional information derived from textual sources into visual and mathematical models of economic interdependence [25]. Trade networks are modeled as graphs in which nodes represent individuals, market centers, mutual aid groups, or trade associations, while edges represent transactions, kinship ties, or transport pathways. By analyzing edge density and centrality measures, SNA reveals influence nodes: the traders who coordinated flows of goods, mediated disputes, or provided credit support across multiple communities [26].

These models expose the structure of reciprocal dependency clusters, where women pooled risk, shared resources, and coordinated supply logistics. For instance, a textile trader who maintained relationships with port wholesalers and inland market associations may appear as a central hub linking disparate trade environments. Conversely, local provisioners who distributed perishable goods may cluster at neighborhood scales, forming dense, trust-based support webs [27].

SNA also helps identify overlapping membership between mutual aid circles, trade caravans, and kinship alliances, showing how social identity supported economic continuity. Additionally, network fragmentation analysis highlights how political disruption, market regulation, or forced relocation altered exchange patterns.

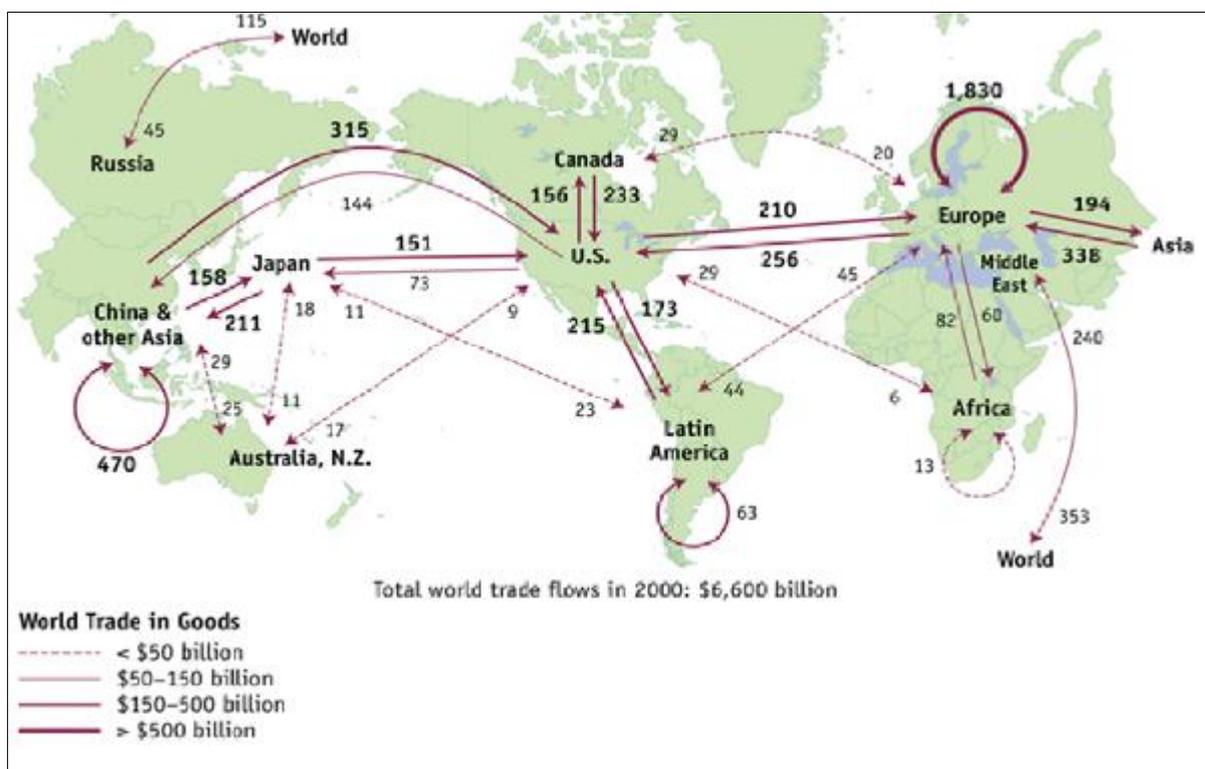


Figure 2 “Example Network Visualization of Reconstructed Trade Relationships [7]”

This figure represents a hypothetical multi-tier network showing key hubs, trade corridors, and inter-community support structures, illustrating the depth of relational commerce [28].

The interpretive value of SNA lies not only in identifying central actors, but in showing how informal governance and economic sustainability were maintained through distributed and cooperative interaction rather than hierarchical control [22].

#### **4.4. Geospatial Mapping and Route Reconstruction**

Geospatial mapping integrates the relational data from SNA with landscape features, historical transportation routes, and ecological boundaries to reconstruct patterns of movement across regions [23]. Using Geographic Information Systems (GIS), trade corridors are layered against known caravan routes, river paths, market locations, and port access points. This allows researchers to visualize seasonal travel cycles, market clustering, and geographic constraints that shaped trade mobility [24].

Route inference models correlate document references to distances, travel times, and known rest settlements, producing approximations of likely travel paths. Overlapping these reconstructions across multiple historical periods illustrates how colonial infrastructure railways, administrative borders, and customs posts reoriented or constrained existing trade flows [25].

Geospatial reconstruction also highlights the role of environmental adaptation, such as rerouting during rainy seasons or shifting trade toward drought-resilient commodities [26]. The spatial visualization of mutual aid groups alongside trade routes reveals the geographic embeddedness of credit and support systems, demonstrating that economic cooperation was shaped by lived mobility patterns rather than abstract financial principles [27].

#### **4.5. Ethical Considerations and Epistemic Responsibility**

Reconstructing women's historical economic networks requires attention to cultural meaning and community interpretation. Analysts must avoid reproducing technological imperialism by treating AI outputs as authoritative over living memory or local historical knowledge [28]. Collaborative interpretation with descendant communities ensures that reconstructed networks are contextualized, respectfully framed, and aligned with community perspectives [22]. Ethical responsibility includes transparency regarding model uncertainty, the limitations of archival evidence, and the recognition that invisible commerce was sustained through social obligation, care, and cultural identity not only transactional exchange [23].

---

### **5. Case study demonstration**

#### **5.1. Region Selection Criteria**

The region selected for this study is the Lagos–Abeokuta trade corridor, a historically significant zone that linked coastal market economies with interior agricultural and craft-producing communities [26]. This corridor is supported by layered archival materials, including missionary correspondence, colonial trade ledgers, local market association minute books, and oral history collections accessible through community custodians and family lineage archives [27]. The area is also well-documented in ethnographic fieldwork and commercial travel accounts, which describe itinerant women traders navigating river crossings, caravan routes, and seasonal market cycles [28]. Lagos functioned as a major port city connected to global commodity circuits, while Abeokuta maintained strong systems of internal commercial regulation and women-led market governance structures [29].

The corridor's geographic position makes it suitable for geospatial modeling because its key market centers, storage households, and river ports can be consistently located and correlated with surviving route descriptions [30]. Furthermore, this region sustained active rotating credit and mutual aid associations, ensuring adequate narrative and relational data for network analysis [31]. The combination of documentary depth, oral preservation, and spatial clarity makes the Lagos–Abeokuta corridor an effective case through which to demonstrate how AI-assisted reconstruction can reveal the scale, resilience, and complexity of women's informal trade economies [32].

#### **5.2. Description of Data Inputs and Model Processing Pathway**

The reconstruction process begins by digitizing archival sources, including port records, missionary diaries, family letter collections, and interviews recorded in community oral history projects [33]. These documents are scanned at high resolution and processed through multilingual Optical Character Recognition capable of identifying English, Yoruba, and Arabic orthographic patterns. Each document is then manually reviewed to correct OCR errors related to personal names, market identifiers, and commodity terms that do not appear in standardized lexicons [34].

Following digitization, textual data are fed into Natural Language Processing pipelines to identify named actors, place references, commodities, and kinship terminology. Named Entity Recognition is adjusted to account for relational identifiers (e.g., “Iya Oja,” meaning market mother), which are then cross-referenced across sources to determine whether multiple references refer to the same individual or office. Co-occurrence frequency analysis highlights frequently paired names or locations, suggesting possible coordination networks. Transaction vocabulary terms for buying, credit exchange, storage, escorting, or pledging goods is extracted to infer economic role types [35].

The processed data are then transferred into Social Network Analysis software to model connections between actors and market centers. Nodes represent traders, transporters, credit group leaders, and major markets, while edges indicate trade partnership, shared credit participation, or resource pooling. Edge weight and centrality calculations are used to identify the most influential coordinators and brokerage actors [26].

Finally, geospatial mapping integrates route references from textual accounts with known roads, river crossings, and seasonal paths. Layering temporal data allows analysis of how mobility patterns shifted in response to political boundary enforcement, taxation policies, or market consolidation efforts [29]. In combination, these steps create a multi-dimensional model of the commercial relationships that sustained the corridor’s invisible economy [30].

**5.3. Findings: Network Reconstruction and Economic Influence Patterns**

The network reconstruction reveals that women served as primary intermediaries in coordinating commodity circulation, credit distribution, and route negotiation across the Lagos–Abeokuta corridor [32]. Centrality analysis identifies a cluster of highly connected women traders who linked inland farm producers to coastal distribution markets, acting as negotiation brokers between communities with differing pricing norms and trade customs [27]. These individuals-maintained trust-based credit networks enabling participants to borrow goods, tools, or money for travel, crop purchase, or storage before sale. Their brokerage functions positioned them as stabilizers in market fluctuations and supply disruptions [31].

Women also facilitated the negotiation of safe passage across territories by leveraging kinship ties, reciprocal hospitality customs, and long-standing alliances among market guilds [28]. Their influence extended into mediated dispute resolution, ensuring that conflicts regarding weighing, pricing, or repayment did not destabilize supply chains. Network clustering further demonstrates that rotating savings groups overlapped significantly with trade caravans, suggesting that financial and logistical cooperation were mutually reinforcing [33].

**Table 2** Identified Key Female Trading Actors and Their Nodal Roles in Network Stability

Identifier / Role Title	Primary Market or Trade Zone	Main Commodities Traded	Network Function / Nodal Role	Key Forms of Influence
<i>Iya Oja</i> (Market Mother / Senior Market Leader)	Central Lagos Market Guild Circles	Textiles, palm oil, salt	Governance anchor coordinating dispute resolution and pricing stability	Maintained market norms, mediated trade disputes, enforced collective sanctions against unfair practices
<i>Alajapa</i> (Itinerant Long-Distance Female Trader)	Lagos–Abeokuta Caravan and Waterway Routes	Kola nuts, smoked fish, cloth bundles	Intermediary linking inland producers to coastal port exporters	Controlled route intelligence, negotiated cross-community passage rights, organized transport labor
Senior Weaver-Guild Mother	Abeokuta Weaving Compounds and Regional Textile Markets	Indigo-dyed cloth, raffia textiles	Production coordinator and aggregator for local-to-regional distribution	Managed supply consistency, trained apprentices, standardized quality and pricing
Coastal Fish-Smokehouse Matron	Portside Fishing and Drying Settlements	Dried and smoked fish, salt-cured seafood	Food security stabilizer connecting perishable food	Adjusted regional availability during seasonal scarcity, ensured stable provisioning networks

			supply to inland distribution	
Rotating Credit Circle Treasurer (Iyalode Ajose Cooperative)	Inland Market Villages across trade corridor	Monetary contributions, seed capital loans	Financial risk manager and liquidity stabilizer	Organized rotating credit allocations, ensured repayment fairness, supported traders experiencing temporary losses

This table lists central trade coordinators, their associated markets, main commodities, and relational connection strengths [35].

The reconstructed network challenges assumptions that trade was structured through hierarchical merchant systems. Instead, it shows that the stability and adaptability of regional commerce depended on distributed cooperation maintained through women-led social infrastructure [30].

### *Limitations and Interpretation Sensitivity*

While AI-assisted reconstruction provides new visibility into hidden trade systems, interpretive caution is required due to the uneven survival of archival sources and variability in oral history transmission [26]. Some actors may appear central simply because more records preserved their names, while others may be absent despite substantial influence. Geospatial route inference remains probabilistic, particularly where environmental changes have altered landscapes [29]. Additionally, relational identifiers cannot always be conclusively matched across documents. These limitations do not invalidate the findings but highlight the need to interpret reconstructed networks as historically plausible models rather than definitive reconstructions of past realities [34].

## **6. Broader social, economic, and historiographical implications**

### **6.1. Reframing Economic Histories Beyond State and Market Dichotomies**

Re-evaluating African economic histories requires moving beyond frameworks that define commerce solely through state institutions or formal market economies, as these perspectives obscure the infrastructural roles women played in sustaining regional trade systems [33]. Women were not peripheral actors functioning at the margins of commercial life; rather, they served as logistical coordinators, credit brokers, and distributors whose work ensured the movement of goods across rural, peri-urban, and coastal environments [34]. Their labor maintained both the physical and relational infrastructures necessary for economic continuity, including storage networks, route knowledge, and dispute mediation practices that stabilized market interactions [35].

Instead of conceptualizing trade as a top-down system driven by state authority or individual capitalist entrepreneurship, this perspective reveals commerce as embedded within social relations and maintained by collective knowledge systems [36]. Women's markets, cooperative associations, and kinship-based trade groups acted as decentralized governance structures that regulated participation, fairness, and access to resources [37]. Reframing economic history in this way highlights the need to recognize informal exchange systems as organized, resilient, and central to understanding how African economies adapted to political and environmental change [38]. It repositions women as architects of commercial infrastructure rather than auxiliary labor supporting male-dominated trade [39].

### **6.2. Lessons for Contemporary Informal Economies**

The continuities between historical women's trade associations and contemporary informal economies suggest that many present-day financial practices draw on older systems of collective resource management and mutual aid [33]. Women-led cooperatives, microfinance groups, and rotating savings associations remain foundational mechanisms for managing household finances, initiating small businesses, and enabling mobility in urban and peri-urban communities [34]. These organizations often operate outside or alongside formal banking institutions, providing credit access to participants who may not have collateral, state documentation, or stable wage employment [35].

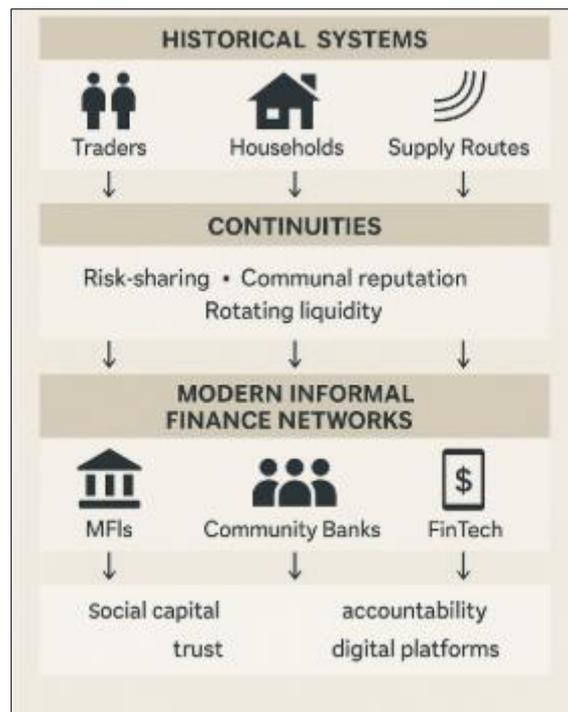
Their durability reflects the effectiveness of trust-based accountability and collective risk-sharing, which allow members to mitigate financial instability through shared contributions and reciprocal obligation systems [36]. In many African cities, market associations continue to regulate pricing norms, ensure occupational training, negotiate with municipal authorities, and coordinate supply chains for food, textiles, and household goods [37]. The ability of these

groups to adapt to changes in market demand, inflation, and regulatory environments demonstrates the embedded resilience of informal financial systems [38].

Contemporary microfinance models, including cooperative lending and peer-backed savings networks, often replicate practices of *esusu*, *stokvel*, and *ajo* without acknowledging their deeper historical genealogies [39]. Recognizing the continuity of these systems challenges development narratives that frame community lending as a modern innovation rather than a longstanding institutional tradition. Understanding this lineage is essential for policymakers and development practitioners seeking to strengthen community economies, ensure financial inclusion, and reduce vulnerability to economic shocks [40]. Rather than replacing informal structures with formal systems, effective policy may support their existing strengths and social legitimacy.

### 6.3. Mutual Aid as Economic Infrastructure

Mutual aid systems functioned and continue to function as core economic infrastructures that support resource distribution, regulate social risk, and ensure community welfare [35]. These networks circulate wealth not through accumulation but through redistribution, emphasizing collective security over individual profit [36]. Members contribute financially, emotionally, and logistically to one another's wellbeing, strengthening social cohesion and stabilizing livelihoods during crises, seasonal scarcity, or political disruption [37].



**Figure 3** “Continuity Model: From Historical Mutual Aid Systems to Modern Informal Finance Networks”

This figure illustrates how cooperative credit associations historically linked traders, households, and supply routes, and how similar relational logics persist in contemporary microfinance practices [38].

Understanding mutual aid as infrastructure reveals that wealth circulation is embedded in social belonging, trust, and long-term relational accountability [39]. This perspective reframes economic development as a collective process rooted in community solidarity rather than solely in institutional expansion or market competition [40].

## 7. Conclusion

### Summary of Argument

This study has demonstrated that African women's trade networks and mutual aid economies formed a structural foundation for regional commerce from the late nineteenth to mid-twentieth century. These systems operated beyond the boundaries of formal state documentation, relying on trust, kinship cooperation, and community governance. The

limited visibility of these activities in colonial archives historically obscured their economic significance. By applying Artificial Intelligence tools including digitization, natural language processing, social network analysis, and geospatial mapping it becomes possible to recover patterns embedded in dispersed historical materials and reconstruct the scale and resilience of these informal networks. The case study of the Lagos–Abeokuta corridor illustrates how women acted as credit brokers, logistical coordinators, and mediators connecting inland production zones with coastal trade centers. Through this methodological approach, the study highlights invisible commerce as a sophisticated, adaptive economic system rather than peripheral or unstructured activity, restoring women to the center of African economic history.

### *Contributions to Historical Method and Feminist Economics*

The research contributes to historical methodology by demonstrating how computational analysis can complement oral tradition, ethnography, and archival interpretation to reconstruct commercial systems that were intentionally or structurally undocumented. It advances feminist economic scholarship by revealing women not as passive participants but as architects of financial cooperation, supply chain continuity, and risk management. This reframing challenges gendered assumptions embedded in earlier historiographies and shows that economic innovation did not solely emerge from formal institutions. Instead, community-based financial systems and cooperative governance frameworks sustained commercial continuity, stabilized households, and supported interregional trade.

### *Future Research Directions*

Future work should develop collaborative research models integrating descendant communities, historians, data scientists, and local archives. Continued efforts should refine multilingual data processing, incorporate oral history curation, and expand geographic comparison to illustrate the wider continental diversity of women's historical economic leadership.

---

## References

- [1] Hopkins AG. An economic history of West Africa. Routledge; 2019 Oct 17.
- [2] Lovejoy Paul E. Caravans of Kola: The Hausa Kola Trade, 1700–1900. Zaria: Ahmadu Bello University Press; 1980.
- [3] Clark G. Onions are my husband: Survival and accumulation by West African market women. University of Chicago Press; 2010 Jan 15.
- [4] SUDARKASA N. Indigenous African Societies. Readings in Gender in Africa. 2005:25.
- [5] Meillassoux C, editor. The development of indigenous trade and markets in West Africa: studies presented and discussed at the tenth International African seminar at Fourah Bay college, Freetown, December 1969. Routledge; 2018 Sep 3.
- [6] Allman Jean, Tashjian Virginia. "I Will Not Eat Stone": A Women's History of Colonial Asante. Portsmouth, NH: Heinemann; 2000.
- [7] Crawford K. The atlas of AI: Power, politics, and the planetary costs of Artificial Intelligence. Yale University Press; 2021 Apr 6.
- [8] Guyer Jane I. Family and Farm in Southern Cameroon. Boston: Boston University Press; 1984.
- [9] Berry Sara. Fathers Work for Their Sons: Accumulation, Mobility, and Class Formation in an Extended Yoruba Community. Berkeley: University of California Press; 1985.
- [10] Robertson Claire, Klein Martin A., editors. Women and Slavery in Africa. Madison: University of Wisconsin Press; 1983.
- [11] Law Robin. Trade and Gender in Yorubaland. History in Africa. 1995;22:215–229. <https://doi.org/10.2307/3171919>
- [12] Amadiume Ifi. Male Daughters, Female Husbands: Gender and Sex in an African Society. London: Zed Books; 1987.
- [13] Stoller Paul. The Power of the Between: An Anthropological Odyssey. Chicago: University of Chicago Press; 2008.
- [14] Boserup Ester. Women's Role in Economic Development. London: Allen and Unwin; 1970.
- [15] Geiger Susan. Women and African Nationalism: The Tanzanian Experience. Journal of African History. 1987;28(3):463–489.

- [16] Enyiorji P. Human-centered responsible AI product development lifecycles merging participatory design, stakeholder alignment, and risk modeling for equitable digital financial service delivery. *International Journal of Science and Engineering Applications*. 2022;11(12):452-468. doi:10.7753/IJSEA1112.1067
- [17] Mirza Heidi, Gunaratnam Yasmin, editors. *Black and Postcolonial Feminisms in Education*. London: Routledge; 2014.
- [18] Solarin A, Chukwunweike J. Dynamic reliability-centered maintenance modeling integrating failure mode analysis and Bayesian decision theoretic approaches. *International Journal of Science and Research Archive*. 2023 Mar;8(1):136. doi:10.30574/ijrsra.2023.8.1.0136.
- [19] Caswell Michelle. Seeing Yourself in History: Community Archives and the Fight Against Symbolic Annihilation. *The Public Historian*. 2014;36(4):26–37. <https://doi.org/10.1525/tph.2014.36.4.26>
- [20] Terras Melissa, Smith David A, Sanderson Robert, editors. *Digitisation and the Humanities: Representing Analog Reality in a Digital Age*. London: Routledge; 2016.
- [21] Manning Patrick. *Big Data in History*. Cambridge: Cambridge University Press; 2013. <https://doi.org/10.1017/CBO9781139225305>
- [22] Bamdele Igbagbosanmi John. CROSS-FUNCTIONAL ENGINEERING LEADERSHIP COORDINATING MULTIDISCIPLINARY TEAMS TO ACHIEVE SYNCHRONIZED EXECUTION, TECHNICAL ALIGNMENT, AND CONSISTENT OPERATIONAL IMPROVEMENT IN MANUFACTURING. *International Journal Of Engineering Technology Research and Management (IJETRM)*. 2022Dec21;06(12):161–77.
- [23] Guldi Jo, Armitage David. *The History Manifesto*. Cambridge: Cambridge University Press; 2014. <https://doi.org/10.1017/CBO9781139923881>.
- [24] Rumbidzai Derera. HOW FORENSIC ACCOUNTING TECHNIQUES CAN DETECT EARNINGS MANIPULATION TO PREVENT MISPRICED CREDIT DEFAULT SWAPS AND BOND UNDERWRITING FAILURES. *International Journal of Engineering Technology Research and Management (IJETRM)*. 2017Dec21;01(12):112–27.
- [25] Blevins Cameron. Space, Nation, and the Triumph of Region: A View of the World from Houston. *Journal of American History*. 2014;101(1):122–147.
- [26] Derera R. Machine learning-driven credit risk models versus traditional ratio analysis in predicting covenant breaches across private loan portfolios. *International Journal of Computer Applications Technology and Research*. 2016;5(12):808-820. doi:10.7753/IJCATR0512.1010.
- [27] Onyechi VN. Modern Reservoir Optimization Techniques: Data-Guided Field Development Strategies for Improving Hydrocarbon Recovery and Reducing Operational Uncertainty. *International Journal of Computer Applications Technology and Research*. 2019;9(12):465–474. doi:10.7753/IJCATR0912.1014.
- [28] Moretti Franco. *Graphs, Maps, Trees: Abstract Models for Literary History*. London: Verso; 2005.
- [29] Atanda ED. EXAMINING HOW ILLIQUIDITY PREMIUM IN PRIVATE CREDIT COMPENSATES ABSENCE OF MARK-TO-MARKET OPPORTUNITIES UNDER NEUTRAL INTEREST RATE ENVIRONMENTS. *International Journal Of Engineering Technology Research and Management (IJETRM)*. 2018Dec21.;2(12):151-64.
- [30] Afolabi OS. Load-Bearing Capacity Analysis and Optimization of Beams, Slabs, and Columns. *Communication In Physical Sciences*. 2020 Dec 30;6(2):941-52.
- [31] Adeyanju BE, Bello M. Storage stability and sensory qualities of Kango prepared from maize supplemented with kidney bean flour and alligator pepper. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*. 2022;27(1, Series 3):48-55. doi:10.9790/0837-2701034855
- [32] Underwood Ted. *Distant Horizons: Digital Evidence and Literary Change*. Chicago: University of Chicago Press; 2019.
- [33] Afolabi Oluwafemi Samson, Femi Adeyemi, Toyiyb Oladipo. Effect of transverse reinforcement on the shear behavior of reinforced concrete deep beams. *World Journal of Advanced Research and Reviews*. 2022;16(2):1294-1303. doi: 10.30574/wjarr.2022.16.2.1267. Available from: <https://doi.org/10.30574/wjarr.2022.16.2.1267>
- [34] Ridge Mia. *Crowdsourcing Our Cultural Heritage*. London: Routledge; 2014.

- [35] Ibitoye JS. Securing smart grid and critical infrastructure through AI-enhanced cloud networking. *International Journal of Computer Applications Technology and Research*. 2018;7(12):517-529. doi:10.7753/IJCATR0712.1012.
- [36] Kinyanjui MN. *Women and the informal economy in urban Africa: From the margins to the centre*. Bloomsbury Publishing; 2014 Jun 12.
- [37] Madden K, Dimand RW, editors. *The Routledge handbook of the history of women's economic thought*. London: Routledge; 2019.
- [38] Van den Hoonaard WC. *Map worlds: A history of women in cartography*. Wilfrid Laurier Univ. Press; 2013 Sep 21.
- [39] Topik SC, Topik S, Wells A. *Global markets transformed: 1870–1945*. Harvard University Press; 2014 Apr 21.
- [40] Ortiz P. *Emancipation betrayed: The hidden history of black organizing and white violence in Florida from reconstruction to the bloody election of 1920*. Univ of California Press; 2005 Mar 29.