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Slum-Based CAV Networks: Networking in Unyielding Poverty Situations

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ABSTRACT

Over a billion of the world's population reside in slums. However, the configurations of their social and structural ties in these environments remain unsubstantiated. Drawing on a psychosociological rational choice perspective, we introduce theoretical explanations distinguishing slum dwellers' behavior, actions, and attitudes in community asset voucher (CAV) networks. Regression and equation modeling results, based on 19,892 slum dwellers' CAV transactions, reveal intersecting socio-economic dynamics suggesting that twenty-five percent (25%) of these dwellers are entrepreneurially-minded. They leverage CAVs for consumption and enterprise purposes. They also time when to transact in their slum-based CAV networks. Their central position indicates that they influence CAV transactions. But seventy-five percent (75%) of these dwellers are passive. They accept that they cannot change their seemingly unyielding poverty situation; hence, they only receive and use CAVs for consumption purposes. This stark contrast in behavior and attitude carries academic, economic, and social ramifications.

1 | Introduction

Since Granovetter's (1983) seminal work on networking, network theory has garnered attention in research. Various scholarly works on networks expand upon Granovetter's foundational insights on networking, portraying networks as deliberately 'planted' communities where participating nodes (individuals, organizations, and government institutions) are able to reach out to each other, making rational decisions to collaborate (see Chen et al. 2022; Hallen et al. 2020; Maupin et al. 2023). Like Granovetter's (1983) and Ahuja's (2000) work, much of this research assumes that the nearness of these nodes to each other induces an exchange and sharing atmosphere in which they draw upon each other's capabilities to foster product, process, and service innovations (Brass and Borgatti 2020; Burt 2021; Burt

and Soda 2021; Simba 2015; Turkina 2018; Zardini et al. 2023). In this scenario, reciprocity, benevolence, and trust-like ties are identified as fundamental pillars that yield positive outcomes (see Cannatelli and Antoldi 2012; Castelfranchi 2008; Chen et al. 2022; Cook and Hardin 2001 etc.). While there is unanimous acknowledgment of the essence of these networking fundamentals and benefits, research on the configurations of the social and structural ties that underlie the networking attitudes, behaviors, and choices of individuals embedded in slum-based networks like CAV networks, established on the basis of donated CAVs to support communities to break endemic poverty cycles, is unsubstantiated.

Therefore, considering the imbalance created by this lack of research evidence in the extant literature, this study focuses on

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Summary

- Networking under slum conditions of enduring socio-economic hardships based on 19,892 slum dwellers' CAV transactions, reveal intersecting socio-economic dynamics suggesting that twenty-five percent (25%) of these dwellers are entrepreneurially-minded.
- Entrepreneurship in a slum-based community asset voucher (CAV) network.
- Leveraging a central position in a slum-based CAV network for entrepreneurship.
- Structural and social ties underlying entrepreneurs in a slum-based CAV network.
- A scarcity vs. entrepreneurial mindset in a slum-based CAV network.
- Survival instincts in a slum-based CAV network-actions, behavior, and attitude.

slum-based CAV networks in East Africa with a specific focus on Kenya. Community asset vouchers, that are at the core of these networks, are digital tokens that can be exchanged for goods, labor, and other essential services (Ruddick 2023; Shrum et al. 2023). They are a form of digital currency embedded in a blockchain-like system donated by NGOs and grassroots organizations to support people living in poverty (Kuk et al. 2022). With over a billion people considered to be living in poverty-stricken neighborhoods (UN-Habitat 2023), an understanding of how these communities rationalize the use of a complementary currency in their surroundings can provide a pathway toward their financial inclusion, equality, and poverty alleviation.

Consistent with this focus and observation, we take center ground in research, channeling our efforts toward developing a solid theoretical baseline for enabling a broad understanding of the socio-economic dynamics in slum-based Kenyan CAV networks. We contend that such an approach does not only illuminate how impoverished communities rationalize their decisions when using donated community currencies in their poverty scenarios (cf., Rahman and Ley 2020; Shrum et al. 2023), but also spotlights consumption patterns likely to be widespread in similar communities confronting poverty across many parts of the developing world (cf., Burt 2019). In some way, these efforts align with the UN's Sustainable Development Goals (SDGs) advocating for ways of identifying, understanding, and tackling poverty to build sustainable cities and communities. From an academic perspective, our comprehensive poverty-networking and entrepreneurship analysis, which draws upon a psychosociology rational choice perspective (see Hechter and Kanazawa 1997) advances new understanding that depicts the social and structural ties (Burt 2019) underpinning slum-based community asset voucher (CAV) networks (cf., Reficco and Márquez 2012). Based on our phenomenon-theory interface, the following question guides our inquiry: *How do slum dwellers in Kenya's impoverished surroundings characterized by CAV networks rationalise the use of community asset vouchers they access through donations?*

Research efforts to develop explanations that address the requirements of this phenomenon and theory-driven question contribute

to research on poverty, networking, and entrepreneurship in several ways. First, the study contributes to research by conceptualizing the behaviors, attitudes, and mindset that a poverty scenario induces in entrepreneurial individuals who dwell in slums (cf., Kuk et al. 2024; Shrum et al. 2023). It extends the psychosociological rational choice perspective by developing theoretical explanations elaborating on how entrepreneurially-minded slum dwellers leverage CAVs for micro-entrepreneurship, timing when to do business in their CAV networks (cf., Morris and Tucker 2023; Rahman and Ley 2020). This provides new insights into how their central position in CAV networks mediates the way in which CAVs are utilized for consumption and enterprise in these poverty scenarios. Similarly, the research contributes insights into how a proportionately large percentage of slum dwellers adopt a passive or scarcity mindset, resigning to their fate of being trapped in poverty (cf., De Bruijn and Antonides 2022; Hoyt et al. 2023). In this state of mind, they perceive access and use of CAVs as the means to an end because of their seemingly unyielding poverty situation (cf., Morris 2020; Morris et al. 2020). Thus, introducing new perspectives depicting the psychosociological rational choices slum dwellers make in networks characterized by poverty. Such insights are essential as they complement research suggesting that experiencing poverty can have a lasting impact on an individual's cognitive processes, decision-making approaches, self-efficacy, affective outlook, capabilities, and behaviors (see Jackman et al. 2021; Morris et al. 2018).

Second, the research reported herein contributes an instructive poverty-networking-entrepreneurship analysis depicting how entrepreneurial actions and behaviors are predominantly driven by prevailing social conditions (cf., Baldassarri 2015; Hechter and Kanazawa 1997). Thus, it advances new insights to explain how the need to survive in slum-based CAV networks shapes one's mindset and subsequent actions and attitudes. This introduces a new dimension to the literature on networking and communities (cf., Ahuja 2000; Borgatti and Halgin 2011; Granovetter 1983). It advances this body of knowledge by incorporating entrepreneurial behavior, mindset, actions, and attitudes induced by a context characterized by chronic poverty, high resource deficiencies, and instability.

Third, our comprehensive poverty-networking-entrepreneurship analysis, psychosociological rational choice perspectives, and the outcomes of this research have academic, economic, social, and policy implications. With over a billion individuals residing in slums (UN-Habitat 2023), policymakers gain insights into the impact of donated resources. Furthermore, an understanding of the social and structural ties (Burt 2019) in slums encourages debate on how to reconcile the resource shortages and needs in such poverty-stricken conditions (cf., Kuk et al. 2024). Academics are presented with a research puzzle necessitating alternative theorisations to incorporate psychosociological rational choice perspectives in defining networking behavior and attitudes, or lack thereof, in poverty contexts.

2 | Theoretical Argument

Existing research on networking suggests that networks link individuals and businesses to crucial resources necessary for their innovation and development (Chell and Baines 2000; Pittaway

et al. 2004; van Burg et al. 2022). In this scenario, networks form part of a strategy growth-oriented firms deploy in search of both tangible and intangible resources (Elfring et al. 2021; Felzensztein et al. 2022; Milanese et al. 2020). While the literature intersecting the concept of networks and firm development is well-established (Burt and Soda 2021; Leppäaho et al. 2022; Simba 2013), theoretical explanations to define community-driven networks that emerge through individual and/or collective action to confront societal problems widespread in poverty scenarios remain underdeveloped. Given that existing scholarly research draws parallels between a dire situation and a survival mentality (Granados et al. 2022; Morris et al. 2023; Shrum et al. 2023), a comprehensive poverty-networking and entrepreneurship interface and the psychosociology rational choice perspectives (Hechter and Kanazawa 1997) can be the basis for inspiring theorisations that go beyond the averages to increase the inferential value of theory in research (Newbert et al. 2022). In the case of slum-based networks whose purpose differs from that envisioned in Ahuja (2000) and Granovetter (1983) ideas about strong and weak ties, the connections and relationships that potentially form produce social and structural ties that are different from those of a traditional network paradigm. Ties in slum-based networks are largely intermittent. Their existence is determined by the availability of donated community asset vouchers. They evolve on a monthly basis due to a high emphasis on survival in slum networks.

To develop solid theoretical explanations, this research operationalises Hechter and Kanazawa's (1997) sociological rational choice theory, extending and adjusting it to decipher the behaviors, attitudes, and the mindset poverty scenarios induce in entrepreneurial individuals affiliated with CAV networks in slums. Unlike decision theory, rational choice perspectives are multilevel (i.e., they consider the micro- and macro-level influences on individuals [see Coleman 1990]). Rational perspectives include assumptions about individual cognitive capacities and values, among other things. At the individual level (micro-level) sociological rational choice assumptions help to explore the behaviors, attitudes, and the mindset of slum dwellers as they receive and use donated CAVs. At the micro-level, rational choice assumptions provide an avenue for developing theorisations to account for the situational effects associated with slum-based CAV networks. Thus, the rational choice theory's ability to facilitate multi-level explanations that consider the context and individuals makes it suitable for theorizing our phenomenon involving entrepreneurially-minded and passive slum dwellers in slum-based CAV networks.

3 | Hypotheses Development

The hypotheses for this research advance assumptions about social and structural ties in slum-based CAV networks characterized by endemic cycles of poverty. They theorize about the behaviors, attitudes, and mindset of slum dwellers who must confront their economic and social hardships within their networks in order to survive. Earlier conceptualizations of networks (see Ahuja 2000; Granovetter 1983) advocate for close-knit communities bound by mutual relationships characterized by access and sharing of knowledge and assets to enhance productivity (also see Borgatti and Halgin 2011). Our hypotheses add a dimension to this body of knowledge by discerning how impoverished conditions induce

different behaviors, attitudes, and mindsets, i.e., entrepreneurial approaches and a passive/poverty mindset among slum dwellers confronting similar hardships in slum-based CAV networks.

To elaborate on these differences, we draw upon the literature at the intersection of poverty, networking, entrepreneurship, and psychosociology rational choice perspectives. Based on this, we formulate hypotheses that discern the mechanisms underlying the social and structural ties forming in networks of donated community asset vouchers in impoverished communities. In some way, our hypotheses extend the application of psychosociology rational choice perspectives and networking to incorporate behaviors, attitudes, mindsets, and ties that develop in networks involving people under poverty constraints (cf., Rahman and Ley 2020; Shrum et al. 2023).

4 | Community Asset Vouchers in Slums

Research identifies financial exclusion as a major issue affecting many communities in the developing world (Simba et al. 2024). In slums or shanty towns, the absence of financial resources means that poor communities are excluded from participating in mainstream economics (Kuk et al. 2021). With limited access to financial resources and no recourse to government resources (Simba and Tajeddin 2023), slum dwellers are forced to rely on donated CAVs to sustain their livelihoods. Based on the concept of commitment pooling, individuals in impoverished communities are afforded a fair opportunity to acquire the resources they require for their daily consumption (Ruddick 2023). This approach hinges on the idea that commitments can be effectively pooled to create an equitable and collaborative economic system (Mattsson et al. 2022). A commitment pooling protocol built on donated CAVs aggregates commitments (via digital systems) and facilitates the management and fair exchange of resources (Ruddick 2023). For slum communities, the ability to use such innovative payment mechanisms (e.g., CAVs) underpins their livelihoods in their impoverished surroundings (Hossain 2018; Seyfang and Longhurst 2013; Zapata Campos et al. 2023). Crucially, their ability to pay for necessities using CAVs fosters community wellbeing through access to essential commodities (cf., Diniz et al. 2021).

Considering this essential role community-based currencies play in impoverished neighborhoods (Kuk et al. 2024), there is a case for ensuring individuals living in such surroundings have access to this critical resource (Zapata Campos et al. 2023). Research suggests that community currency systems generally serve a specific local area or region, often with positive social and economic impacts (Ruddick et al. 2015). Mattsson et al.'s (2022) collection of transactions involving digital currency exchanges in Kenya's impoverished communities alone confirm some 3 million transactions between 2021 and 2022. That overview of transactions involving digital currencies like CAVs confirms their level of use and impact in marginalized communities. To that end, the following hypothesis is offered:

H1. *In slum communities, where access to fiat currency is limited, community asset vouchers (CAVs) savings significantly increases the likelihood of new CAV transactions for goods, labor, and services.*

5 | CAVs In Slums-Based Networks

There is ample research describing how networks function as a conduit for innovation, enhanced product development, and processes ingrowth-oriented firms (Clifton et al. 2020; Lindstrand et al. 2011; Miller et al. 2007; North et al. 2020; Obeng 2019). Within this business scenario, mutual relationships that involve open access to participating nodes' capabilities, resources, tangible and intangible assets are known to form the core of their collaborations (Cisi et al. 2020; Friedrich and Kagel 2025; Lechner et al. 2006; Lioukas and Voudouris 2020). However, while numerous studies have focused on this strategy for accessing crucial resources for entrepreneurs and businesses in general (Parrilli and Heras 2016), research on the types of structures, behavior, attitudes, and ties that take shape in slum networks, where daily survival activities dictate how individuals, communities, or groups interact, remains underdeveloped in mainstream research. Indeed, participatory and community-driven networks have received little attention (Gold 2003), yet they can enhance understanding of the attitudes and mindsets impoverished scenarios induce in individuals confronting chronic resource shortages, lack of income, and access to basic necessities (cf., De Bruijn and Antonides 2022; Hoyt et al. 2023).

The limited research on digital community currency in Sarafu networks (an equivalent of CAV networks) within slum communities or informal settlements suggests that the flow of this type of financial resource is highly modular, geographically localized, and occurs among users with diverse livelihoods (see Anagrius 2017; Mattsson et al. 2023; Zapata Campos et al. 2023). Prominent users within CAV or Sarafu networks are identified by their central position in the community—a position directly related to the circulation of community asset vouchers or digital currency (Ba et al. 2023; Mattsson et al. 2023). The circulation of this complementary means of making economic and social transactions in slums or slum-like conditions often occurs in particular sub-populations consisting of co-located users with diverse livelihoods (cf., Seyfang and Longhurst 2013; Stodder 2009; Viano 2024). As with Sarafu networks, CAV networks comprise community-based institutions headed by a faith or community leader (cf., Kuk et al. 2024). The institutions these leaders oversee take the shape of localized 'hubs' and they play a key structural role in their communities by forming sub-networks that underlie the circulation of crucial resources (Mattsson et al. 2023; Ruddick 2023). In this sense, it is reasonable to suggest that CAV networks enable localized sub-systems that allow slum dwellers to pay for basic commodities they require on a daily basis. Based on that, we reason that:

H2. *In slum communities, high CAV saving increases individuals' embeddedness in the CAV transactions network.*

6 | Behaviors, Actions, and Attitudes in Slums-Based CAVs Networks

Research suggests that entrepreneurially-minded people are proactive individuals who turn adversity into an opportunity (Osievskyy et al. 2023; Shepherd and Williams 2020). They are able to identify opportunities in the face of persistent substantial

adversities (see Shepherd and Wiklund 2020). Studies that have focused on poor neighborhoods elsewhere suggest individuals in such communities tend to coalesce to collectively tackle their hardships (Meyer 2020; Waliuzzaman and Alam 2022; Wang et al. 2021). With this level of community interaction, individuals engage in some form of prosocial acts of altruism, reciprocity, camaraderie, and benevolence (cf., Baldassarri 2015; Riar et al. 2024; Simba et al. 2023). Therefore, given this wider acknowledgment that people facing challenges show some level of kindness to each other, one would expect this to be the case in impoverished scenarios identifiable in slum-based networks. Indeed, this also aligns with research indicating that repeated interaction and social networks are frequently considered viable solutions to collective action problems (Baldassarri 2015; Diani and McAdam 2003). However, it is also reasonable to suggest that when people are hard-pressed economically and socially, their behavior, attitudes, and mindsets are likely to take a different turn.

Sociology research has relevant models that can explain individual behavior in a given scenario (see Hechter and Kanazawa 1997). As advocated by Max Weber, models that account for individual action in a given scenario are richer due to their ability to consider certain aspects of intentionality (Weber 2023). Individuals have reasons for their actions. Their behaviors and attitudes can be predictable only if their motives are known. Without insights into what motivates them, the baseline is to assume that individuals seek maximum quantities of exchangeable private goods such as wealth and, arguably, power or prestige (Hechter and Kanazawa 1997). This assumption perhaps explains why others may behave entrepreneurially, taking advantage of an opportunity that presents itself even in adversity (Osievskyy et al. 2023).

The literature on entrepreneurship and poverty provides an alternative view depicting the mindset of individuals in poverty (see Morris and Tucker 2023; Hoyt et al. 2023). This body of knowledge suggests that the actions of the impoverished are often found to reinforce their state of poverty, creating a cycle that is arduous to break (Caballero et al. 2023). Consistent with the assumptions of the sociological rational choice theory (Hechter and Kanazawa 1997), micro-level (e.g., personality traits) and macro-level (e.g., lack of financial resources) factors can trigger a passive or scarcity mindset in a given community. This means that in cases where resources are scarce, cognitive processes kick into motion, causing affected people to behave in a particular way (see Caballero et al. 2023; Shah et al. 2015). In view of this stark contrast in behavior, attitude, and mindset among entrepreneurially-minded and passive slum dwellers, we propose the following hypotheses.

H3. *Individuals who are entrepreneurially-minded in slum-based CAV networks leverage CAVs for business purposes, timing when to transact in their slum-based CAV networks. Due to their central position in these networks, they also mediate CAV transactions.*

H4. *On the contrary, those who adopt a passive or scarcity mindset because they have accepted that they cannot change their seemingly unyielding poverty situation receive and use CAVs for consumption purposes only.*

7 | Conceptualisation of CAV Usage in Slum-Based Networks

The constructs in Figure 1 are informed by the literature, our hypotheses, and observations of CAV transactions in poverty scenarios unfolding within slums. It illustrates how two different camps of slum dwellers decided to use donated community asset vouchers in slum-based CAV networks. The first group comprised proactive slum dwellers who acted entrepreneurially. They timed the use of CAVs to generate a surplus. This indicates that they built the capacity to influence the supply and purchase of essential commodities in their vicinity. In some way, they were embedded and central to the social and economic activities occurring in their networks of donated community asset vouchers. In contrast, the second group comprised passive slum dwellers. They were not proactive. They only received and utilized donated CAVs for purchasing necessities only. As described in the literature (e.g., Morris and Tucker 2023) they assumed a scarcity mindset, placing them at the peripheries of a CAV network.

8 | Methodology

8.1 | Sample and Data Description

For this research, we relied on CAV transactions provided by Grassroots Economics in Kenya. Grassroots Economics is a not-for-profit making organization focusing on community development by enabling the availability of communal goods. The organization was established to support underprivileged communities and build a resource pool. To facilitate social and economic exchanges, Grassroots Economics provides a blockchain-like platform to support the use of community-based currencies like CAV (Kuk et al. 2021).

Drawing upon data Grassroots Economics deposited on the UK Data Services, we identified 199,907 transactions involving slum-dwellers located across 60 villages in Kenya. The data we identified contained a traceable CAV code and key, the name of the issuer and sender, the transaction date, and the amount. Based on our observation of the data, the vast majority of slum dwellers use CAVs intermittently, appearing only once during the period under consideration. These patterns showing how the dwellers engaged with CAVs restricted us to 45,790 transactions that occurred between April 2022 and July 2023. During this period, the number of slum-dwellers who regularly used CAVs rose from

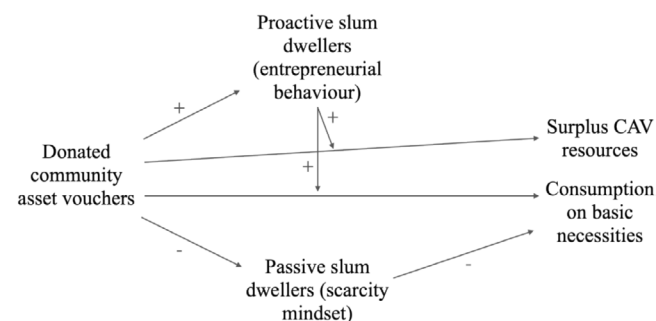


FIGURE 1 | Conceptualisation of CAV usage in slum-based networks.

19,892 to 23,142. As illustrated in Table 1, the distribution of monthly CAV transactions demonstrates a significant disparity among individuals. Furthermore, Table 1 and Figure 2 below emphasize the skewness of the distribution.

As shown in Table 1, less than 25% of grassroots members use CAVs more than twice a month, while the majority (75%) of individuals in the sample use CAVs occasionally. Additionally, most individuals vary their usage of CAVs each month. Consequently, the resultant CAV network is dominated by a few active users who multiply the transactions or establish bridges among clusters (also see Burt and Soda 2021) as illustrated in Figure 3. Figure 3 also indicates that a few slum dwellers who we considered entrepreneurially minded established a large number (V3943) of ties in these CAV networks, while others were poorly linked to the network with only V422 ties.

In addition to the overview of the usage of CAVs, Table 2 below illustrates the balances in the digital wallets of slum

TABLE 1 | Percentile distribution of monthly transactions.

Summarize monthly_transactions, detail					
Monthly_transactions					
	Percentiles	Smallest			
1%	1	1			
5%	1	1			
10%	1	1	Obs	45,790	
25%	1	1	Sum of Wgt.	45,790	
50%	2		Mean	4.365735	
		Largest	Std. dev.	10.16493	
75%	2	179			
90%	9	193	Variance	103.3259	
95%	21	207	Skewness	6.021664	
99%	52	217	Kurtosis	55.51843	

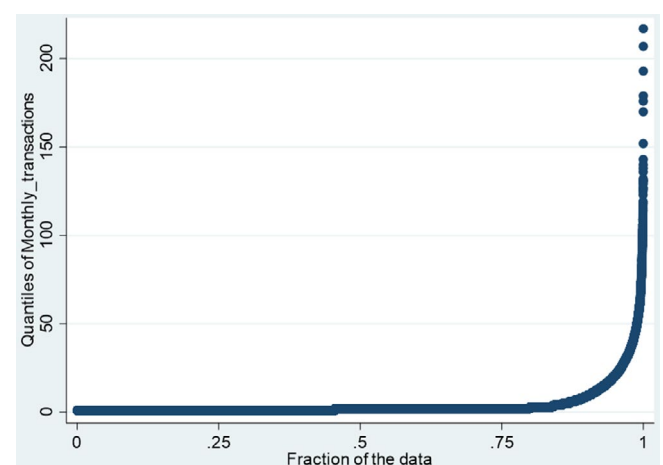


FIGURE 2 | Cumulated distribution of monthly transaction.



FIGURE 3 | The slum-based CAV networks in a poverty context. [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1002/sc.2673)]

dweller who we identified as participants in slum-based CAV networks. This serves as a proxy for the financial gains of CAV users. Table 2 below shows the distribution of these gains as of July 2023.

The median gain is 6.80 Kenyan shillings (KES) which is equal to 0.05US\$. Only 25% were considered entrepreneurial because they were able to time the use of CAVs, gaining substantially from transacting in CAVs within their networks. Their maximum gain was 559,089 KES (i.e., 4276 US\$) which is notable in counties or villages where people live on less than 2US\$ a day. The distribution of gains mirrors the distribution of the monthly tally of transactions, meaning that the multiplication of CAV transactions drives the financial gains of those members whom we considered entrepreneurially minded because they proactively engaged in social and economic exchanges in their CAV networks.

This provides unique insights into two distinctive groups of people in CAV networks. There was the proactive group, i.e., those who acted entrepreneurially by increasing the balances of their wallets of CAVs through financial creativity, and a passive group that perceived CAVs as the means to an end. This group would only use them (CAVs) for consumption purposes. In order to highlight the antecedents of CAV transactions for these two different categories of slum dwellers, we used a panel threshold logit model. The panel threshold logit model allowed us to differentiate the results of our econometrics for the two classes of CAV users highlighted in Table 2.

TABLE 2 | CAV balances in the wallets of members of CAV networks as of July 2023.

Summarize balance, detail					
Balance					
	Percentiles	Smallest			
1%	0	0			
5%	0	0			
10%	0	0	Obs	23,142	
25%	3.752733	0	Sum of Wgt.	23,142	
50%	6.804793		Mean	94.30561	
		Largest	Std. Dev.	3750.175	
75%	17.26325	28484.73			
90%	79.23158	38121.68	Variance	1.41e+07	
95%	239.1211	93992.47	Skewness	143.8668	
99%	1370.33	559088.8	Kurtosis	21351.03	

8.2 | Dependent Variable

The dependent variable is the occurrence of a CAV transaction at month t for individual i . This dummy variable equals 1 if the individual i transacts using a CAV at month t and zero otherwise. We labeled our dependent variable *OMT*. Although

dummy variables help capture categorical data, they can also lead to subtle information included in the original categories being overlooked. This simplification may impact the model's explanatory capacity since it may eliminate variability and finer group distinctions. However, the choice of monthly transactions' frequency is consistent with the measurement used for the other variables, which have the same granularity level.

8.3 | Independent Variables

8.3.1 | Number of Monthly Transactions for Month $t - 1$

Individuals undertaking CAV transactions regularly are more likely to participate in additional CAV transactions. For each participant, we added up the number of his/her transactions on a monthly basis. We labeled this variable monthly.

8.3.2 | Closeness Centrality for Month $t - 1$

Local currencies as a means of payment are more likely to be used if they become a standard practice. For example, it is easier to pay in pounds in London than in the European Union because a European enterprise or business may have difficulties exchanging pounds for other goods. Hence, slum dwellers who occupy central positions in a CAV network are more likely to accept CAV transactions. Therefore, we compute the closeness centrality of each slum dweller as the sum of its graph-theoretic distances from all other CAV users, where the distance from one CAV user to another is defined as the length (in links) of the shortest path from one to the other.

$$Cc(ni) = (g - 1) / \sum_{j=1}^{g-1} d(ni, nj)$$

where g is the number of CAV users and $d(ni, nj)$ is the geodesic linking CAV user ni and nj . Combining the distances of all reachable related CAV users excluding the focal one ($g - 1$) provides the total closeness score for CAV user ni . We labeled this variable closeness.

8.3.3 | Betweenness Centrality for Month $t - 1$

Betweenness centrality highlights the control exerted by the considered member over the CAV transactions between two other members. Hence, an entrepreneurially-minded slum dweller who solves problems of availability, location, and timing has some control over both his suppliers of essential commodities and customers. Conversely, if the member occupies a peripheral position, the measure of their betweenness centrality presents a low value. The betweenness centrality captures how much a given CAV user (hereby denoted i) is in-between others. This metric is measured by the number of shortest paths (between any couple of CAV users in the graphs) that pass through the target CAV user i (denoted $dj, k(i)$). We termed this variable betweenness.

$$B(i) = \sum_{i \neq j \neq k}^{\infty} \left(\frac{d(j, k(i))}{d(j, k)} \right)$$

8.4 | Wallet Balance for Month $t - 1$

This balance reflects the financial resources of each member at the end of the previous month and, therefore, their ability to consume during the current month. We labeled this variable *Wallet*. Graph theory enabled us to shed light on the nature of the relationships linking CAV users. Behind each transaction, there is a relationship between two individuals. By aggregating these relationships, we can characterize the place occupied by each slum-dweller within the network of CAV users.

8.5 | Control Variable

8.5.1 | Inflation Rate

Inflation tends to accelerate the circulation of any mode of payment. In the case of slums, it reduces the purchasing power associated with the face value of the CAV and may drive the multiplication of transactions. Using the central bank of Kenya baseline rates, we were able to control for the monthly variation of inflation assessed on a year-on-year rolling basis. We labeled this variable *IR*. Table 3 below shows the basic statistics for the whole sample, the group of individuals below the 75th percentile of the wallet balance variable, and the group above. The occurrence of a monthly CAV transaction (*OMT*) is almost eight times higher for people with the largest wallet balance.

Also, the number of average monthly CAV transactions (*monthly*) greatly differs between the two groups. Individuals in the last quartile occupy a more central position (*closeness*) in the network of CAV users than people in other quartiles. For these three variables, the difference is significant at the 1% level. However, individuals in these two groups do not exert strong control over the CAV transactions, and whichever group is considered, the average betweenness is low, with the difference only being significant at the 10% level. As expected, the difference in wallet balance (*wallet*) is significant at the 1% level. Finally, the monthly inflation rates vary from -1.29% to 0.91% , influencing in two ways the opportunity to accept CAV transactions.

8.6 | Panel Threshold Method

Our study extends the panel threshold model (Hansen 1999) by using a binary dependent variable. The model is specified in the following equations:

If $q_{it-1} \leq \gamma$

$$y_{it}^* = \mu_i + \beta_1' x_{it-1} + \varepsilon_{1,it} \quad (1)$$

If $q_{it-1} > \gamma$

$$y_{it}^* = \mu_i + \beta_2' x_{it-1} + \varepsilon_{2,it} \quad (2)$$

In the model above, i and t denote the i th individual at month t , q is the threshold variable, γ is the threshold value

TABLE 3 | Basic statistics of the variables in the whole sample and the two groups considered.

Variables	Whole sample			Below the 75th percentile	Above the 75th percentile	<i>t</i> -test difference
	Mean (sd.)	Min.	Max.	Mean (sd.)	Mean (sd.)	
OMT	0.17 (0.45)	0	1	0.11 (0.21)	0.82 (0.49)	2.354***
Monthly	2 (3.64)	1	217	1 (0.44)	110 (17.07)	327.32***
Closeness	0.013 (0.025)	0.0005	0.258	0.012 (0.022)	0.131 (0.066)	5.91***
Betweenness	0.001 (0.006)	0	0.076	0.001 (0.002)	0.021 (0.005)	1.032*
Wallet	94.31 (3750.75)	0	558088.8	3.07 (6.72)	139835.4 (279488.41)	15421.706***
IR	−0.73 (0.791)	−1.29%	0.91%			

Note: This table presents the basic statistics of the variables for the whole sample, individuals below the last quartile according to the wallet balance variable, individuals belonging to the last quartile according to the same variable. The last column shows the mean differences between the two groups and the associated *t* statistics. *, **, and *** indicates significance levels of 0.1, 0.05, and 0.01, respectively.

corresponding to the 75th percentile of the wallet balance variable distribution, and y^* is the unobserved dependent variable. The dependent variable, y_{it}^* , is the occurrence of a CAV transaction by the i th individual at month t , and x_{it-1} is the vector of explanatory variables. The term μ_i in Equations (1) and (2) refers to a fixed effect or an “incidental parameter”. However, the fixed effects may vary with the cross-sectional units but not over time, leading to bias in the estimation parameters (Greene 2004). This problem is particularly relevant in non-linear models like the logit model (Chamberlain 1980). A conditional Logit Model conditions out the fixed effects by focusing on the conditional likelihood function. It effectively removes the fixed effects from the estimation, reducing bias in the estimates of β . However, this method does not provide estimates for the fixed effects themselves. Therefore, we have undertaken maximum likelihood estimation and conditional likelihood estimation of the parameters.

9 | Results

9.1 | Logit Model With and Without Fixed Effects

Table 4 shows the results of a logit model with and without fixed effects. The standard errors for the models without fixed effects are adjusted for heteroscedasticity (White 1980). Due to a potential multicollinearity issue between the network variables, we differentiate four specifications for each model. Both models, with or without fixed effects, present similar results. The wallet balance in the previous month strongly and very significantly influences the occurrence of a CAV transaction for the current month. Also, an increase in the monthly inflation rate positively influences the occurrence of a CAV transaction. In that regard, CAVs can substitute fiat currency. The quantity of CAVs previously accumulated heightens the likelihood of a new transaction. Furthermore, an increase in the inflation rate tends to accelerate the circulation of CAVs. Therefore, Hypothesis 1 is validated: *In the absence of fiat currency, in slum communities, CAVs can be a viable means of payment for goods, labor, and services.*

9.2 | Panel Threshold Logit Model

Table 5 presents the findings of the panel logit threshold model (PTLM) which applies to the two regimes previously defined. The low wallet balance regime encompasses individuals from the first three quartiles based on the wallet variable. The high wallet balance regime includes individuals from the final quartile according to the same variable. This conditional logit model eliminates the fixed effects by concentrating on the conditional likelihood function. We test the null hypothesis of no threshold by testing the equality of the coefficients $\beta_1 = \beta_2$ between the two regimes using alog-likelihood ratio. The PTLM rejects the null hypotheses for three out of the five variables at the 1% level. The equivalence of the two other parameters is rejected at the 5% level. The overall χ^2 is 5304.51, significant at the 1% level, revealing the highly significant overall difference between the two regimes.

For individuals within the high wallet balance regime, the decision to undertake a new CAV transaction is principally driven by the quantity of their CAV transactions the month before and their prior *closeness* to the other CAV users. Both are significant at the 1% level. Therefore, individuals in this regime are embedded in a network of transactions where CAV has become a common medium of payment. Hence, Hypothesis 2 is validated: *In slums, community asset vouchers function as an alternative form of finance used to sustain the livelihoods of individuals who have limited opportunities to generate income through gainful employment.* For individuals in this camp, CAVs effectively sustain their livelihoods. Nonetheless, this impact is only significant at the 5% level. Also, the amount of their wallet balances the previous month influences their decision to transact thanks to CAVs at the 5% level, meaning that their current consumption is impacted by the amount of CAV they have previously accumulated. This result is particularly important as it shows that entrepreneurially minded individuals can build a surplus of CAVs (i.e., means of payment in excess compared to their current needs) that would improve their future consumption. Here, it is important to note that the variation in the monthly inflation rate does not affect their decision to use their CAV. Hence, CAVs

TABLE 4 | Results of the baseline model without thresholds estimated by logistic regression with and without controlling for fixed effects.

Variables	Logit model with fixed effect				Logit model without fixed effect			
	1	2	3	4	1	2	3	4
Constant	7.241*** (3.20)	4.055*** (2.56)	6.832*** (2.74)	4.611*** (2.51)				
IR_{t-1}	0.026** (2.26)	0.024** (2.31)	0.014* (1.83)	0.025** (2.34)	0.046** (2.02)	0.035** (2.17)	0.051** (2.31)	0.043** (1.99)
Wallet _{t-1}	6.357*** (31.13)	5.912*** (24.52)	4.424*** (28.41)	5.8422*** (28.53)	8.661*** (36.24)	8.422*** (33.62)	7.655*** (33.91)	7.731*** (34.29)
Monthly _{t-1}		4.217 (1.63)	4.592 (2.01)	3.652 (1.78)		3.046 (1.56)	3.244 (1.69)	4.692 (1.76)
Closeness _{t-1}			0.277 (2.01)	0.335 (1.6)			0.251 (1.02)	0.306 (1.16)
Betweenness _{t-1}				0.187 (1.49)				0.187 (0.49)
Pseudo-R2	0.041	0.052	0.056	0.057	0.056	0.061	0.066	0.060
Log likelihood	251.612	246.253	244.622	237.435				
Conditional log likelihood						125.361	165.401	106.203

Note: *, **, and *** indicates significance levels of 0.1, 0.05, and 0.01, respectively.

are not used to make good bargains through sales when inflation accelerates or purchases when it decelerates.

Finally, theco-efficient associated with the variable *betweenness* shows that CAV may serve to control transactions between other members. Typically, anentrepreneurially-minded slum dweller will aim to control the transactions between their suppliers and customers. A CAV, as a general equivalent that can be used to purchase any goods substituting barter, allows the emergence of an entrepreneurial group of dwellers. However, the parameter associated with the *betweenness* variable is only significant at the 10% level. Globally, theco-efficients associated with the variables for people of the high regime validate the H3 hypothesis: *Individuals who areentrepreneurially-minded inslum-based CAV networks leverage CVS for business purposes, timing when to transact in theirsalum-based CAV networks, and because of their central position in these networks, they also mediate CAV transactions.*

CAVs are more than a means to acquire goods for current consumption. Firstly, CAVs previously accumulated only guided current consumption at the 5% level. Secondly, the number of past transactions, as well as the centrality in the network of CAV users, are the more significant drivers of their current CAV transactions. Hence, people of the high wallet balance regime increase their CAV wallet balance through the multiplication of CAV transactions and their proximity with other CAV users. Accordingly, transactions become a means to accumulate CAVs far beyond the current needs' satisfaction. Individuals with low wallet balances comprise 75% of our sample. Our model indicates that their decision to make a CAV transaction is only guided by the amount of CAVs available to them from the previous month. The descriptive statistics of the wallet balance variable show that this amount does not exceed 7.26 KES or 0.13US\$ for those in the low wallet balance regime. For them, CAVs are only an opportunity to address their immediate needs. Therefore, Hypothesis 4 is validated: *On the contrary, those who adopt a passive or scarcity mindset because they have accepted that they cannot change their seemingly unyielding poverty situation receive and use CAVs for consumption purposes only.*

It is difficult to argue that CAVs may alter the situation of these individuals and facilitate their economic development. However, our model indicates that holding a CAV increases the probability of immediate consumption. This effect is significant at the 1% level. Hence, part of Hypothesis 2 is further validated: *H2... CAVs sustain the livelihoods of these individuals.* This effect is significant at the 1% level for 75% of the population and significant at the 5% level for the remaining 25%.

The results of the regression we conducted highlight the validity of our conceptualisation of CAV usage in slum-based networks, as illustrated in Figure 1. Starting with donated CAVs, our panel threshold logit model enabled us to differentiate two sub-samples based on their CAV wallet balance. Individuals with the high wallet balance regime use CAVs as a means of payment for the consumption of basic necessities but also, to a larger extent, to increase the surplus of their CAV resources. We described this sub-sample as proactive slum dwellers. Their entrepreneurial mindset leads them to multiply transactions in order to accumulate CAVs. From the opposite end of the spectrum, individuals

TABLE 5 | Panel threshold logit model for high vs. low wallet balance regimes.

Variables	Panel threshold logit model (PTLM)		
	High wallet balance regime	Low wallet balance regime	χ^2 for testing $H_0: \beta_1 = \beta_2$
IR_{t-1}	0.015 (1.03)	0.061** (2.46)	10.825**
$Wallet_{t-1}$	3.162** (3.44)	5.655*** (4.11)	9.541***
$Monthly_{t-1}$	5.207*** (3.74)	2.043 (1.23)	12.342***
$Closeness_{t-1}$	6.404*** (4.05)	0.132 (1.01)	7.905***
$Betweenness_{t-1}$	2.416* (2.21)	0.01 (0.32)	4.327**
Conditional log likelihood		47.581	
χ^2 for joint test of: $\beta_i = 0, I = 1, 2$		5304.51***	

Note: *, **, and *** indicate significance levels of 0.1, 0.05, and 0.01, respectively.

with the low wallet balance regime only convert the CAVs they receive into goods for their immediate consumption. We have defined this cohort as passive slum dwellers. They do not demonstrate any strategic behavior to enable them to improve their poverty predicament in the long term.

10 | Robustness Checks

The comparative results from models with fixed (vs. without) effects ensure that our overall findings are not driven by the choice of method for handling unobserved heterogeneity. Additionally, to ensure the consistency and reliability of our PTL model's results, we have employed diverse threshold values within the final quartile of the wallet balance variable. In addition, we split the sample into different sub-samples based on time periods to check if the results are consistent across different sub-samples. Lastly, the Bootstrap method applied to the high wallet balance regime concludes that our findings are not skewed by influential cases.

11 | Discussion

Unlike conventional networks known for enabling collaborating parties to enjoy complementary relationships in which they jointly convert ideas into commercial outputs (Kurniawan et al. 2021; Wegner et al. 2023), slum-based networks have distinctive social and structural ties (cf., Rahman and Ley 2020; Shrum et al. 2023). Their distinctive social and structural ties contribute to research in several ways. Founded on community asset vouchers—a digital currency donated by NGOs and grassroots organizations to alleviate poverty (Ruddick et al. 2015), the ties that emerge in these community asset voucher networks comprise distinct categories of slum dwellers distinguishable by their characteristics and behavior.

The empirical findings of this research point to a group of individuals who have accepted their fate of being trapped in poverty. As predicted in our fourth hypothesis, the burden of being in poverty exerted an overbearing effect on this group of slum dwellers. In networking terms, they resemble passive nodes (see Ahuja 2000; Granovetter 1983) because of their resignation to the fact that they can not change their situation.

Thus, with such a poverty or scarcity mindset, the community asset vouchers they received through donations were merely a means to an end because, in their mind, their poverty situation was unyielding (cf., Morris and Tucker 2023; Morris et al. 2018). This mentality in networks of donated resources (CAV networks) confirms the lasting impact of experiencing poverty on their cognitive processes, decision-making approaches, self-efficacy, affective outlook, capabilities, and behaviors (see Morris et al. 2018; Shah et al. 2015). Thus, in networks comprising individuals who are under poverty constraints, sustenance as opposed to long-term prospects of development may be the goal for participating in a network.

Although our second hypothesis suggested that CAVs provided a lifeline as an alternative form of finance for slum dwellers, our empirical evidence hinted at how a passive group of slum dwellers intermittently engaged with donated CAVs. The group was not only partially connected to the network, but also participated by receiving donated resources mainly for consumption purposes. Furthermore, the way the group members interacted in their social settings demonstrated a different pattern of networking behavior, exhibiting different social dynamics in a poverty context. As previously stated, this is an attribute of a poverty mindset sometimes inescapable (cf., Morris and Santos 2025). In a way, these insights amplify rational choice perspectives by elucidating the attitudes and behaviors of slum residents within networks characterized by poverty.

Contrary to this passive approach in which individuals were consumed by the immediate problem at hand, a minority of slum dwellers who were also engaged in these geographically localized networks of community asset vouchers identified opportunities. Thus, despite relying on donated community asset vouchers as predicted by our first hypothesis, this visionary minority group of slum residents was proactive and did not use CAVs for consumption only. They were adventurous, going on to establish viable enterprises. Indeed, and consistent with our third hypothesis and empirical findings, this group of entrepreneurially minded individuals in slum-based CAV networks leveraged CAVs for business purposes, timing when to transact in their slum-based CAV networks, and because of their central position in these networks, they also influenced CAV transactions. In a way, their central position (Burt 2021) enabled them to simultaneously leverage community asset vouchers for trading

and consumption purposes (cf., Kuk et al. 2024). From a conservation of resources perspective (see Halbesleben et al. 2014; Hobfoll 1989; Lim et al. 2020), they acted entrepreneurially, preserving community asset vouchers while timing when to transact in their poverty context.

Considering that, there is ground to argue that context matters (Simba et al. 2024). The attitudes and behaviors, both passive and entrepreneurially-minded, slum dwellers exhibited in their environment were unique to a poverty context characterized by donated community asset vouchers. Against that backdrop, universal conceptualisations of typical networking behavior in networks (see Ahuja 2000; Granovetter 1983) may fall short of capturing the contextual richness of slum-based networks of donated community asset vouchers. Yet, understanding this digital community currencies phenomenon is essential as they are increasingly being used in poverty situations, including Brazil's favelas (see Diniz et al. 2019; Fare et al. 2015). Also taking into perspective a chorus of research calls for contextualizing theory building in research (see Newbert et al. 2022; Simba 2024; Wickert et al. 2024), this research contributes to these calls by paying attention to the broader social ties and dynamics in networks that are established in impoverished contexts. Crucially, the study facilitates scholarly conversation with context (Bruton et al. 2022; Hamann et al. 2020).

11.1 | Implications

The findings of this research have several implications. Considering that we focus on a community considered to be over a billion of the world's population (UN-Habitat 2023), we encourage serious social reforms and policy debate among government institutions, NGOs, and social commentators. A better understanding of the social and structural ties (Burt 2019) can be crucial for reconciling the resource needs and shortages poverty-stricken communities endure in many parts of the developing world. The theorisations of the attitudes and behaviors exhibited by slum dwellers, sampled for this research, provide a research puzzle for academics, inviting them to initiate further studies to explore the underlying social ties and dynamics of slum-based networks in both developing and developed economies.

Crucially, our research efforts bring the UN's Sustainable Development Goals to the forefront. Indeed, developing an understanding of the thought processes of individuals dealing with pressing social and economic hardships aligns with SDG1 and SDG11 on ending poverty and creating sustainable cities and communities. Additionally, implementing digital community currency in impoverished neighborhoods offers insights into the responsible utilization of digital technology, enabling equity and inclusion in societies and communities, which is all consistent with the essence of the SDGs.

11.2 | Limitations and Suggestions for Future Research

As with any other research, our study has its limitations. The 199,907 community asset voucher transactions we focused on

were based on 60 Kenyan villages alone. Given that there are over a billion people living in slums across the world (UN-Habitat 2023), it may be hard to generalize our findings to this large population because of varying psychosocial conditions, e.g., drug-related violence in Brazil and Mexico may introduce different macro-level conditions. This limitation provides an opportunity for future research. Thus, we encourage future studies to test our conceptualisations of CAV usage in slum-based networks in communities that have similar network characteristics and poverty settings in a developing world scenario. Such research endeavors have the potential to understand the extent of the problem and to develop new insights into the social and structural compositions of slum-based networks.

12 | Concluding Remarks

This research demonstrated that slum-based networks, especially those built on donated complementary financial resources, have complex ties, and their poverty scenario induces varying attitudes and behavior. Notably, two distinct groups of slum dwellers with diametrically opposing mindsets emerged. One cohort displayed entrepreneurial tendencies. This camp was proactive and creatively utilized donated community asset vouchers. The entrepreneurial approach adopted by slum dwellers in this camp was evidenced by their calculated approach, which enabled them to systematically augment their wallet balances. Specifically, they timed the deployment of community asset vouchers, utilizing them in social and economic exchanges at opportune moments likely to generate returns. From a theoretical perspective, this minority group of slum dwellers exhibited high-order cognitive capabilities similar to entrepreneurial behavior. In other words, this group developed an entrepreneurial mindset that distinguished them from their counterparts. Contrary to research suggesting that individuals in a poverty scenario are often reduced to a counter-productive survival mode, this study offers theoretical explanations elaborating on how such a context also induces entrepreneurial tendencies of proactiveness.

The second camp comprised slum dwellers who exhibited a mindset of scarcity. They resigned themselves to their fate of poverty in their seemingly unyielding situation. Based on our analysis of their transactions, we concluded that they participated in community asset voucher networks solely for consumption opportunities. Based on these contrasting behaviors playing out in networks of donated financial resources embedded in slums, this demonstrates that poverty engenders diverse mindsets in slum dwellers.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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