Chapter 12

DELIVERING AID AMID ACTIVE CONFLICT AND INSECURITY: DIGITAL TRANSFERS FOR DELIVERING SOCIAL AND HUMANITARIAN ASSISTANCE IN SUDAN

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The recent resurgence of armed conflict in Africa is increasing the need for shock-responsive humanitarian and social assistance programs. For example, the armed conflict in Sudan, which erupted in April 2023, has caused the world's largest displacement crisis, creating a multifaceted humanitarian crisis that requires significant investments in assistance. Armed conflicts in Africa are aggravating poverty and hunger (Corral et al. 2020)[1] and threatening important gains in poverty reduction made in the last few decades. This is causing major setbacks to achieving the Sustainable Development Goals (SDGs) by 2030 (Corral et al. 2020; World Bank Group 2020), particularly SDG2 (Zero Hunger), SDG3 (Good Health and Well-Being), and SDG16 (Peace, Justice, and Strong Institutions).

While armed conflicts increase the need for humanitarian and social assistance, they complicate the delivery of assistance to vulnerable populations. Conflicts and associated fragilities can significantly limit the reach, breadth, and impact of humanitarian and social assistance programs, especially in contexts where markets and livelihood services are unavailable and/or informal.[2] They can affect the implementation, targeting, delivery, and access to various humanitarian and social assistance programs, which in turn, reduces the impact of these programs (Ghorpade 2017; Sabates-Wheeler et al. 2022). Beyond the difficulties associated with delivering humanitarian services amid protracted armed conflicts, humanitarian organizations are facing a growing funding gap as donor aid dwindles. This dual challenge is forcing humanitarian organizations to revisit the effectiveness and cost-efficacy of their programs and services for conflict-affected

1 While poverty has declined in much of the world, it is resurging in fragile and conflict-affected settings (see Corral et al. 2020; Abay et al. 2023a).

2 In the presence of active conflict, armed state and nonstate actors that control territories and associated populations can restrict access of humanitarian actors to vulnerable populations or sometimes divert humanitarian assistance for their own use (Kurtzer 2019). Indeed, aid diversion and siphoning of humanitarian aid by military actors have been documented in Africa in the past few years (Igoe 2023).

populations. Yet the choice and relative efficacy of alternative modalities and delivery of social assistance programs in conflict-affected communities remains an active area of debate. While a long-existing empirical literature and debate on the relative effectiveness of in-kind versus cash transfers provides some guidance that is applicable in stable settings,[3] we know little about how these modalities fare in conflict-affected settings. Indeed, some of the market failures and uncertainties in fragile and conflict-affected settings may make some delivery mechanisms prohibitively costly or less impactful than others. Reduced or disturbed delivery of assistance, as well as politicization of assistance amid economic instability, can intensify divisions within the political marketplace. In such contexts, political actors may use control over aid for political gains at the expense of those who are food insecure (Thomas and de Waal 2022). Furthermore, while empirical evidence from stable contexts provides some guidance on households' preference for different delivery modalities such as cash-in-hand, in-kind, or vouchers (Hirvonen and Hoddinott 2021; Berkouwer et al. 2021; Gadenne et al. 2024), there is little evidence on what households in conflict-affected settings may prefer and benefit from most. Such households face unique challenges and environments, which can shape preferences for and effectiveness of alternative modalities for delivering humanitarian assistance. Emerging studies demonstrate the potential benefits of digital transfers in improving financial inclusion and empowering women (Kipchumba and Sulaiman 2021; Riley 2024); ensuring transparency and security (Suri 2017; Suri et al. 2023; Idris 2024); reducing social pressure to share assistance with relatives or community members (Riley 2024); and reducing transaction costs (Suri 2017; Callen et al. 2025). However, whether these gains can be accrued and are appreciated by potential beneficiaries in conflict-affected settings remains unknown.

Understanding beneficiaries' preferences for different modalities of assistance delivery is crucial for ensuring their delivery and impactful programming. This is particularly true in conflict-affected settings, where beneficiaries often prefer options that reduce their exposure to harm and limit the visibility of the support they receive. For example, in active conflicts and evolving environments, delivering social assistance through conventional in-kind and physical cash-in-hand may not be feasible or effective because of access challenges. Moreover, where violence and vandalism are pervasive, delivering in-kind or physical cash transfers to vulnerable populations under the control of warring armed groups can endanger their safety.

3 See Currie and Gahvari 2008; Cunha 2014; Hidrobo et al. 2014; Gentilini 2016; Aker 2017; Alderman et al. 2017; Hoddinott et al. 2018; Schwab 2019; and Hirvonen and Hoddinott 2021.

In this chapter, we study potential beneficiaries' preferences for different transfer modalities for social assistance—in-kind versus cash-in-hand versus digital transfers—focusing on urban households in Sudan, where some beneficiaries are grappling with active conflict and fragility. The ongoing armed conflict between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) has disrupted the lives and livelihoods of millions and destroyed essential infrastructure and public services (Abushama et al. 2023; Kirui et al. 2023; Siddig et al. 2023; Guo et al. 2024). The conflict has left more than 30 million of Sudan's 47.5 million residents needing humanitarian assistance (Humanitarian Action 2025). It has been characterized by widespread local violence as well as massive theft and looting of public, private, and cultural property in several conflict hotspots (Amin 2023; ACJPS 2023; Amin and Rickett 2023; Mobley 2024).[4] Recent literature on social assistance in Sudan highlights significant challenges in providing assistance digitally. However, Abd Elkreem and Jaspars (2025) show that despite liquidity constraints, limited internet infrastructure and digital literacy, and security concerns, digitalization of food assistance continues to be the best and perhaps the most feasible mechanism of delivering assistance to vulnerable populations amid conflict.

Beyond surveying preferences for different modalities, we also explain these preferences using empirical data. For example, we examine the impact of exposure to armed conflict, violence, and theft as well as associated insecurity on preferences for different transfer modalities. Similarly, we explore whether lack of trust in financial institutions and aid organizations shapes these preferences. We find that about two-thirds of potential beneficiaries prefer digital transfers (both through mobile banking and mobile airtime), while the remaining share prefers cash-in-hand or in-kind transfers. We find that about 48 percent prefer mobile banking transfers through Bankak, a mobile banking platform provided by the Bank of Khartoum, while 44 percent prefer airtime transfers that can be cashed out. In contrast, a study in Uganda—a more stable context with better banking and internet infrastructure—found that 70 percent of beneficiaries preferred mobile money (Maghsoudi and Abakar 2024). These are interesting patterns worth noting and suggest a significant surge in preference for digital cash transfers via mobile banking apps and airtime money transfers, even in contexts where digital infrastructure is not well developed. The growing preference for digital transfers in contexts characterized by poor physical and digital infrastructure suggests they may address some

4 Humanitarian assistance and movement of commodities inter- and intrastate are also subject to threats of looting, and possible theft of stocks and warehouses (Lewis, 2023; UNOCHA, 2024a).

of the bottlenecks associated with delivering physical cash or in-kind transfer amid active conflict. Most important, we find that exposure to armed conflict, violence, and theft as well as associated feelings of insecurity are significantly associated with higher demand for digital transfers over cash and in-kind transfers. In addition, greater trust in relevant institutions—local community-based organizations (CBOs), nongovernmental organizations (NGOs), and local government—is strongly associated with preference for digital transfers. Finally, access to markets and transaction costs associated with each type of transfer are important factors shaping preferences for different modalities. These findings offer important insights that can inform the design and delivery of humanitarian services in conflict-affected settings.

The remainder of the chapter is organized as follows: We first review the theoretical and empirical literature on the choice of modality for delivering social and humanitarian assistance. We then present the context and data for our study, and in the next section, we provide empirical explanations for households' transfer modality preferences for delivery of humanitarian and social assistance. We conclude by highlighting relevant policy and programmatic implications.

Literature: Theoretical and conceptual foundations

The debate about choice of delivery mechanisms for welfare and social assistance builds on an established neoclassical model of consumer choice between cash and in-kind transfers (Southworth 1945). In this model, a consumer has preferences among two or three goods, such as food and an equivalent amount of cash or digital money. Southworth (1945) demonstrates that rational consumers' preference for in-kind or cash transfers depends on the nature of the in-kind transfers and target beneficiaries. A fundamental aspect of this model is the distinction between inframarginal and extramarginal in-kind transfers. In-kind transfers are defined as inframarginal if the amount of the transfer is less than what specific target beneficiaries would buy. Extramarginal in-kind transfers are more than the amount a specific household would consume. Whether a specific amount of in-kind transfer is inframarginal or extramarginal varies across households, as a result of different household characteristics that impact consumption patterns, such as household size. Southworth's model predicts that if in-kind transfers are inframarginal, consumers will be indifferent between cash and in-kind transfers. However, if the food transfer is extramarginal for a specific household and there is no possibility of cash transfers, the latter would result in a welfare loss, which Cunha (2014) refers to as a "distortion" effect. Because of

this, economists have usually defaulted to the notion that cash is preferred over in-kind transfers, although many empirical studies fail to support this (Gentilini 2007; 2016; Hirvonen and Hoddinott 2021).

The empirical literature on the choice between in-kind and cash transfers has identified a range of additional factors that influence their relative effectiveness and preferences. These factors include, for example, the characteristics of the target population, notably gender, education, and literacy, and other exogenous factors such as exposure to conflict and security risks, implementation costs, and the capacity of local markets, among other considerations (Brück and d'Errico 2019; Jeong and Trako 2022; Ravallion 2022). While evidence consistently shows that both cash and in-kind transfers increase overall consumption relative to scenarios without transfers (Cunha 2014; Gentilini 2016; Hidrobo et al. 2014; Schwab 2020), their comparative effectiveness is highly context-dependent. For instance, studies from middle-income settings—such as Ecuador and Mexico—indicate that cash transfers tend to promote more diverse diets than in-kind assistance (Hidrobo et al. 2014; Cunha 2014). In contrast, in very low-income and rural contexts such as Niger, in-kind transfers have been found to be more effective in enhancing dietary diversity (Hoddinott et al. 2018).

In addition to these contextual differences, fluctuations in food prices also influence preferences for cash or in-kind transfers, adding another layer of complexity to the choice. When food prices rise sharply, preferences can shift significantly. In such contexts where markets are volatile, recipients may favor in-kind assistance, as it ensures more stable access to essential goods (Gentilini 2023; Hirvonen and Hoddinott 2021). Gadenne and colleagues (2024) reinforce this argument by emphasizing that in-kind transfers can serve an important insurance function, as the real value of the transfer automatically adjusts with fluctuations in the price of the transferred goods. Specifically, they demonstrate that such transfers help smooth household consumption in the face of market price shocks, thereby offering a stabilizing effect beyond their immediate material value.

While cash transfers offer greater autonomy and flexibility(Gentilini 2016; 2023), their effectiveness may be constrained by the level of financial development and access to markets (Berkouwer et al. 2021; Hirvonen and Hoddinott 2021). Moreover, from the perspective of implementers, in-kind transfers may still be strategically preferable in certain contexts and purposes, for example, for promoting the consumption of specific goods, encouraging self-selection among beneficiaries, or increasing the availability of scarce commodities in local markets (Cunha 2014; Aker 2017).

The cost of delivering in-kind and cash transfers is another factor usually considered in the debate about in-kind versus cash transfers. Studies assessing the relative costs indicate that in-kind food transfers are generally more expensive to deliver than cash transfers and vouchers (Hidrobo et al. 2014; Cunha 2014; Gentilini 2016; Schwab 2020). This is unsurprising, given the logistical complexities typically associated with food distribution programs (Cunha 2014; Gentilini 2016). Cunha (2014) suggests that the additional distribution costs of in-kind transfers, compared with cash transfers, is at least 17.6 percent of the transfer amount, while Caldés, Coady, and Maluccio (2006) report distribution costs of only about 5 percent of transfer amounts in large-scale cash transfer programs. Furthermore, given that in-kind transfers may be extramarginal for some households and their resale values can be lower than market values, many economists favor cash over in-kind transfers. Because of these cost-effectiveness considerations, humanitarian services have been shifting from in-kind assistance to cash transfers, and more recently toward digital payments (Idris 2024).[5] Nonetheless, in contexts of active conflict, a significant caveat to note is the politicization and weaponization of telecommunications and banking services, which can create disruptions to GPS and access and use of internet (broadband or Starlink) and banking services, when these are controlled by one of the warring factions (Abd Elkreem and Jaspars 2025; Digital Rights Lab 2024).

Political and institutional factors also influence the design and sustainability of assistance programs. From a political economy perspective, food is a sensitive issue, as described by Gentilini (2023). Moreover, in-kind assistance involves complex logistics, which can attract political support from actors engaged in supply chains (Gentilini 2023). Similar discussion applies to energy (electricity) transfer programs and other types of in-kind transfers. Recent evidence suggests that subsidies can increase public support for the government. For example, a study in Ghana found that support for the ruling party was 7 percent higher among those who received an in-kind electricity transfer than nonbeneficiaries (Berkouwer et al. 2022).[6] In conflict-affected settings marked by politicization and weaponization of telecommunications and humanitarian assistance, these preferences can also be shaped by the degree of surveillance, potential diversion, and security risks (Abd Elkreem and Jaspars 2025; Jaspars et al. 2022).

5 Moreover, the distinction between cash and vouchers is becoming less clear, as vouchers can now be used for online purchases, and cash transfers can be restricted to specific vendors or regions (Gentilini 2023).

6 Their analysis also shows that the government may have gained political support by emphasizing the benefits of the program while avoiding discussion of its costs.

Several studies offer important empirical explanations for preferences for in-kind versus cash transfers, including inflation and price levels, trust in financial institutions, and social pressure to share resources. Price fluctuations significantly affect beneficiaries' preferences, with a tendency to increase preference for in-kind transfers over cash transfers when prices are high (Gentilini 2016).[7] Gadenne and colleagues (2024) demonstrate that in the presence of significant food price volatility, in-kind transfers can serve as insurance against deterioration in food security. Consistent with this, Hirvonen and colleagues (2021) show that beneficiaries experiencing high food prices are more likely to prefer in-kind food assistance over cash. Individuals who trust their banks are more likely to trust financial innovations, such as internet banking and digital transfers, handled by these banks (van der Cruijsen et al. 2023). Similarly, Abay and colleagues (2025) suggest that households' trust in banking institutions is key to adoption of digital cash transfers. Conversely, when there is little trust, people may prefer holding their assets in cash rather than banks (Stix 2013) and prefer cash over digital transfers (Berkouwer et al. 2021).

Building on these debates and literature, our study expands on two areas of investigation. First, the advent of digital transfers offers unique and fundamentally different options to transfer humanitarian and social assistance. Payments are classified as digital if they meet either of the following criteria: (1) payment status and transaction details are reported digitally to the financial service provider, or (2) beneficiaries receive, store, and use money digitally without making direct payments or collecting physical cash (Idris 2024). Providing aid through digital means can reduce coordination costs and delays, enhance transparency for donors, protect the privacy of beneficiaries, and leverage local supply chains for purchases without relying directly on local authorities, thereby minimizing concerns about the diversion of transfers (Callen et al. 2025). Another advantage for donors and humanitarian agencies is the increased transparency and decentralization of digital transfers compared with in-kind or physical cash transfers. For beneficiaries, digital transfers reduce the travel costs and time burdens involved in reaching distribution centers (Callen et al. 2025). According to Callen and colleagues (2025), the delivery cost of digital transfers is 40 percent less than the

7 Inflationary environments can weaken the purchasing power of cash transfers and hence make cash transfers less effective than in-kind transfers. For example, Sabates-Wheeler and Devereux (2010) argue that high inflation in Ethiopia weakened the purchasing power of transfers associated with the national Productive Safety Net Programme and hence were less effective than food transfers.

World Food Programme's (WFP's) average figure for cash-based transfers. Digital transfers can also address social pressures and risk-sharing practices, which can ultimately affect the effectiveness of cash and in-kind transfers. Emerging evidence shows that beneficiaries who face high familial pressure to share money are more likely to prefer transfers through mobile money (Riley 2024).

Second, active conflicts and associated insecurity present unique challenges to the different delivery mechanisms. In contexts where security is a major concern, physical delivery of food or cash can be both costly and logistically challenging, if not impossible, because of inaccessibility and disruption in road infrastructure (Callen et al. 2025). While digital transfers are becoming a viable option for transferring humanitarian payments in conflict-affected settings, the feasibility of this transfer mode depends on the capacity of service providers. This capacity, in turn, depends on the reliability of critical infrastructure, including banks, electricity, mobile phone networks, and internet connectivity (Idris 2024).

Context and data

The armed conflict in Sudan

As we write this chapter, it has been more than two years since the violent conflict began between the SAF and the RSF, creating a severe humanitarian crisis, including large-scale population displacement. As of February 2026, an estimated 7 million individuals have been internally displaced within Sudan (UNHCR 2026), and humanitarian needs are at an all-time high. The latest update from the UN Office for the Coordination of Humanitarian Affairs reports that 64 percent of the population—30.4 million people of the 47.5 million Sudanese population—needs humanitarian assistance (UNOCHA 2025b). Despite ongoing efforts, the humanitarian response faces a growing funding gap and has fallen significantly short of addressing the magnitude and intensity of people's needs, reaching only 8.6 million people with at least one form of assistance out of a target of 20.9 million (UNOCHA 2025b; 2025a).

Beyond the funding gap, two key factors constrain delivery of humanitarian assistance across Sudan. First, active hostilities in many regions and blockages along the country's main trade routes, as well as the lack of security on alternative and remote desert roads, often force humanitarian organizations to rely on either alternative routes or alternative assistance delivery

mechanisms (Abushama et al. 2023; Kirui et al. 2023; SPARC and Crises) 2025). This likely increases the cost of delivery of humanitarian services. Second, the control of distinct regions by the SAF and RSF and increased politicization and weaponization of telecommunication channels by both factions creates bureaucratic impediments to access. These include the need for approvals for movement or delivery of humanitarian assistance as well as limited access to civilians trapped in some parts of the country, complicating the delivery of assistance to all those in need (UNOCHA 2024a; Abd Elkreem and Jaspars 2025).

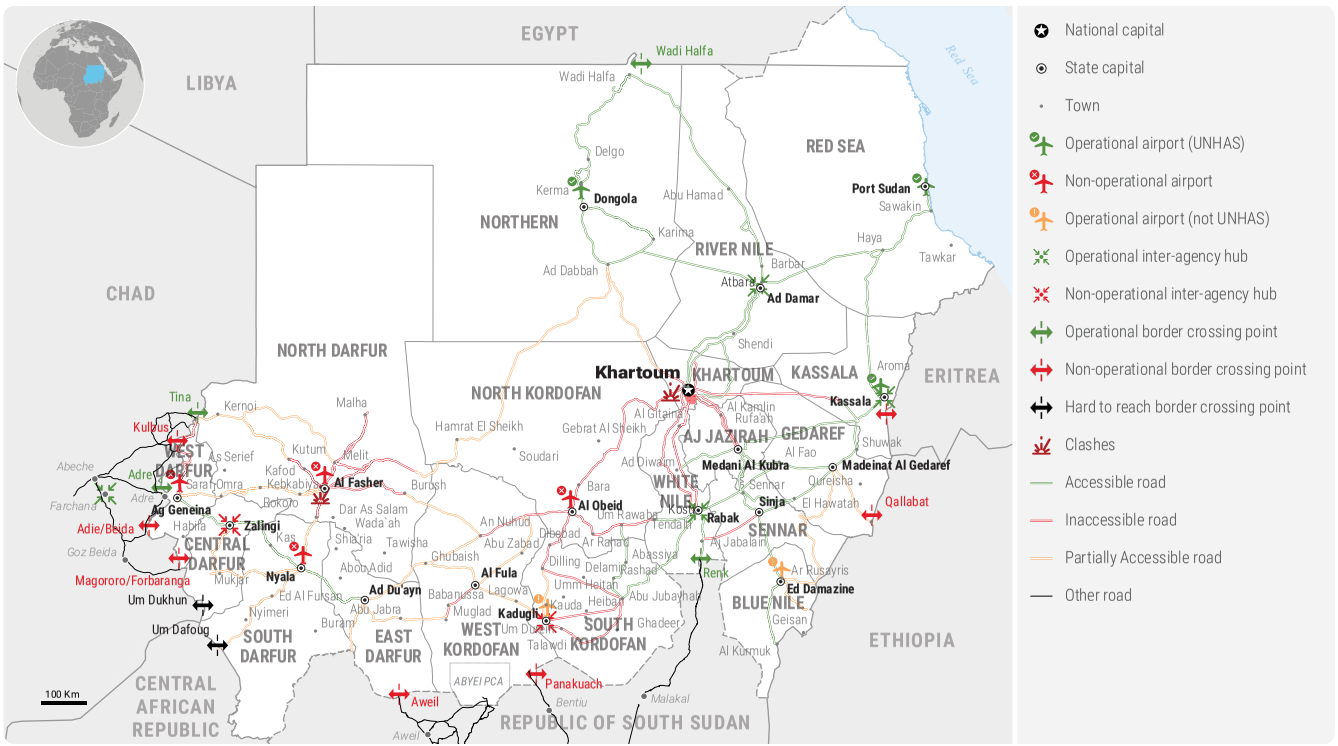
Figure 12.1 maps the access and logistical constraints imposed by the conflict's evolving landscape, with continued obstacles to movement between the eastern and western regions of Sudan but relatively easier movement within the regions controlled by the SAF and by the RSF.[8] Because the delivery of physical goods is hindered by insecurity, logistical challenges, and infrastructure damage, humanitarian responses have to shift from traditional in-kind assistance to various forms of cash assistance (CCS 2024b). In the context of the significant disruptions to Sudan's banking and telecommunication sectors since the conflict began, humanitarian organizations have identified and employed various modalities to deliver cash to populations in need. Notably, they have utilized multiple financial service providers, including banks, microfinance institutions, and money transfer agents, which can continue operations during network outages and address liquidity and access constraints in collaboration with delivery agencies (CCS 2024b; 2024a).

Data and data source

Our study builds on the large Sudan Urban Household Survey (SUHS 2024), which was conducted between May and July 2024, to monitor the impact of the armed conflict on the livelihoods of urban households (IFPRI and UNDP 2024). The survey covered more than 2,500 urban households across Sudan's 18 states. The sample utilized telephone numbers of urban households assembled from databases maintained by three different sources: the WFP, International Food Policy Research Institute (IFPRI), and Geo-Poll. The households included in the survey were drawn from these databases (IFPRI and UNDP 2024). Due to the difficulties of running in-person surveys in conflict zones, the survey was conducted through computer-assisted telephone interviewing (CATI) technology, which avoided security and accessibility

8 We define SAF-controlled and RSF-controlled regions as regions where military authority and control of trade routes persists by one of the two factions.

FIGURE 12.1 Humanitarian access constraint map, January 2025



Source: UNOCHA (2025b).

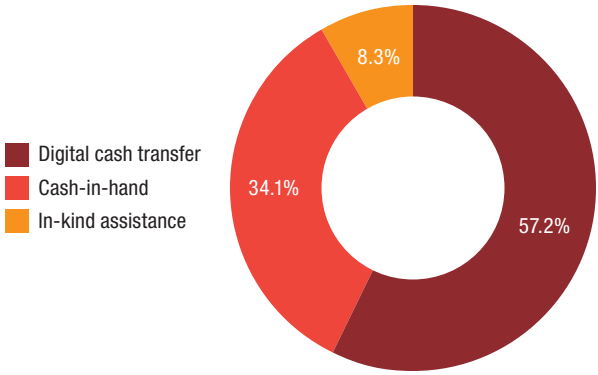
constraints, particularly in areas heavily affected by conflict. Despite persisting network instability across Sudan's 18 states, the CATI approach enabled completion of the survey, along with inclusion of mechanisms such as consent, scheduling of call-backs, and smooth engagement throughout the administration of the survey.

Building on this baseline survey, IFPRI and partners implemented a pilot intervention that delivered digital cash to a randomly selected portion of urban households included in our sample. At the time of the intervention (January–February 2025), about 86 percent of the baseline sample (2,582 urban households) was reachable and hence were included in the randomized controlled trial.[9] The intervention used individual-level randomization, in which the households were assigned to either a control group or one of the two treatment groups. Specifically, 38 percent of the sample was assigned to the control group, which received no digital transfers, and 62 percent was further split into two treatment arms based on the amount transfer households were assigned to receive: either US$50 per household or $75 per household. The sample is stratified by state as well as mode of digital transfer, as households indicated varying preferences for means of delivery of digital cash. About two to four weeks after the intervention, we conducted an endline survey that reached about 97 percent (2,513 urban households) of the sample who responded to this CATI survey between February and March 2025. The survey included a wide array of questions to follow up on households' economic and security conditions and to elicit respondents' preferences for in-kind, cash-in-hand, or digital transfers. These included questions on household livelihoods, food insecurity, and mental health. Questions also addressed respondents' experience with using the digital cash transfers and associated transaction costs incurred to get the transfers. They were also asked about their access to alternative means of digital payments and markets, and their trust in financial institutions and other organizations involved in the delivery of humanitarian services. Most importantly, the survey asked about respondents' exposure to armed conflict, violence, theft, and associated insecurity in the last two months.

Figure 12.2 shows that digital cash transfers were the most preferred modality of assistance for urban households, with 57 percent of respondents preferring digital transfers, 34 percent choosing cash-in-hand, and the

9 We note potential selection biases as a result of the conflict and lack of security, as some households may have not had access to phones at the time of data collection as a result of theft, looting, confiscation (or fear of these losses).

FIGURE 12.2 Overall preference for transfer modality



Source: Authors' calculations based on household phone survey data.

remaining 8 percent opting for in-kind transfers. We disaggregated these preferences across gender and age of respondents. Younger respondents exhibited slightly greater preference for digital transfers, while older respondents show slightly greater preference for cash. This may be explained by differences in digital literacy. We do not observe major differences across gender, in contrast with findings from Maghsoudi and colleagues (2024), which imply that gender differences in digital and financial literacy are significant factors impacting the effectiveness of digital cash assistance. This may be explained by contextual variation; in the context of Sudan, the widening funding gap of humanitarian assistance and active conflict together impede delivery of assistance, with the result that all beneficiaries prefer digital assistance over other means for which access may be uncertain. The popularity of digital transfers in contexts where digital infrastructure and associated regulatory institutions remain weak merits further investigation and explanation. The accessibility challenges described in Figure 12.1 as well as the security situation and fear of keeping cash at hand may explain some of these patterns.

Explaining the preferences for modality of delivery in conflict-affected settings

Sudan provides a unique case of large-scale active conflict that is geographically dispersed across various regions, each with distinct economic and social characteristics. Consequently, the preferences of urban households

regarding assistance modalities are likely to be influenced by a complex set of factors. While several studies in low- and middle-income countries show that in-kind assistance is preferred over cash transfers (Gentilini 2023; Hirvonen and Hoddinott 2021) and these preferences are particularly pronounced in contexts characterized by surging inflation and high food prices (Gentilini 2016; Gadenne et al. 2024), the disruption of trade routes and humanitarian corridors in Sudan presents significant challenges to the consistency and efficiency of in-kind assistance delivery in conflict areas. In view of these problems, cash-in-hand may be preferred over in-kind transfers, as it allows for greater diversity in nutrition and more autonomy over food preferences and access amid the ensuing conflict. This option can be especially appealing in situations where there is a lack of trust in banks and financial services (Stix 2013). Nevertheless, the physical risks associated with theft and looting of property (ACJPS 2023; Amin and Rickett 2023) raise concerns about beneficiaries' ability to save and secure cash assistance effectively.

Digital cash transfers can be advantageous in contexts where physical access to beneficiaries is impeded, the costs of delivering assistance are high, and there is social pressure to share transfers (Suri 2017; Riley 2024; Callen et al. 2025). In sub-Saharan Africa, where 86 percent of men and 77 percent of women have mobile phones, 165 million adults without bank accounts (56 percent of the "unbanked") do possess a mobile phone, indicating a potential avenue for digital assistance (Demirguc-Kunt et al. 2022). However, Sudan's limited digitalization and access to financial innovations raise questions about the level of trust in local banks and the banking system. Thus, while some individuals may prefer to keep their money in cash because they distrust banks, the risks of looting and theft may also drive beneficiaries to consider digital cash options. In light of all these factors, it is key to understand and adopt a user-centric approach to delivering humanitarian services, especially to minimize risk to communities under active conflict (Mercy Corps 2023; Idris 2024).

Against this backdrop, we empirically explore some of these hypotheses and findings from the literature on the impact of several factors discussed in the previous section. We note that while the randomized digital cash transfers introduce exogenous variation in access to digital transfers, the remaining factors and attributes such as exposure to armed conflict cannot be randomized and hence can be considered endogenous. Thus, we refrain from causal interpretation in our analysis and focus on generating associational evidence and interpretation.

Access and exposure to alternative digital payment services and associated transaction costs

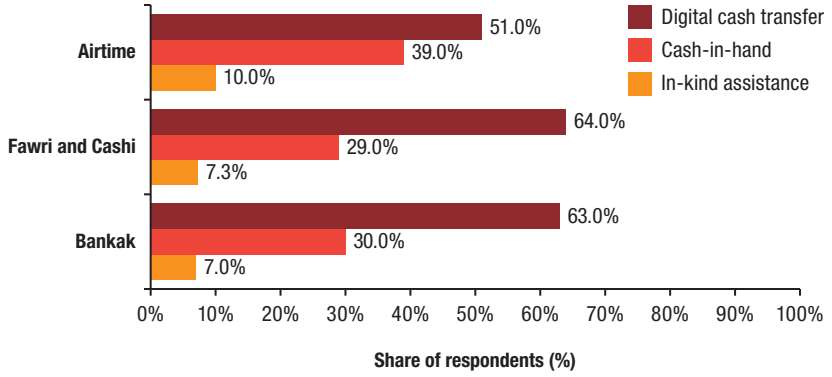
Access to digital financial services in Sudan was in a nascent stage prior to the outbreak of conflict. In 2014, only 15 percent of adults had bank accounts (Singer et al. 2014). In 2017, while more than 28 million people (approximately 66 percent of the population in 2018)[10] had mobile phones, only about 12 million had mobile internet (TPRA 2017). However, in more recent years, the Bank of Khartoum and its mobile banking app Bankak have become widespread, while Faisal Islamic Bank's Fawry mobile banking app has also shown some prevalence. Mobile money remains an underdeveloped tool in Sudan, despite the emergence of Cashi, a mobile money platform, albeit limited in reach and possibly not of interest to potential users. Interestingly, transfer of airtime followed by cashing out is also a popular means of money transfer. This approach to cash transfers has gained momentum amid the country's conflict and the challenges of internet coverage gaps[11] and banking connectivity.

In the survey, we asked respondents about their preferred digital payment method. Half of them (48 percent) chose Bankak, 44 percent chose airtime, and the remaining share chose either Fawry or Cashi. Most households who have bank accounts in their own names or in the name of friends or relatives chose Bankak. Figure 12.3 shows that households who have a mobile bank account or mobile money apps prefer digital cash transfers more often than unbanked households do. For example, 63 percent of respondents who have a Bankak account prefer digital transfers while the corresponding rate among those who opted for airtime transfers is 51 percent. Similarly, 39 percent of those who resorted to airtime transfers prefer cash compared with around 30 percent of banked households. In sum, cash-in-hand is more often preferred by unbanked households compared with households with bank accounts or mobile money accounts. This may be explained by accessibility to banking services and financial inclusion as well as transaction costs associated with the different modalities of transfers. For example, cashing out airtime transfers in Sudan involves some fees. Thus, in practice, the choice of modality affects the amount of the transfer received by beneficiary; for example, the use of airtime may be more costly due to transaction fees compared to mobile banking cash transfers, causing the transfer to lose value.

10 Calculation based on World Bank Data Portal estimates: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=SD

11 Preconflict data show that the mobile network coverage for Sudan for 2G, 3G, and 4G stand at 83, 46, and 12 percent, respectively (TPRA 2017).

FIGURE 12.3 Preference for assistance by preference for transfer modality



Source: Authors' calculations based on household phone survey data.

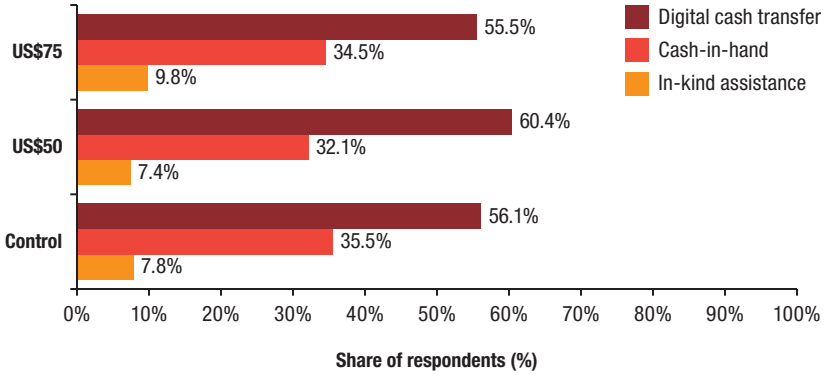
Beyond access to digital payment methods, exposure to digital transfers may also affect trust and preference for digital transfers over cash-in-hand or in-kind transfers.[12] To test this hypothesis, we relied on the random assignment of the digital transfer described above. Figure 12.4 shows that exposure to the digital transfer introduced as part of this project does not generate distinguishable impact on preference for digital transfers over cash or in-kind transfers.

As mentioned, the transaction costs associated with each of the delivery mechanisms is another factor that may shape respondents' preferences for different modalities. Armed conflicts can directly or indirectly increase these transaction costs for recipients of social assistance. Among those households randomly selected to receive the digital transfer, about one-quarter reported some costs paid to access the transfers. This varies across the different payment methods used, as shown in Figure 12.5. Among those receiving their transfer through Bankak, about 15 percent reported paying a portion of the transfer to access their money. This share increased to 35 percent for the airtime transfers.

Our results show that digital cash transfers entail non-uniform transaction fees, varying by digital modality (Bankak, Fawry, and Cashi,

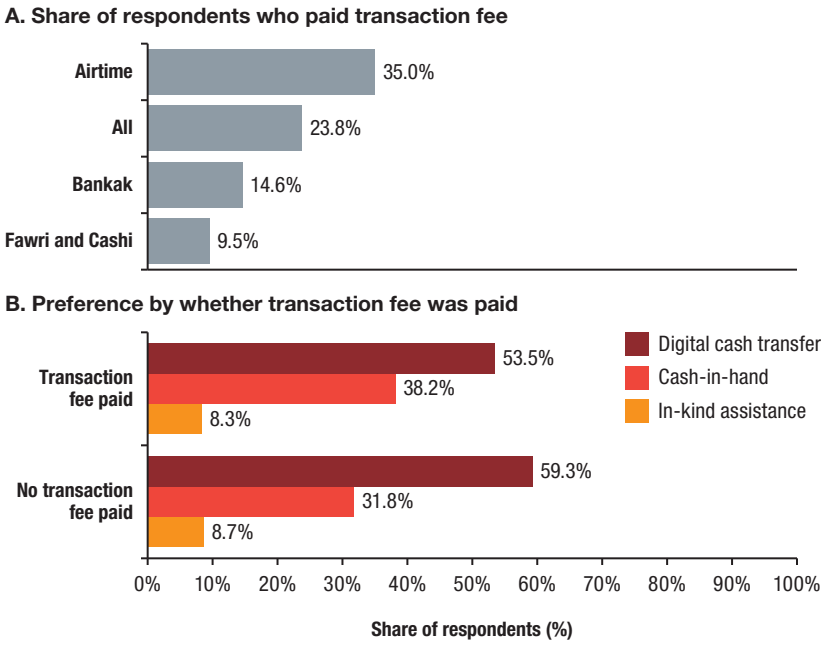
12 For example, in Egypt, exposure to randomly offered in-kind transfers shifted demand toward in-kind over cash transfers, especially among those households experiencing inflationary environments (Abay et al. 2023b).

FIGURE 12.4 Exposure to digital transfers by preference for transfer modality



Source: Authors' calculations based on household phone survey data.

FIGURE 12.5 Share of respondents who paid transaction fees, by transfer method and preference for transfer modality



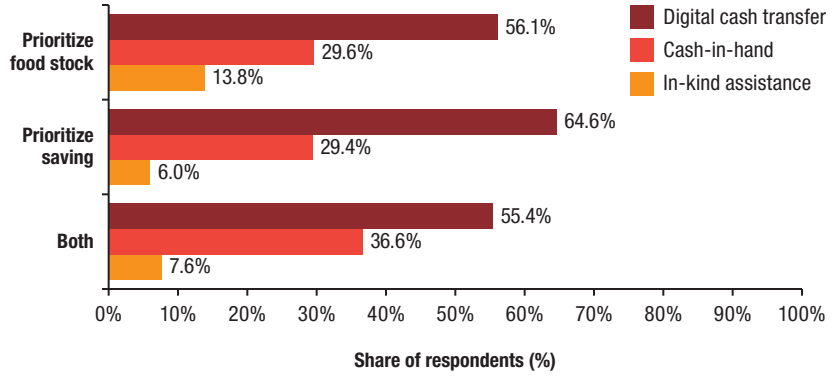
Source: Authors' calculations based on household phone survey data.

or airtime), which can affect the households' preference of modality. Households that reported no payment of transaction fees to receive transfers show strong preference for digital cash (59 percent) compared with cash-in-hand (32 percent) and in-kind (9 percent) (Figure 12.5, panel B). Households that paid transaction fees, despite their nonlinearity in amount of transaction cost paid, also prefer digital cash transfers (53 percent). This preference is likely related to the security situation and uncertainty about consistent receipt of cash or in-kind assistance. Among those who paid some transaction fees, 38 percent prefer cash-in-hand while the corresponding rate among those who did not pay such fees is 32 percent. However, the fact that more than half of those who paid transaction fees still prefer digital transfers implies that they are willing to pay to receive their transfers through digital means.

Urban households in Sudan, grappling with the adverse effects of conflict, have limited or no food stocks or cash savings, with 43 percent of households reporting no savings. The scarcity of food stocks and cash savings impacts households' preferences for the modality of assistance. As discussed, in-kind transfers can be inframarginal or extramarginal for households (Cunha 2014; Hidrobo et al. 2014; Hoddinott et al. 2018). For poorer households that rely heavily on humanitarian and social assistance, potential in-kind transfers (such as the type of cereals usually provided by humanitarian organizations in Sudan) are likely to be inframarginal.

To examine this hypothesis, we asked about respondents' immediate priorities and needs: food stocks, cash savings, or both. For those households targeting savings as an immediate priority, in-kind food transfers are likely to be extramarginal and can cause a distortionary consumption effect (that is, increasing consumption of the foods transferred compared with what households would purchase with cash) (Cunha 2014; Hoddinott et al. 2018). For these households, and following Southworth's theoretical model, digital and cash transfers afford them greater fungibility than in-kind transfers. Consistent with this hypothesis, the results in Figure 12.6 show that those respondents prioritizing savings over food consumption report higher demand for digital transfers (65 percent) than those prioritizing food stocks. Similarly, our results show that 14 percent of households that prioritize food stocks prefer in-kind assistance, compared with only 6 percent of households who prioritize cash savings (Figure 12.6). Thus, preference for in-kind assistance is correlated with preference for securing food stocks, which may reflect the lack of market access or inflated prices of commodities.

FIGURE 12.6 Priorities (savings and food stocks) by preference for transfer modality



Source: Authors' calculations based on household phone survey data.

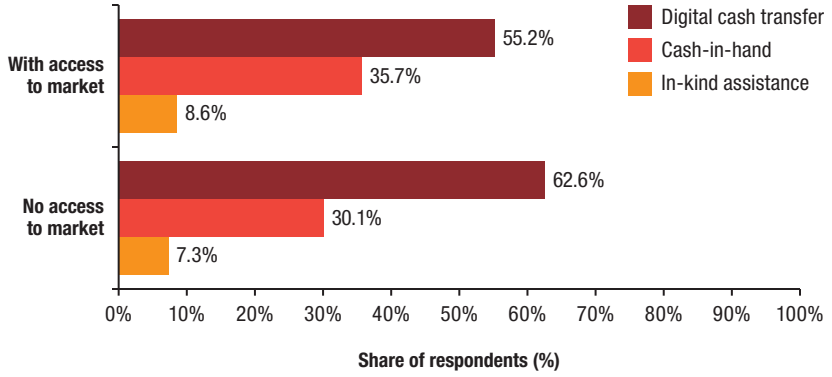
Market access, price information, and inflation

Access to markets and information about price dynamics can play an important role in shaping preferences for the modality of social assistance. Cash transfers may be preferred or effective in areas where markets are functioning and the commodity supply is not greatly constrained (Schwab 2020). However, inflation may shift preferences toward in-kind assistance (Hirvonen and Hoddinott 2021; Abay, Abdelfattah et al. 2023). Figure 12.7 shows that 63 percent of households that have no access to markets prefer digital cash transfers, compared to 55 percent among those with access to markets. Similarly, our results show that the preference for cash-in-hand is more common when market access is better. The preference for cash in well-functioning markets is consistent with previous evidence (Gentilini 2016), although large increases in prices of goods and services may reduce the purchasing power of cash transfers (Mercy Corps 2023). Inaccessibility of markets is likely to be correlated with insecurity, and thus higher demand for digital transfers can be expected in these contexts, as we discuss in the next subsection.

Armed conflict, insecurity, and preference for digital transfers

Armed conflict and associated insecurity present unique challenges for delivering humanitarian and social assistance. In situations of active conflict, potential beneficiaries may be inaccessible to humanitarian organizations and services, especially if they are in areas under the control of armed

FIGURE 12.7 Access to markets by preference for transfer modality

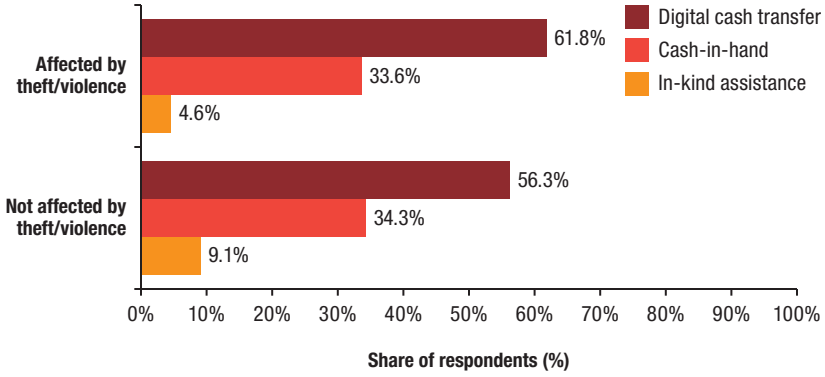


Source: Authors' calculations based on household phone survey data.

groups or when access routes and transportation infrastructure are not functioning. In these contexts, delivering humanitarian services through in-kind and cash-in-hand is not feasible, creating an urgent need for digital transfers. However, armed conflicts may also disrupt financial and banking systems and digital infrastructure (Idris 2024). Indeed, the armed conflict in Sudan has disrupted Sudan's banking system (Mercy Corps 2023) as well as regulatory mechanisms, which creates challenges for the delivery of digital and physical transfers. However, potential beneficiary households face some additional challenges that can shape their preference for cash, in-kind, or digital transfers. For example, the armed conflict in Sudan, like many such conflicts, is characterized by pervasive violence and vandalism and theft of assets and properties (Kirui et al. 2023; Amin 2023).

Given these insecurities and uncertainties, potential beneficiaries may prefer digital transfers over in-kind or cash transfers for two reasons. First, they are likely to understand that in-kind and physical cash transfers may not be feasible in their context and hence may not reach them. Second, even if they receive in-kind and cash transfers, such transfers may be vulnerable to theft and vandalism. To test these hypotheses, we asked about respondents' exposure to (1) street violence, theft, or robbery, (2) armed conflict associated with the recent SAF-RSF conflict, and (3) general insecurity associated with conflict. Figure 12.8 shows that those respondents experiencing street violence, theft, or robbery in the past two months were slightly more likely (5.5 percentage points higher) to prefer digital transfers than

FIGURE 12.8 Exposure to theft/violence by preference for transfer modality



Source: Authors' calculations based on household phone survey data.

those not experiencing such violence. In contrast, those who had not experienced such violence show relatively higher demand for in-kind transfers (4.5 percentage points).

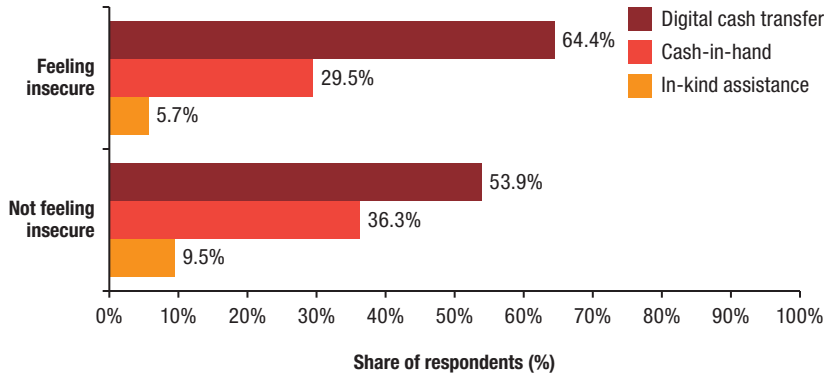
In Figure 12.9, we show similar patterns for respondents' exposure to general insecurity in the past two months. Among those households feeling insecure, 64 percent prefer to receive humanitarian and social assistance through digital transfers, while only about 6 percent prefer to receive social assistance in-kind. The corresponding shares among households not feeling insecure are 54 percent preferring digital transfers and 9.5 percent preferring in-kind transfers.

Finally, we asked about respondents' exposure to the SAF-RSF conflict and whether they had been affected by the ongoing conflict in the past two months. Consistent with the patterns shown in Figures 12.8 and 12.9, households affected by the SAF-RSF conflict exhibit slightly higher preference for digital transfers and lower preference for in-kind transfers. Overall, these findings clearly demonstrate that armed conflict and associated insecurity are likely to increase preference for digital transfers.

Trust in financial institutions and preference for digital transfers

Respondents' trust in financial institutions and actors involved in digital transfers can shape beneficiaries' preference for digital transfers over cash-in-hand or in-kind transfers. This influence is likely to be more pronounced in contexts such as Sudan, where overall trust in institutions remains low. Even

FIGURE 12.9 General insecurity by preference for transfer modalities

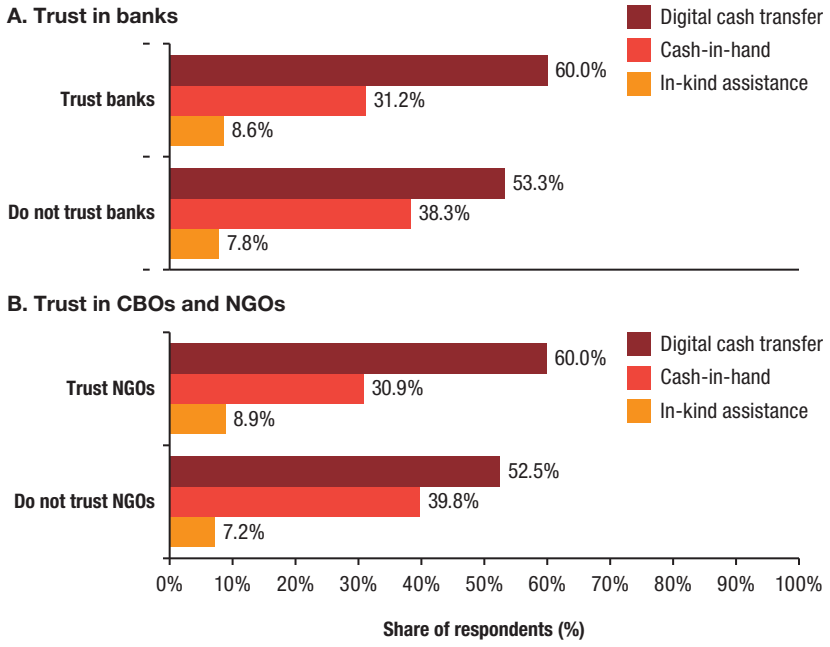


Source: Authors' calculations based on household phone survey data

in stable settings, trust in financial institutions and associated social capital is crucial for delivering financial services as well as for development of the financial sector (Guiso et al. 2004; Singer et al. 2014; van der Cruijsen et al. 2021). But trust in financial and other institutions evolves dynamically (Stevenson and Wolfers 2011) and tends to deteriorate in the aftermath of crises, including those triggered by armed conflict or financial or unemployment crises (Stevenson and Wolfers 2011; Guiso 2015; Sapienza and Zingales 2012; van der Cruijsen et al. 2021). Building on this literature, we assess whether respondents' trust in financial and other local institutions shaped their preference for digital transfers. We asked about respondents trust in financial institutions, particularly banks, CBOs, and NGOs, which are usually active in delivering humanitarian services.

Figure 12.10, panel A, shows that those respondents who trust banks are more likely to prefer digital transfers (60 percent) over cash transfers (31 percent). On the other hand, those respondents who lack trust are more likely to prefer cash-in-hand (38 percent) than are those who trust banks. Figure 12.10, panel B, shows similar patterns in relation to trust in CBOs and NGOs. These results are consistent with evidence from stable settings, where lack of trust in financial institutions is usually associated with preference for savings in cash outside of financial systems (Stix 2013; Singer et al. 2014; Shy 2023). These empirical patterns suggest that rebuilding trust in financial institutions and related local institutions involved with delivering digital transfers could improve adoption and willingness to use digital transfers.

FIGURE 12.10 Trust in banks and NGOs by preference for transfer modalities



Source: Authors' calculations based on household phone survey data.

Concluding remarks

The armed conflict in Sudan has dramatically increased demand for humanitarian and social assistance, while also complicating the delivery of assistance to vulnerable populations in areas under the control of warring armed groups. The large-scale disruption and destruction of infrastructure and associated inaccessibility of physical roads because of the ongoing armed conflict in Sudan necessitates unconventional methods to deliver social assistance. The advent of digital transfers and their potential to facilitate delivery of humanitarian services remains an active area of inquiry (Callen et al. 2025). With the objective of assessing the potential and feasibility of deploying digital transfers in conflict-affected settings, we examined beneficiaries' preference for alternative modalities of delivering social assistance. For this purpose, we surveyed potential beneficiaries about their preferences for in-kind, cash, and digital transfers. We administered a large CATI survey, focusing on urban households and covering more than 2,500 households across all the 18 states

in Sudan. These households face varying levels of insecurity and live in areas under the control of the two warring factions. Beyond eliciting preferences for different social assistance delivery modalities, we also explain these preferences empirically for different modalities. In particular, we examined whether and how households' exposure to armed conflict as well as respondents' trust in financial and local institutions shape their preference for digital transfers versus other modalities.

We find that about two-thirds of potential beneficiaries prefer digital transfers, while the remaining share prefers cash-in-hand or in-kind transfers. We show that access to markets and transaction costs associated with each type of transfer are important factors shaping preferences for different modalities. We also show that exposure to armed conflict, violence, and theft as well as resulting feelings of insecurity are significantly associated with higher demand for digital transfers over cash and in-kind transfers. Furthermore, trust in financial institutions, local CBOs, NGOs, and local government is strongly associated with preference for digital transfers.

Our findings offer important insights that can inform the design and delivery of humanitarian services in conflict-affected settings. The evidence that digital transfers are preferred in such settings, despite the challenges associated with delivering and regulating digital transfers in fragile settings, is worth noting. The fact that respondents experiencing some form of insecurity and violence prefer digital transfers strongly suggests that this mode of delivering social protection helps to reduce such insecurities and associated violence and theft. Finally, rebuilding trust in financial institutions and local institutions may facilitate the transition to digital ecosystems and platforms.

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