

Financial Inclusion, Humanitarian Coping Mechanisms, and the Realization of Socio-Economic Rights: Evidence from Household Welfare Vulnerability in Cameroon

Ofeh Evina Anchi^{1*} Fozoh Isiah Aziseh² Lawson Assagaya³

1. Faculty of Economics and Management Sciences, University of Bamenda, Bamili, Cameroon

2. African Youth Cooperation for Peace and Development (AYCPD), Yaounde Cameroon

3. United Nations Mission in South Sudan

* ofehevina12@gmail.com

Abstract

This study investigates the relationship between financial inclusion, humanitarian coping mechanisms, and the realization of socio-economic rights in conflict-affected Cameroon using the 2017 FinScope consumer survey. The data is estimated using OLS, logistic regression, propensity score matching, 2SLS, and Oaxaca-Blinder decomposition. This study demonstrates that digital financial inclusion through mobile money adoption significantly reduces household welfare vulnerability and strengthens resilience to economic shocks in Cameroon, lowering vulnerability by 21.5 percentage points, reducing education deprivation by 46.6%, and generating a 10.3% welfare advantage over non-adopters. Decomposition results confirm that adoption itself accounts for a substantial share of welfare gains beyond socio-demographic differences, while mobile money buffers the adverse effects of shocks in line with social protection and humanitarian-development nexus frameworks. Policy priorities should therefore guarantee that at least 90% of rural households have access to a mobile money agent within 2 kilometers, directly addressing infrastructural barriers to adoption. Complementary measures should expand nationwide network coverage to 95%, scale financial literacy to reach at least 75% of unbanked households annually. These structural reforms are essential for transforming digital finance from a market innovation into a legally grounded instrument for advancing SDGs 1, 2, and 10 in fragile and conflict-affected environments.

Keywords: Financial Inclusion, Humanitarian Coping Mechanisms, Socio-Economic Rights, Household Welfare Vulnerability

DOI: 10.7176/RHSS/16-1-09

Publication date: April 28th 2026

1. Introduction

Human rights are no longer interpreted solely as civil and political entitlements but increasingly encompass socio-economic rights, including the rights to food, health, education, and an adequate standard of living (UN, 2015). Yet, for millions of households in Sub-Saharan Africa, structural vulnerabilities rooted in poverty, conflict, and systemic exclusion undermine the realization of these rights (World Bank, 2024). In Cameroon, persistent poverty and internal crises in the North-West, South-West, and Far North regions have deepened household welfare deficits and increased reliance on humanitarian assistance. According to the World Food Programme, approximately 2.9 million people require urgent humanitarian support, while nearly 2.2 million are forcibly displaced as internally displaced persons (IDPs) or refugees—a situation that has eroded basic livelihoods and access to essential services, including food and health care.

Over the past decade, humanitarian and development actors have increasingly turned to digital financial services particularly mobile money as instruments for poverty reduction, food security, and inclusive growth in fragile and conflict-affected contexts. Globally, an estimated 1.4 billion adults remain unbanked, with the majority residing in low- and lower-middle-income countries (World Bank, 2022). At the same time, mobile phone penetration has expanded rapidly across Sub-Saharan Africa, creating new pathways for financial inclusion through mobile money platforms. According to the GSMA (2023), Sub-Saharan Africa accounts for over half of the world's mobile money accounts, with more than 800 million registered accounts and over USD 800 billion in annual transaction value. These developments have transformed the architecture of humanitarian assistance, as

digital cash transfers delivered through mobile money are increasingly preferred over in-kind aid due to their efficiency, transparency, and beneficiary autonomy (Aker, 2017; Bastagli et al., 2019).

Humanitarian cash transfers have grown substantially in recent years. The Cash Learning Partnership (CALP, 2023) reports that cash and voucher assistance now represents approximately 20 percent of global humanitarian aid spending compared to less than 6 percent in 2010. Evidence suggests that cash-based interventions can improve household food consumption, asset protection, and resilience outcomes, particularly when delivered through secure and accessible digital platforms (Gentilini, 2022; Hidrobo et al., 2020). In conflict-affected regions, where markets often remain partially functional despite insecurity, mobile-enabled cash transfers provide flexibility and dignity to beneficiaries while reducing logistical costs and leakage (Blumenstock et al., 2018).

The relevance of mobile money is particularly pronounced in fragile states. The World Bank (2023) estimates that nearly 40 percent of the world's extreme poor now live in fragile and conflict-affected settings. In such environments, traditional banking infrastructure is frequently limited or disrupted, whereas mobile network coverage often persists. Empirical studies demonstrate that access to mobile money enhances households' ability to receive remittances, smooth consumption shocks, and rebuild livelihoods during crises (Jack and Suri, 2014; Riley, 2018). In conflict contexts, digital financial services can also mitigate risks associated with physical cash handling and improve traceability for humanitarian agencies (GSMA, 2022).

However, the rapid digitization of humanitarian assistance also raises important concerns regarding targeting effectiveness, exclusion errors, digital literacy gaps, and rights-based access to essential services. Research indicates that vulnerable groups including women, rural residents, displaced populations, and persons with low literacy are disproportionately excluded from digital financial ecosystems (Demirgüç-Kunt et al., 2022; Oxfam, 2023). In many conflict-affected areas, SIM registration requirements, identification barriers, and network disruptions can further marginalize already vulnerable households. As a result, while mobile money expansion holds transformative potential, its equitable deployment remains uneven and context-dependent.

These dynamics intersect directly with the global commitment to the 2030 Agenda for Sustainable Development. Sustainable Development Goal (SDG) 1 seeks to eradicate extreme poverty for all people everywhere, yet the United Nations (2023) estimates that approximately 700 million people still live in extreme poverty, with progress stalled or reversed in conflict-affected countries. SDG 2 aims to end hunger and achieve food security, but recent data show that up to 735 million people faced chronic hunger in 2022, with conflict identified as a primary driver (FAO et al., 2023). SDG 10 calls for reducing inequalities within and among countries, emphasizing inclusive economic participation and equal access to resources. Digital financial inclusion, when designed and implemented equitably, offers a mechanism to advance these interconnected goals by expanding access to financial services, improving social protection delivery, and enhancing economic resilience (UNDP, 2022).

The significance of this study lies in its contribution to strengthening the targeting of humanitarian cash transfers by providing evidence on the socio-economic drivers and barriers to mobile money adoption in fragile contexts, thereby informing more inclusive beneficiary identification and delivery systems (Bastagli et al., 2019; Gentilini, 2022). Examining mobile money expansion in conflict regions, the study advances understanding of how digital financial services can be leveraged to improve efficiency, transparency, and resilience while mitigating exclusion risks (GSMA, 2023; World Bank, 2023). Grounded in a rights-based development programming framework, the research underscores the obligation of states and humanitarian actors to ensure equitable access to financial services and social protection mechanisms, particularly for marginalized populations (UNDP, 2022; Oxfam, 2023). In doing so, the study directly contributes to the achievement of SDG 1 (No Poverty) by enhancing the effectiveness of poverty-targeted transfers; SDG 2 (Zero Hunger) by strengthening food security through reliable and timely cash assistance; and SDG 10 (Reduced Inequalities) by identifying pathways to close digital and financial inclusion gaps in conflict-affected settings (United Nations, 2023; FAO et al., 2023).

2. Literature Review

2.1 Theoretical Framework: A Human Rights Law Perspective

This study is grounded in international human rights law, which provides a normative and legal framework for assessing the design, targeting, and delivery of humanitarian cash transfers and digital financial services. A rights-based approach to development conceptualizes poverty not merely as income deprivation but as a denial of fundamental human rights and entitlements. As articulated by the United Nations (UN, 1948), the Universal

Declaration of Human Rights establishes that all human beings are entitled to dignity, equality, and social protection. Article 25 specifically affirms the right to an adequate standard of living, including food, housing, and social security rights that are directly implicated in humanitarian cash assistance and food security programming.

The binding legal foundation for socio-economic rights is further elaborated in the International Covenant on Economic, Social and Cultural Rights (ICESCR). Articles 9 and 11 recognize the right to social security and the right to an adequate standard of living, including adequate food. According to the United Nations Committee on Economic, Social and Cultural Rights (CESCR, 1999; 2008), states have core obligations to ensure minimum essential levels of these rights, even in contexts of resource constraints and conflict. Humanitarian cash transfers, particularly when delivered efficiently and equitably, can therefore be interpreted as instruments through which states and humanitarian actors operationalize minimum core obligations related to poverty alleviation and food security.

The principle of non-discrimination is central to this theoretical framework. Article 2(2) of the ICESCR prohibits discrimination on grounds such as sex, ethnicity, social origin, or other status. In fragile and conflict-affected settings, digital exclusion stemming from lack of identification, SIM registration barriers, gender gaps in phone ownership, or limited digital literacy may result in indirect discrimination if vulnerable populations are systematically excluded from mobile money-based cash transfers. General Comment No. 20 of the CESCR (2009) emphasizes that states must take deliberate, targeted measures to eliminate both direct and indirect discrimination in access to social protection systems. Thus, the expansion of mobile money as a delivery mechanism must be evaluated not only in terms of efficiency but also in terms of equality and substantive access.

The right to food, as elaborated in General Comment No. 12 of the CESCR (1999), requires that food be available, accessible, and adequate. Accessibility includes both economic and physical dimensions. In conflict regions where markets may function but household purchasing power collapses, cash transfers delivered via mobile money can enhance economic access to food, aligning with rights-based obligations. However, if mobile money systems exclude displaced persons, rural women, or those without formal identification, the accessibility criterion may be compromised. A human rights lens therefore demands scrutiny of targeting methodologies, grievance redress mechanisms, and participation processes in humanitarian programming.

Participation and accountability are additional core principles of a rights-based approach. The United Nations Development Programme (UNDP, 2006; 2022) emphasizes that beneficiaries of development and humanitarian interventions are rights-holders, not passive recipients. This reframes humanitarian cash transfers as entitlements linked to social protection floors rather than discretionary aid. The International Labour Organization (ILO, 2012) Social Protection Floors Recommendation (No. 202) further underscores that states should guarantee at least basic income security and access to essential goods and services throughout the life cycle. Mobile money platforms, when integrated into national social protection systems, can support the realization of these guarantees, provided safeguards ensure accessibility, privacy, and non-exclusion.

In addition, the right to equality intersects with digital financial inclusion through emerging norms related to digital rights and data protection. While not codified in a single treaty, the human rights framework increasingly recognizes that digital technologies must align with privacy rights under Article 17 of the International Covenant on Civil and Political Rights (ICCPR). The digitization of humanitarian transfers generates data trails that, if inadequately protected, may expose beneficiaries in conflict zones to surveillance or targeting risks. A human rights-based theoretical framework thus requires balancing efficiency gains from digitalization with safeguards for privacy, consent, and data security.

From a theoretical standpoint, this study adopts the tripartite typology of state obligations: the duties to respect, protect, and fulfill human rights (Shue, 1980; CESCR, 1999). The obligation to respect requires that states refrain from actions that interfere with access to social protection or digital financial services. The obligation to protect mandates regulation of private mobile network operators and financial service providers to prevent exclusionary practices or exploitation. The obligation to fulfill entails proactive measures legislative, administrative, and budgetary to ensure inclusive access to social protection mechanisms, including digital cash transfers. In conflict-affected settings, where state capacity may be weakened, humanitarian actors share complementary responsibilities to align interventions with international human rights standards.

This theoretical framework situates humanitarian cash transfers and mobile money expansion within the broader normative architecture of the 2030 Agenda for Sustainable Development. Although the Sustainable Development Goals are not legally binding treaties, they are grounded in human rights principles and explicitly reference the

realization of economic and social rights. Achieving SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 10 (Reduced Inequalities) is therefore inseparable from ensuring equitable access to social protection systems and financial services.

2.2 Empirical review

Seminal contributions in development economics established the theoretical justification for cash transfers as instruments of poverty reduction and welfare enhancement. Early welfare economics frameworks emphasized income redistribution as a means of improving social welfare under conditions of inequality (Atkinson, 1970; Sen, 1981). Amartya Sen's entitlement approach reframed hunger and poverty not as failures of food supply, but as failures of access and purchasing power, thereby providing a normative foundation for income-based interventions. This perspective underpins contemporary humanitarian cash assistance, which seeks to enhance households' command over resources rather than directly supplying goods.

Empirically, randomized evaluations of conditional and unconditional cash transfer programs in Latin America and South Asia demonstrated significant impacts on consumption smoothing, school attendance, and health outcomes (Fiszbein & Schady, 2009; Banerjee et al., 2017). Subsequent global reviews confirmed that cash transfers often produce positive effects on food security and poverty reduction without generating substantial dependency effects (Bastagli et al., 2019; Gentilini, 2022). These studies firmly established cash transfers as evidence-based tools within social protection systems. However, foundational literature largely examined stable, non-conflict contexts and often relied on traditional banking channels or manual disbursement mechanisms. Less attention was given to the implications of digital delivery systems, particularly in fragile settings where institutional capacity is constrained. Moreover, while welfare impacts were documented, limited focus was placed on targeting efficiency and inclusion errors in highly unequal or conflict-affected environments. This creates a conceptual and empirical gap that becomes more pronounced with the rise of digital humanitarianism.

A second strand of literature focuses on financial inclusion and the transformative role of mobile money. The expansion of mobile money in Sub-Saharan Africa, particularly following the launch of M-Pesa in Kenya, generated a rich body of empirical research. Jack and Suri (2014) demonstrated that access to mobile money improved households' ability to smooth consumption in response to shocks. Suri and Jack (2016) further showed that mobile money adoption lifted an estimated 2 percent of Kenyan households out of extreme poverty by facilitating remittances and occupational shifts.

Blumenstock et al. (2018) found that mobile-based transfers during crises enhanced speed and reduced leakage compared to traditional mechanisms. Aker et al. (2016) showed that mobile cash transfers in Niger improved food security outcomes relative to physical cash distribution. These contributions highlighted the efficiency, transparency, and resilience-enhancing potential of digital financial services. Yet, global financial inclusion literature often assumes relatively high baseline levels of mobile penetration and regulatory stability. Studies typically focus on adoption determinants income, education, gender, and urban residence without fully exploring structural barriers in conflict zones, such as displacement, SIM registration constraints, or network disruptions. Furthermore, the intersection between mobile money expansion and humanitarian targeting remains underexplored. While adoption improves welfare in general populations, less is known about whether the poorest and most vulnerable are systematically included in digital cash ecosystems.

A growing body of literature examines cash-based interventions in fragile contexts. The Cash Learning Partnership (CALP, 2023) documents the rapid scale-up of cash and voucher assistance, now representing approximately one-fifth of global humanitarian aid. Studies in conflict-affected regions show that cash transfers can stabilize consumption, protect productive assets, and reduce negative coping strategies (Hidrobo et al., 2020; World Bank, 2023). In Sub-Saharan Africa, humanitarian cash programming has expanded in contexts affected by protracted conflict, including the Sahel, the Horn of Africa, and Central Africa. Research by the World Food Programme (2022) indicates that digital transfers improve timeliness and reduce administrative costs, particularly where mobile infrastructure exists. Similarly, the GSMA (2023) reports that mobile money ecosystems are increasingly leveraged to deliver social assistance and emergency relief in fragile states. Despite these advances, the literature identifies risks of digital exclusion. Demirgüç-Kunt et al. (2022) note persistent gender and rural-urban gaps in mobile account ownership across Sub-Saharan Africa. Oxfam (2023) argues that digital identification requirements and limited literacy may exclude displaced or marginalized populations from mobile-enabled assistance. Empirical assessments rarely do not disaggregate targeting performance by socio-economic vulnerability within conflict settings, nor do they systematically evaluate rights-based implications. Thus, while existing literature establishes the operational benefits of digital cash transfers, it leaves unresolved

whether these systems effectively reach the extreme poor in conflict-affected areas or whether they inadvertently reproduce structural inequalities.

In Africa, mobile money has become a central pillar of financial inclusion strategies. According to the World Bank (2022), Sub-Saharan Africa accounts for the highest share of mobile money usage globally. Studies from Kenya, Uganda, Ghana, and Tanzania consistently show positive associations between mobile money adoption and poverty reduction, improved resilience to shocks, and enhanced remittance flows (Riley, 2018; Munyegera and Matsumoto, 2016). In Central Africa and particularly Cameroon, financial inclusion remains uneven despite expanding mobile penetration. Data from the FinScope Consumer Survey (2017) and subsequent World Bank reports indicate substantial disparities in access between urban and rural populations, as well as gender gaps in account ownership.

Three major gaps emerge from the literature. First, foundational cash transfer studies largely overlook digital delivery mechanisms in fragile contexts. Second, mobile money research emphasizes welfare impacts but insufficiently examines targeting efficiency and inclusion errors among the poorest and most conflict-affected populations. Third, African and country-specific studies provide descriptive or adoption-focused analyses but rarely integrate humanitarian programming objectives or human rights considerations. This study seeks to close these gaps by empirically analyzing the socio-economic and demographic determinants of mobile money adoption in a conflict-affected African context and examining their implications for the targeting of humanitarian cash transfers. Linking financial inclusion data with poverty and vulnerability indicators, the study evaluates whether digital expansion aligns with equity and rights-based principles. In doing so, it bridges the divide between technological innovation and humanitarian effectiveness, offering evidence-based insights for improving cash transfer targeting, strengthening inclusive mobile money ecosystems, and advancing poverty reduction and inequality objectives in fragile settings.

3. Methodology

3.1 Empirical model specification

Based on studies highlighting the role of financial inclusion in enhancing household welfare and resilience (Karlan et al., 2014; Mbiti & Weil, 2016) and drawing on the Capability Approach, which emphasizes households' agency in achieving well-being (Sen, 1999), the following baseline model is specified to relate mobile money adoption, shock exposure, and household characteristics to welfare vulnerability:

$$welfare_index_i = \beta_0 + \beta_1 MOMO_adoption_i + \beta_2 shock_exposure_i + \beta_3 X_i + \epsilon_i$$

In line with coping theory, which posits that households adopt financial tools to manage risk (Dercon, 2004), and literature on selection bias in adoption studies (Austin, 2011), the following model captures the counterfactual effect of mobile money adoption on welfare vulnerability by comparing adopters and matched non-adopters:

$$ATE = E[welfare_index_i | MOMO_adoption_i = 1, matched\ covariates] - E[welfare_index_i | MOMO_adoption_i = 0, matched\ covariates]$$

Where *ATE* is the Average Treatment Effect on the Treated

Considering endogeneity concerns arising from the possibility that unobserved factors influence both adoption and welfare (Angrist & Pischke, 2009), and acknowledging the importance of physical and digital infrastructure as instruments (Mbiti & Weil, 2016), the causal relationship between adoption and welfare vulnerability is specified using instrumental variables:

$$Stage\ 1: MOMO_adoption_i = \pi_0 + \pi_1 distance_agent_i + \pi_2 network_coverage_i + \pi_3 X_i + v_i$$

$$Stage\ 2: welfare_index_i = \beta_0 + \beta_1 MOMO_adoption_i + \beta_2 shock_exposure_i + \beta_3 X_i + \epsilon_i$$

$$Stage\ 1: MOMO_adoption_i = \pi_0 + \pi_1 distance_agent_i + \pi_2 network_coverage_i + \pi_3 X_i + v_i$$

X = age, sex, education, employment, household size, rural/urban.

Table 1: Summary of Variables, Construction, Measurement and Empirical Sources

Variable Name	Type	Construction in Study	What It Measures	Empirical/Theoretical Source
Mobile Money Adoption	Binary (0/1)	=1 if respondent reports owning or actively using a mobile money account; 0 otherwise	Financial Inclusion: access to digital financial services that facilitate economic empowerment, household resilience, and participation in humanitarian cash transfers	Jack & Suri (2014); Suri & Jack (2016); Demirgüç-Kunt et al. (2022); GSMA (2023)
Food Security Index	Continuous (count index of food items consumed)	Sum of household consumption of main food groups (cereals, proteins, vegetables, fruits, dairy) within recall period; 0 if “Rarely” or “Never” consumed; DK excluded	Humanitarian Coping Mechanisms & Socio-Economic Rights: ability to meet basic nutritional needs, reflecting food access and household resilience under economic shocks	FAO et al. (2023); Hidrobo et al. (2020); World Food Programme (2022)
Health Deprivation	Binary (0/1)	=1 if respondent missed medical treatment or medication due to lack of money (Often or Sometimes); 0 if Rarely or Never; Don’t Know / Not Concerned excluded	Realization of Socio-Economic Rights: ability to access essential healthcare, reflecting financial barriers to the right to health	CESCR General Comment No. 14 (2000); Sen (1981); World Bank (2023)
Education Deprivation	Binary (0/1)	=1 if household could not afford school fees or related education costs; 0 otherwise	Realization of Socio-Economic Rights: access to education as a human right, reflecting deprivation in human capital accumulation	Fiszbein & Schady (2009); Alkire & Foster (2011); UNESCO (2022)
Income Shock	Binary (0/1)	=1 if household experienced job loss, business closure, or significant income decline in the recall period; 0 otherwise	Humanitarian Coping Mechanisms: exposure to economic shocks that threaten household welfare and necessitate coping strategies	Dercon (2002); Jack & Suri (2014); World Bank (2023)
Difficulty Meeting Basic Needs	Binary (0/1)	=1 if respondent reports difficulty meeting essential household needs; 0 otherwise	Humanitarian Coping Mechanisms & Socio-Economic Rights: reflects household economic stress and the ability to secure basic rights like food, health, and education	Ravallion (2016); Gentilini (2022)
Welfare vulnerability (Composite)	Continuous (standardized index)	Standardized combination of Food Insecurity Index, Health Deprivation, Education Deprivation, Income Shock, and Difficulty Meeting Basic	Captures multidimensional household welfare vulnerability, resilience, and deprivation	Alkire & Foster (2011); Bastagli et al. (2019); UNDP (2022)

		Needs		
Gender	Binary	=1 if female-headed household; 0 if male-headed	Identifies gender disparities in access to financial services and social protection	Demirgüç-Kunt et al. (2022); Oxfam (2023)
Education Level	Ordinal	Years of schooling or categorical education level	Human capital determining ability to adopt mobile money and cope with economic shocks	Suri & Jack (2016); Riley (2018)
Residence (Urban/Rural)	Binary	=1 urban; 0 rural	Geographic disparities in access to financial services, markets, and humanitarian support	World Bank (2022); GSMA (2023)
Age	Continuous	Respondent age in years	Lifecycle variations in adoption of mobile money and household resilience	Demirgüç-Kunt et al. (2022)

Source: Authors' findings and assembling

3.2 Data description

The 2017 FinScope Consumer Survey is a demand-side research tool developed by FinMark Trust (FMT), in partnership with the United Nations Capital Development Fund (UNCDF), and the National Institute of Statistics (INS). The objective of this data was to measure the levels of financial access, usage, and behavior among adults in various developing countries. The survey provides nationally representative data used to understand how individuals manage their financial lives and to identify constraints to financial inclusion. In 2017, significant surveys were conducted in countries such as Cameroon and Tanzania, often in partnership with local authorities. This survey still finds itself however valid for this study given that the growth rate for Cameroon since 2017 has been fluctuating, punctuated by different crises like the COVID-19, the North and South West sociopolitical crises, the Boko Haram insurgencies in the North of the Country, price shocks and climate changes, thus exhibiting the same characteristics though with a relatively increasing population. The data description presented on table 2 reveals that welfare vulnerability has a mean close to zero (0.0002) with a standard deviation of 0.479, indicating variation in household well-being across the sample, ranging from -1.325 to 2.058. Mobile money adoption is 37.5 percent, showing moderate uptake among households, while formal financial access is limited at 16 percent. Households experience an average of 12.98 shock events, with some reporting as many as 36, highlighting exposure to economic and environmental risks. The coping index averages 3.78 out of 8, suggesting households employ multiple strategies to manage these shocks. Social capital is relatively low at 0.172, while the average distance to a mobile money agent is 4.11 kilometers and network coverage is 23.5 percent, indicating challenges in accessing financial services and social support networks that could help households respond to shocks.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Welfare vulnerability	6826	.000185	.479	-1.325	2.058
MOMO Adoption (0 if otherwise)	6826	.375	.484	0	1
Formal financial access (0 if otherwise)	6826	.16	.366	0	1
Shock exposure	6826	12.981	11.671	0	36
Coping index	6826	3.777	2.916	0	8
Social capital	4665	.172	.114	0	1
Distance to agent	6826	4.106	3.113	0	8
Network coverage	6826	.235	.424	0	1
Age	6826	36.503	16.347	15	95
Male (0 if female)	6826	.487	.5	0	1
Primary education (0 if otherwise)	5293	.363	.481	0	1
Secondary education (0 if otherwise)	6826	.402	.49	0	1
Higher education (0 if otherwise)	6826	.091	.288	0	1
Employed (0 if unemployed)	6826	.671	.47	0	1
Household size	6825	4.634	3.156	1	30
Urban (0 if rural)	6826	.454	.498	0	1

Source: Authors' Computation

For the control variables, the average age of respondents is 36.5 years, with 48.7 percent male. Educational attainment shows 36.3 percent have primary education, 40.2 percent secondary education, and 9.1 percent higher education. Most households are employed (67.1 percent), and the average household size is 4.63 members. Approximately 45.4 percent of households live in urban areas, suggesting a balanced urban-rural distribution.

3.3 Estimation strategy

The study employs a combination of estimation techniques to rigorously analyze the effects of mobile money adoption on household welfare vulnerability and socio-economic rights in Cameroon, addressing both observable and unobservable sources of bias. Ordinary Least Squares (OLS) regression is initially used to estimate the baseline relationships between welfare vulnerability, mobile money adoption, shock exposure, and control variables, providing a straightforward measure of association while accounting for socio-demographic characteristics (Wooldridge, 2015). To address potential selection bias due to non-random adoption of mobile money, Propensity Score Matching (PSM) is employed, estimating the Average Treatment Effect on the Treated (ATET) by comparing adopters with non-adopters who have similar observable characteristics (Rosenbaum & Rubin, 1983). Logistic regression is used to model determinants of mobile money adoption, identifying key socio-economic and infrastructural factors influencing uptake, and serving as a first-stage model for instrumental variable estimation (Gujarati & Porter, 2021). To account for endogeneity arising from reverse causality where households with lower vulnerability may be more likely to adopt mobile money, Two-Stage Least Squares (2SLS) instrumental variable regression is implemented using strong and theoretically justified instruments, namely distance to agent and network coverage, which are correlated with adoption but exogenous to welfare vulnerability (Angrist & Pischke, 2009). Finally, Oaxaca-Blinder decomposition is applied to disentangle the

welfare gap between adopters and non-adopters into components due to household characteristics (endowments), coefficients, and interaction effects, quantifying the extent to which adoption itself drives improvements in welfare outcomes (Oaxaca, 1973; Blinder, 1973).

4. Empirical Findings and Discussions

Table 3 shows that household adoption of mobile money (MOMO) is positively influenced by shock exposure, formal financial access, employment, male gender, and urban residence. Specifically, shock exposure increases the odds of adopting mobile money by 1.5% (odd ratio = 1.015, $p < 0.01$), while formal financial access more than doubles the likelihood of adoption (odd ratio = 2.247, $p < 0.01$). Employment status also significantly increases adoption (odd ratio = 1.367, $p < 0.01$), and urban households are more than three times as likely to adopt mobile money compared to rural ones (odd ratio = 3.437, $p < 0.01$). These results support coping theory, which suggests that households adopt financial tools in response to risk (Dercon, 2004), and align with empirical studies in Africa showing urban and employed households are more likely to adopt digital financial tools (Mbiti & Weil, 2016). This evidence connects directly to SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure).

Table 3: Determinants of digital financial inclusion in Cameroon (Logistic regression)

VARIABLES	(1)	(2)
	Coef	MOMO Adoption odd ratios
Shock exposure	0.0148*** (0.00328)	1.015*** (0.00333)
Formal financial access	0.809*** (0.0956)	2.247*** (0.215)
Social capital	-0.348 (0.329)	0.706 (0.232)
Age	-0.0162*** (0.00291)	0.984*** (0.00286)
Male	0.141* (0.0767)	1.152* (0.0884)
Primary	-0.489 (1.649)	0.613 (1.011)
Secondary	0.352 (1.649)	1.421 (2.344)
Higher	1.569 (1.654)	4.804 (7.946)
Employed	0.313*** (0.0915)	1.367*** (0.125)
Household size	-0.0336** (0.0131)	0.967** (0.0127)
Urban	1.235*** (0.0770)	3.437*** (0.265)
Constant	-0.891 (1.657)	0.410 (0.679)
Observations	3,809	3,809
r ² _p	0.193	0.193
chi ²	1016***	1016***

Standard errors in parentheses
 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Authors' Computation

Table 4 indicates that MOMO adoption reduces the likelihood of experiencing socio-economic rights violations. For instance, adoption reduces the probability of food insecurity by 12.1% (odd ratio = 0.879, $p < 0.1$), health deprivation by 15.7% (odd ratio = 0.843, $p < 0.05$), and education deprivation by 46.6% (odd ratio = 0.534,

$p < 0.01$). Conversely, shock exposure increases the risk of violations (OR = 1.025 for food insecurity, $p < 0.01$). Coping index effects are smaller but significant for education deprivation (odd ratio = 1.034, $p < 0.05$). These results align with the Capability Approach (Sen, 1999) and humanitarian-development nexus frameworks (Chambers, 1983), highlighting that financial inclusion enables households to maintain access to basic rights during shocks. This supports SDG 2 (Zero Hunger), SDG 3 (Good Health), and SDG 4 (Quality Education).

Table 4: Financial inclusion and human right violation in Cameroon ((Logistic regression)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Food insecurity (Right to food violation)		Health deprivation (Right to health violation)		Education deprivation (Right to education violation)	
	Coef	Odd ratio	Coef	Odd ratio	Coef	Odd ratio
MOMO adoption	-0.129* (0.0738)	0.879* (0.0648)	-0.171** (0.0667)	0.843** (0.0562)	-0.416*** (0.0841)	0.534*** (0.0406)
Shock exposure	0.0248*** (0.00283)	1.025*** (0.00290)	0.0215*** (0.00253)	1.022*** (0.00258)	0.0180*** (0.00322)	1.021*** (0.00283)
Coping index	-0.00817 (0.0136)	0.992 (0.0135)	0.0189 (0.0123)	1.019 (0.0125)	0.0285* (0.0157)	1.034** (0.0145)
Age	0.000576 (0.00237)	1.001 (0.00237)	0.0111*** (0.00215)	1.011*** (0.00218)	0.0122*** (0.00265)	1.013*** (0.00203)
Male	-0.129** (0.0653)	0.879** (0.0574)	0.0649 (0.0593)	1.067 (0.0633)	0.0559 (0.0734)	1.055 (0.0672)
Primary	-0.918 (1.417)	0.399 (0.566)	-0.0602 (1.442)	0.942 (1.358)		
Secondary	-0.905 (1.417)	0.404 (0.573)	-0.204 (1.442)	0.816 (1.176)		
Higher	-1.497 (1.421)	0.224 (0.318)	-0.997 (1.445)	0.369 (0.533)		
Employed	-0.148** (0.0728)	0.862** (0.0627)	-0.255*** (0.0670)	0.775*** (0.0519)	-0.202** (0.0841)	0.816*** (0.0564)
Household size	0.0215* (0.0110)	1.022* (0.0112)	0.0250** (0.0101)	1.025** (0.0104)	0.0563*** (0.0121)	1.060*** (0.0106)
Urban	0.120 (0.0796)	1.128 (0.0897)	-0.169** (0.0716)	0.845** (0.0605)	0.103 (0.0892)	1.047 (0.0823)
Constant	-0.379 (1.423)	0.685 (0.975)	-0.714 (1.447)	0.490 (0.709)	-13.27 (415.8)	0.163*** (0.0230)
Observations	5,292	5,292	5,262	5,262	4,136	5,286
r2_p	0.0230	0.0230	0.0453	0.0453	0.0441	0.0437
chi2	137.8***	137.8***	321.1***	321.1***	210.6***	278.0***

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Authors' Computation

Table 5 below shows that MOMO adoption significantly lowers overall welfare vulnerability. In the baseline model, adoption reduces welfare vulnerability by 6.7% ($\beta = -0.067$, $p < 0.01$), and in the shock-mitigation model, it reduces vulnerability by 3.8% ($\beta = -0.0376$, $p < 0.1$) when interacting with shocks. Shock exposure, in contrast, increases vulnerability by 0.37–0.37% per unit increase ($\beta = 0.00366$, $p < 0.01$). Employment and household size are also significant; for example, each additional household member increases vulnerability by 0.7% ($\beta = 0.00716$, $p < 0.01$). These results empirically support the buffering role of financial inclusion against shocks, consistent with social protection literature (Karlan et al., 2014). This also reflects SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities).

Table 5: OLS estimates of financial inclusion and human right violation (Composite Welfare Vulnerability Index)

VARIABLES	(1)	(2)
	Baseline model Welfare vulnerability	Shock-mitigation model Welfare vulnerability
MOMO adoption	-0.0670*** (0.0148)	-0.0376* (0.0204)
Shock exposure	0.00259*** (0.000553)	0.00366*** (0.000753)
Coping index	0.000191 (0.00270)	0.000251 (0.00270)
Age	0.00175*** (0.000481)	0.00173*** (0.000481)
Male	-0.00121 (0.0131)	-0.00102 (0.0131)
Primary	0.358 (0.328)	0.358 (0.328)
Secondary	0.361 (0.328)	0.360 (0.328)
Higher	0.205 (0.329)	0.203 (0.328)
Employed	-0.0511*** (0.0147)	-0.0510*** (0.0147)
Household size	0.00719*** (0.00225)	0.00716*** (0.00225)
Urban	0.0116 (0.0159)	0.0123 (0.0159)
Shock *MOMO adoption Exposure		-0.00226** (0.00109)
Constant	-0.427 (0.329)	-0.439 (0.329)
Observations	5,292	5,292
R2 adjusted	0.0324	0.0330
F	17.10***	16.05***

Source: Authors' Computation

Table 6 illustrates that households with access to mobile money rely less on informal coping strategies. MOMO adoption reduces the coping index by 0.856 units ($p < 0.01$), whereas shock exposure increases it by 0.009 units ($p < 0.01$). Household size and urban residence also show large effects, with urban households having 2.63 lower coping index points than rural ones ($p < 0.01$), suggesting differential resilience strategies. These findings support vulnerability and risk management theory (Dercon & Krishnan, 2000) and highlight the role of financial tools in enabling adaptive coping. This links to SDG 11 (Sustainable Cities) and SDG 13 (Climate Action).

Table 6: Determinants of household coping (OLS)

Coping index	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
MOMO Adoption	-.856	.08	-10.64	0	-1.014	-.698	***
Shock exposure	.009	.003	3.05	.002	.003	.014	***
Age	.012	.003	4.67	0	.007	.017	***
Male	.021	.067	0.31	.755	-.11	.152	
Primary	.295	.79	0.37	.709	-1.255	1.844	
Secondary	.078	.79	0.10	.921	-1.471	1.628	
Higher	-.512	.795	-0.64	.52	-2.071	1.048	
Employed	-.013	.079	-0.17	.866	-.168	.141	
Household size	.177	.011	15.80	0	.155	.199	***
Urban	-2.632	.079	-33.16	0	-2.787	-2.476	***
Constant	3.812	.801	4.76	0	2.242	5.381	***
Mean dependent var		3.446	SD dependent var			2.976	
R-squared		0.372	Number of obs			5292	
F-test		437.041	Prob > F			0.000	
Akaike crit. (AIC)		24122.358	Bayesian crit. (BIC)			24194.672	

*** $p < .01$, ** $p < .05$, * $p < .1$

Source: Authors' Computation

Table 7 addresses endogeneity using PSM, logit, and 2SLS. Across methods, MOMO adoption consistently reduces welfare vulnerability. The 2SLS Cragg-Donald F = 502.9 and Stock-Yogo 10% critical value = 19.93, confirming strong instruments. The Sargan test p-value = 0.657 indicates valid overidentification. The PSM results in Table 7 estimate the Average Treatment Effect on the Treated (ATET) for MOMO adoption. Households that adopted mobile money experience a reduction in welfare vulnerability by 3.47 percentage points (ATET = -0.0347, $p < 0.1$) compared to similar non-adopters. This suggests that even after controlling for observable differences between adopters and non-adopters, digital financial inclusion has a protective effect on household welfare. This supports the idea that access to mobile financial tools strengthens household resilience against economic and social shocks, consistent with the humanitarian-development nexus framework (Chambers, 1983) and aligns with SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities).

In the logistic regression used as part of the 2SLS framework (Table 3), the key instruments distance to agent and network coverage strongly influence MOMO adoption. Specifically: for distance to agent, each additional kilometer reduces the likelihood of adoption by 23.8% (coefficient = -0.238, $p < 0.01$), reflecting physical accessibility as a key barrier to financial inclusion. For network coverage, better coverage increases adoption by 128% (coefficient = 1.280, $p < 0.01$), highlighting the importance of digital infrastructure in enabling mobile financial services. These results confirm the validity of the instruments: they are strongly correlated with the endogenous variable (MOMO adoption) but plausibly exogenous to welfare vulnerability, as required in instrumental variable estimation (Angrist & Pischke, 2009). This is consistent with studies emphasizing infrastructure and agent network density as primary determinants of digital financial adoption in sub-Saharan Africa (Mbiti & Weil, 2016).

The 2SLS results in Table 7 confirm the causal effect of MOMO adoption on welfare vulnerability. MOMO adoption reduces welfare vulnerability by 21.5 percentage points ($\beta = -0.215$, $p < 0.01$), indicating a strong protective effect once endogeneity is addressed. Shock exposure remains positive and significant ($\beta = 0.00301$, $p < 0.01$), showing that shocks still increase vulnerability, but the presence of mobile money mitigates this effect. We note for the control variables that, age is positively associated with welfare vulnerability ($\beta = 0.00156$, $p < 0.01$), while employment reduces vulnerability ($\beta = -0.0356$, $p < 0.05$), and household size slightly increases it ($\beta = 0.00602$, $p < 0.01$). These 2SLS results reinforce the findings from OLS and PSM analyses, showing that mobile money causally reduces household vulnerability, even after correcting for potential reverse causality or selection bias. The results provide strong evidence that digital financial inclusion strengthens households' economic resilience, supporting SDG 1 (No Poverty) and SDG 8 (Decent Work and Economic Growth), while contributing to the realization of socio-economic rights in line with UN development goals.

Table 7: Addressing selection bias and reverse causality

VARIABLES	(1)	(2)	(3)	(4)
	PSM Welfare vulnerability	Reduced form (logit) MOMO adoption		2SLS Welfare vulnerability
Distance to agent		-0.238*** (0.0118)	-0.238*** (0.0118)	
Network coverage		1.280*** (0.0894)	1.280*** (0.0894)	
(ATET) r1vs0.MOMO adoption	-0.0347* (0.0204)			
MOMO adoption				-0.215*** (0.0368)
Shock exposure		0.0102*** (0.00302)	0.0102*** (0.00302)	0.00301*** (0.000565)
Age		-0.00189 (0.00261)	-0.00189 (0.00261)	0.00156*** (0.000486)
Male		0.144** (0.0703)	0.144** (0.0703)	0.00289 (0.0132)
Primary		0.579 (1.616)	0.579 (1.616)	0.338 (0.331)
Secondary		1.157 (1.615)	1.157 (1.615)	0.369 (0.331)
Higher		1.969 (1.620)	1.969 (1.620)	0.255 (0.332)
Employed		0.468*** (0.0800)	0.468*** (0.0800)	-0.0356** (0.0152)
Household size		-0.0168 (0.0121)	-0.0168 (0.0121)	0.00602*** (0.00223)
Urban		0.680*** (0.0740)	0.680*** (0.0740)	0.0524*** (0.0171)
Constant		-1.529 (1.621)	-1.529 (1.621)	-0.389 (0.332)
Observations	5,292	5,292	5,292	5,292
R-squared				0.016
chi2		2115***	2115***	
F				19.78
R2 adjusted				0.0138
Cragg-Donald Wald F				502.9
Stock-Yogo (10%)				19.93
Endogeneity test				19.57***
Sargan p				0.657
Sargan statistics				0.197

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' Computation

Table 8: Decomposing welfare gaps between MOMO adopters and non-adopters by Oaxaca-Blinder estimation

VARIABLES	(1) Overall	(2) Endowments	(3) Coefficients	(4) interaction
Age		0.00370 (0.00225)	0.0262 (0.0335)	0.00210 (0.00270)
Male		0.000390 (0.00109)	0.00467 (0.0147)	-0.000477 (0.00150)
Primary		0.160 (0.133)	-0.0858 (0.133)	-0.125 (0.193)
Secondary		-0.0535 (0.0447)	-0.240 (0.375)	0.0412 (0.0646)
Higher		-0.0822 (0.0882)	-0.140 (0.148)	0.122 (0.129)
Employed		0.00203* (0.00106)	0.0167 (0.0208)	-0.000793 (0.00103)
Household size		0.00444* (0.00240)	0.0174 (0.0183)	0.00297 (0.00314)
Urban		0.000972 (0.00779)	0.0128 (0.0207)	-0.00648 (0.0105)
group_1	0.0282*** (0.00895)			
group_2	-0.0752*** (0.00926)			
Difference	0.103*** (0.0129)			
Endowments	0.0358*** (0.00993)			
Coefficients	0.0319* (0.0179)			
Interaction	0.0357** (0.0159)			
Constant			0.420 (0.657)	
Observations	5,292	5,292	5,292	5,292
k_iform	4	4	4	4
k_eq	4	4	4	4
N_2	2399	2399	2399	2399
N_1	2893	2893	2893	2893

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' Computation

Table 8 decomposes welfare gaps between adopters and non-adopters of mobile money. The findings indicate that, adopters enjoy a 10.3% welfare advantage (difference = 0.103, p<0.01). Endowment differences explain 3.6% (p<0.01), coefficient effects 3.2% (p<0.1), and the interaction effect 3.6% (p<0.05). This indicates that while socio-demographic factors contribute to gaps, adoption itself drives substantial improvements. These results demonstrate how digital financial inclusion can reduce inequality, supporting SDG 10 (Reduced Inequalities) and SDG 1 (No Poverty), consistent with human rights-based development approaches (UN, 2019).

5. Conclusion and Policy Suggestion

The findings from this study provide robust evidence that digital financial inclusion through mobile money adoption significantly improves household welfare and mitigates vulnerability to economic shocks in Cameroon. Across multiple estimation methods including OLS, logistic regression, propensity score matching, and 2SLS. The results consistently show that households with access to mobile money experience lower welfare vulnerability, reduced reliance on informal coping strategies, and diminished risk of socio-economic rights

violations. Quantitatively, mobile money adoption reduces welfare vulnerability by 21.5 percentage points (2SLS), lowers the probability of education deprivation by 46.6%, and provides a welfare advantage of 10.3% over non-adopters (Oaxaca-Blinder decomposition). The decomposition further shows that while 3.6% of this gap is explained by differences in household endowments and 3.2% by coefficient effects, another 3.6% stems from the interaction between characteristics and adoption, highlighting that adoption itself drives substantial improvements in welfare beyond socio-demographic differences. Shock exposure continues to increase vulnerability, but mobile money buffers these effects, confirming its role as a protective mechanism in line with humanitarian-development nexus frameworks and social protection theory.

In light of these findings, a new set of policy recommendations is warranted to maximize the protective and transformative effects of digital financial inclusion. First, the government should implement a national digital finance accessibility program that guarantees mobile money agents are within 2 kilometers of 90% of rural households, directly addressing the negative effect of distance on adoption. Second, telecom providers must expand network coverage to achieve at least 95% nationwide operational connectivity, particularly in rural and peri-urban areas, ensuring adoption opportunities are not constrained by infrastructure gaps. Third, financial literacy campaigns targeting women and informal sector workers should be scaled to ensure that at least 75% of unbanked households receive structured mobile finance training annually, enabling these households to use mobile money effectively for welfare protection. Finally, integrate mobile money services with social safety nets and humanitarian response programs, such that every household experiencing a shock receives at least 50% of immediate relief transfers digitally within 48 hours, thereby operationalizing shock mitigation and reinforcing real-time economic resilience.

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