



# Investigating the Link between Financial Technology Adoption and Food Security in Africa

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**Abstract:** Food insecurity remains a pressing challenge in Africa, directly impacting the achievement of the United Nations Sustainable Development Goal 2, which aims to end hunger and ensure food access for all. In this context, financial technology (fintech) has emerged as a potential tool to enhance food security by improving financial inclusion and economic resilience. In this struggle, the present study examines the effect of fintech adoption on food security across 27 African countries from 2012 to 2021, employing fixed effects Driscoll and Kraay estimation and IV-GMM regressions. The results indicate that fintech significantly reduces food insecurity, a relationship that remains robust across multiple robustness checks. Furthermore, industrialisation and trade openness contribute to improved food security, while inflation and rising population density exacerbate food insecurity. Based on these findings, the study recommends expanding digital financial services, integrating fintech into agricultural value chains, fostering industrialisation and trade, and implementing policies to control inflation and manage population growth to enhance food security outcomes in Africa.

**Keywords:** Fintech, Food Security, Financial Inclusion, Industrialisation, Africa

**JEL Classification:** G20, O14, O55, G20

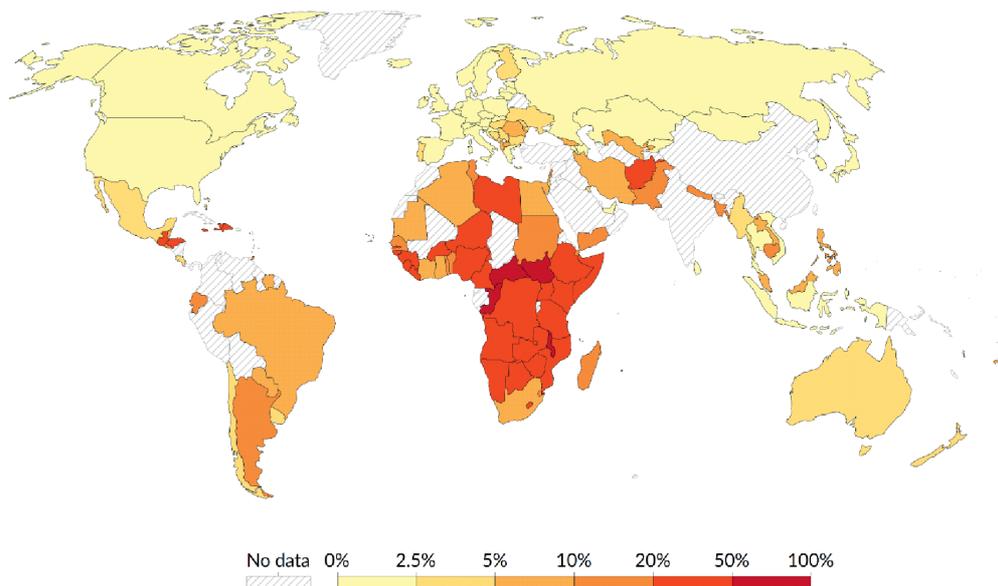
## 1. Introduction

Food security remains a challenge in Africa, where millions of people face hunger and malnutrition due to economic constraints, climate change, and inefficient food distribution systems (World Health Organisation, 2023; Kelly, 2024). While efforts have been made to improve agricultural productivity and supply chain resilience, access to financial resources remains a significant barrier, particularly for small-scale farmers and rural households (Demirgüç-Kunt et al., 2022). Traditional banking systems have failed to bridge this gap due to high costs, inadequate infrastructure, and stringent lending requirements (Beck et al., 2023). In recent years, **financial technology (fintech)** has emerged as a transformative force in Africa's financial landscape (Josyula & Expert, 2021; Obeng et al., 2024). Mobile money services, digital payment platforms, and blockchain-based solutions have expanded financial inclusion, allowing individuals and businesses to conduct transactions, save, and access credit more efficiently (Suri & Jack, 2016). With Africa accounting for about **70% of the world's mobile money transactions** in 2022 (Raithatha et al., 2023), fintech has the potential to play a vital role in enhancing food security by improving financial access for agricultural stakeholders and consumers alike.

Despite the rapid expansion of fintech in Africa, its impact on food security remains largely underexplored. Existing studies on financial inclusion primarily focus on its effects on economic growth, poverty alleviation, and business development (Maimbo et al., 2011; Demirgüç-Kunt et al., 2022; Emara, 2023). However, limited research has examined whether fintech-driven financial inclusion translates into improved food security outcomes. Food insecurity remains a **critical and worsening crisis** in Africa, with millions of people unable to access sufficient and nutritious food. As of **2021, an estimated 282 million individuals were undernourished**, up from 239 million in 2020, representing **21% of the total population** (WHO, 2022). More alarmingly, **severe food insecurity affected 346 million people**, accounting for **27.4% of the continent's population** (Kelly, 2024). These figures emphasise the magnitude of the crisis, making it imperative to explore sustainable solutions to enhance food security.

Several structural and external factors contribute to Africa's persistent food insecurity. **Conflict, climate change, and economic disruptions—particularly those intensified by the COVID-19 pandemic—have significantly aggravated the situation.** Between 2019 and 2021, food prices in Sub-Saharan Africa surged by **20%**,

making basic nutrition increasingly unaffordable for many households (Mohiuddin, 2023). Additionally, **Africa's agricultural productivity remains low** compared to global standards. **Cereal yields average only 1.6 tons per hectare**, far below the global average of **4.0 tons per hectare** (Abate, 2021). This productivity gap, coupled with **high dependence on food imports**, exacerbates food insecurity. Africa's **food import bills rose by 15% between 2019 and 2021**, outpacing the global increase of **10%** during the same period (UNICEF, 2021). Many African countries, including the **Central African Republic, the Republic of Congo, Malawi, and South Sudan**, have more than **50% of their populations experiencing severe food insecurity**, making the continent the **most food-insecure region in the world** (See *Figure 1*).



**Figure 1: Share of population with severe food insecurity**

Source: Food and Agriculture Organisation of the United Nations (2023)

Addressing food insecurity requires **innovative, sustainable, and scalable solutions**, and one such emerging approach is **financial technology**. **Fintech has the potential to enhance food security** by improving access to credit for farmers, streamlining food supply chains, and reducing financial barriers to food affordability (Mhlanga, 2023). Digital financial services, such as **mobile money, digital credit platforms, and blockchain-enabled agricultural transactions**, could help farmers

invest in better inputs, reduce post-harvest losses, and increase market efficiency (Rayhan et al., 2024). Additionally, **greater financial inclusion** through fintech can **empower vulnerable households** by providing tools for saving, insurance, and efficient food purchases (de Sant'Anna & Figueiredo, 2024), thereby enhancing food accessibility and stability.

Given the urgency of Africa's food insecurity crisis and the transformative potential of fintech, this study seeks to **empirically examine the effect of fintech on food security**. Specifically, it investigates whether **increased fintech adoption can lead to substantial improvements in food availability and accessibility**. The central research question guiding this study is: **How does fintech influence food security in Africa?** The hypothesis posited is that **greater fintech development will significantly improve food security by enhancing financial access, reducing market inefficiencies, and fostering resilience against food price volatility**. The intersection of fintech and food security is an emerging but underexplored area in development studies. While financial inclusion has been widely recognised as a tool for poverty reduction (Maimbo et al., 2011; Emara, 2023), its specific role in enhancing food security remains unclear. Given Africa's high dependence on agriculture and the increasing adoption of digital financial services, understanding how fintech contributes to food security is essential for policymakers, development agencies, and financial institutions.

This study makes significant contributions to the literature by being one of the first to empirically examine the direct relationship between fintech and food security in Africa, an area that remains largely unexplored despite the increasing role of digital financial services in economic development. While previous studies, such as those by Najib et al. (2021), Lin et al. (2022), and Mhlanga (2023), have investigated aspects of fintech or food security, they do not explicitly establish a direct link between the two, nor do they focus on the African context. Given the pressing need to achieve Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 9 (Industry, Innovation, and Infrastructure), this study provides empirical evidence on how fintech can enhance food security. Another contribution lies in the study's methodological approach. Unlike existing research that often relies on a single fintech dimension, such as mobile money, peer-to-peer lending, fintech loans, or patents, this study, coupled with robust econometric techniques adopts a more comprehensive measure as it constructs a Fintech Infrastructure Development

Index using Principal Component Analysis (PCA), ensuring a broader and more accurate representation of fintech's role within African economies. This approach provides policymakers with concrete evidence on how digital financial inclusion can improve agricultural productivity, strengthen food supply chains, and enhance household resilience to food crises. The findings offer practical insights for designing fintech-driven policies and interventions that promote inclusive financial systems.

The remainder of the paper is organised as follows: Section 2 reviews the relevant literature, Section 3 describes the methodology employed, Section 4 presents the findings, discusses the results, and includes robustness checks, and Section 5 concludes the study.

## **2. Literature Review**

Theoretically, the relationship between fintech and food security could be explained through the Endogenous Growth Theory, pioneered by Romer (1994). This theory emerged as a response to the limitations of neoclassical growth models, particularly the Solow-Swan model, which attributed long-term economic growth to exogenous technological progress. Unlike its predecessors, the endogenous growth framework emphasises the role of knowledge, innovation, and human capital as internal drivers of sustained economic expansion. Romer (1994) introduced a model where technological progress results from intentional investments in research and development (R&D) and the accumulation of knowledge spillovers, thereby making technological advancement an endogenous process rather than an external force. This approach marked a significant shift in economic thought, highlighting the importance of policy interventions, education, and financial systems in fostering innovation-led growth (Aghion & Howitt, 1992). Over time, the theory has been expanded to incorporate the role of institutions and financial development in facilitating innovation and productivity gains (Acemoglu, 2008). The rise of digital finance and fintech can be understood through this lens, as financial technology plays an important role in reducing transaction costs, improving access to credit, and promoting efficient resource allocation, all of which are fundamental to sustaining long-term economic growth (Beck et al., 2010). The endogenous nature of innovation and financial development, as described in Romer's framework, emphasises how targeted investments in fintech infrastructure can generate positive externalities that foster economic transformation in developing economies (Levine, 2005).

The application of the Endogenous Growth Theory to the relationship between fintech and food security in Africa is particularly relevant, as digital financial services can enhance agricultural productivity and food distribution efficiency by addressing key financial constraints faced by farmers and agribusinesses. Fintech solutions, such as mobile money, digital lending platforms, and blockchain-based supply chain systems, reduce information asymmetry and facilitate better access to credit, which in turn enables farmers to invest in improved inputs, irrigation, and technology (Demirgüç-Kunt et al., 2018). By lowering financial exclusion, fintech fosters a more inclusive agricultural economy where smallholder farmers—who constitute the backbone of food production in many African countries—can participate more effectively in markets, enhancing overall food security. Furthermore, the knowledge spillovers and network effects generated by fintech innovations align with the core principles of Romer's (1994) model, as they create new opportunities for investment, learning, and economic diversification. Given the structural challenges in Africa's financial sector, integrating fintech into food systems can accelerate economic growth by improving financial efficiency, reducing risks associated with agricultural production, and ensuring more stable food supply chains (Honohan & King, 2012). Therefore, leveraging fintech for food security is not only a technological advancement but also an economic strategy rooted in the principles of endogenous growth, where digital financial innovations serve as catalysts for sustainable agricultural development and poverty reduction.

Empirically, the literature explicitly addressing the fintech-food security nexus is indeed relatively scarce, yet related research provides valuable insights into the mechanisms through which financial technology and related factors influence food systems. These studies can be broadly categorised into those focusing on the direct impact of digital finance and artificial intelligence on agricultural production and those examining the broader implications of digital inclusion and climate finance on food security. Looking at the first category, Mhlanga (2023) demonstrates how fintech solutions enhance financial access for farmers, enabling them to invest in necessary inputs, while AI applications, such as precision agriculture, contribute to improved crop productivity and reduced losses. These findings are echoed in further work by Najib et al. (2021), reinforcing the argument that integrated technological approaches are essential for addressing food insecurity through enhanced farm efficiency and output quality.

In the vein of the second category of studies mainly investigating the broader impact of digital inclusion and financial aspects on food security, Lin et al. (2022) and Tan et al. (2024) explored the role of digitally inclusive finance in enhancing food security in China, using robust econometric models. They revealed that digital financial inclusion, particularly through its breadth of coverage and depth of use, significantly promotes multi-dimensional food security by fostering urbanisation and marketisation. Similarly, Liu and Ren (2023) extended this analysis by examining the dual role of digital inclusive finance in balancing food security and carbon emission reduction, highlighting its positive spillover effects in neighbouring regions. Shifting the focus to climate finance, Kelly (2024) demonstrated that climate finance significantly reduces food insecurity in African countries, identifying indirect pathways through which financial support enhances food security.

While existing studies highlight the individual contributions of digital finance, AI, and climate finance to aspects of food security, a significant gap remains in understanding the comprehensive and direct impact of fintech specifically on food security within the African context. Current researches either focus on agricultural productivity enhancements through technology or examine broader financial inclusion and climate-related effects. Consequently, there's a lack of analysis on how the integrated suite of fintech services, beyond mere financial access, influences the dimensions of food security across diverse African economies. This study aims to bridge this gap by directly investigating the causal relationship between fintech adoption and food security outcomes in Africa. By doing so, it provides a more comprehensive understanding of the fintech-food security nexus, offering targeted policy recommendations tailored to the unique challenges and opportunities within the African landscape, thus moving beyond the isolated assessments of individual technological or financial components as examined in previous literature.

### **3. Methodology**

#### ***3.1. Definition of variables and data source***

This study utilises secondary data sourced from the World Development Indicators (WDI). The dataset includes 27 African countries.<sup>2</sup> and spans the period from 2012 to 2021, with the selection of the timeframe determined solely by data availability. Africa is selected as the study region due to its unique challenges and opportunities in leveraging financial technology. In addition, the continent faces persistent food

insecurity, with nearly 282 million people affected in 2022, largely due to climate change, conflict, and economic instability (WHO, 2023). At the same time, Africa has witnessed rapid fintech adoption, particularly through mobile money and digital financial services, which have the potential to improve agricultural productivity, market access, and financial inclusion for smallholder farmers. Understanding this relationship in this region is thus crucial for designing policies that harness fintech to address food insecurity effectively. The variables used in the present study can be categorised into the explained, explanatory, and control variables.

### *3.1.1. Explained Variable*

This study uses the prevalence of severe food insecurity as the main dependent variable, measured as the percentage of the total population experiencing severe food insecurity, following Gebre (2021). This metric reflects the proportion of individuals facing extreme food shortages, including those who have run out of food, gone hungry, or skipped meals for an entire day or more due to insufficient resources (FAO, 2016). The percentage captures the severity of food access challenges within the population. As indicated in Table 1, food insecurity in the sample varies from a minimum of 2.58% to a maximum of 58.8%, with the former representing the lowest detectable level and the latter signifying a substantial portion of the population affected. It is important to note that the data for this variable are reported as a three-year average. Alternatively, to this variable, the study employs the Prevalence of Undernourishment for robustness purposes.

### *3.1.2. Explanatory Variable*

To analyse the relationship between fintech and food security, this study employs a Fintech Index as the primary independent variable. In empirical literature, fintech is measured using various proxies, such as mobile money (Makina, 2019), cryptocurrencies like Bitcoin (Yermack, 2018), fintech firms (Phan et al., 2020), fintech patents (Jiang et al., 2021), and binary indicators of fintech adoption (Jünger & Mietzner, 2020). However, these measures often fail to capture the specific dynamics of fintech ecosystems in developing countries. Additionally, they tend to focus on a single aspect of fintech, such as mobile-based financial services or internet usage, while overlooking crucial factors like access to electricity, which serves as a fundamental enabler of fintech, especially in Africa (Yermack, 2018).

To overcome these limitations and following Yermack's (2018) approach, we developed a Fintech Infrastructure Development Index specifically designed for African economies. This index was constructed using Principal Component Analysis (PCA) and includes four key variables: mobile phone penetration, fixed broadband subscriptions, internet usage by individuals, and access to electricity. The use of PCA is justified as it generates a linear combination of the original variables, effectively condensing them into a single index for more comprehensive policy insights (Ezeoha et al., 2020). PCA identifies shared components among highly correlated variables, assigning weights that accurately capture their variability. Baccini (2010) advocates for standard PCA when integrating variables from diverse domains with different measurement units, as it relies on empirical weights derived from internal data patterns. The Bartlett test confirms significant correlations among the selected fintech indicators, while the Kaiser-Meyer-Olkin measure, Cronbach's alpha, and Bartlett's test validate the PCA's suitability. The results indicate that the first principal component, with an eigenvalue exceeding 1, accounts for approximately 71% of the variation in fintech indices, making it the primary component used to integrate fintech into economic analyses.

### *3.1.3. Control Variables*

Beyond the primary independent variable, and in line with key determinants of food security identified in the literature, we incorporated several control variables into the model to account for additional economic and structural factors influencing food security outcomes. These control variables included **industrialisation**, which reflects the level of economic transformation and its impact on agricultural productivity and food availability (Mohamed & Damin, 2015); **inflation**, which affects food prices and household purchasing power, thereby influencing food accessibility (Obiora et al., 2023); **trade openness**, which captures the extent of a country's integration into global markets and its potential impact on food supply through imports and exports (Fusco et al., 2020); and **population density**, which relates to pressure on land and resources, potentially affecting food production and distribution efficiency (Molotoks et al., 2021). Table 1 presents the descriptive statistics of the variables used in this study, while Table 2 shows the relationship between Food security, Fintech and the covariates.

**Table 1: Descriptive Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
Food Insecurity	270	19.708	12.849	2.586	58.8
Fintech	255	0.372	0.976	-0.893	3.192
Industrialization	257	11.405	4.725	3.42	37.759
Inflation	270	12.421	44.531	-17.254	604.946
Trade openness	250	61.111	22.909	4.128	125.783
Pop density	270	61.403	47.214	2.633	234.309
PoU	269	17.048	10.914	2.5	51
Electricity	270	51.555	24.776	12.9	100
Internet	260	24.86	18.605	1.05	78.99
Fixed_broadband	261	1.299	2.186	0.001	12.207
Mobile_phone	268	87.005	32.295	21.73	168.924

Source: Author's construction

**Table 2: Matrix of correlations**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) Food Insecurity	1.000					
(2) Fintech	-0.185	1.000				
(3) Industrialisation	-0.088	0.260	1.000			
(4) Inflation	0.134	-0.017	-0.054	1.000		
(5) Trade openness	-0.267	0.077	0.033	0.057	1.000	
(6) Pop density	0.382	0.012	0.016	0.040	0.322	1.000

Source: Author's construction

### 3.2. Model and Estimation Strategy

Drawing inspiration from the works of Kelly (2024), we empirically specified the following model:

$$Food\ Security_{it} = \alpha_0 + \alpha_1 Fintech_{it} + \delta_k X_{it} + \mu_{it} \quad (1)$$

Where  $Food\ Security_{it}$  is the dependent variable representing food insecurity for country  $i$  at time  $t$ .  $Fintech_{it}$  representing financial technology, the independent variable,  $X$  is the vector of control variables, and  $\mu$  is the stochastic error term.

To strengthen the robustness of statistical inference and ensure reliable standard errors in the panel analysis, we applied the fixed effects Driscoll and Kraay method alongside the Instrumental Variable Generalised Method of Moments (IV-GMM). The analysis began by estimating the baseline model using Driscoll and Kraay's (1998) standard error correction, which is particularly effective in addressing

potential cross-sectional dependence across panels (Kelly & Radler, 2024; Kelly & Ndeffo, 2024). As noted by Hoechle (2007), Driscoll and Kraay standard errors also account for heteroscedasticity by employing a weighted average of both between-group and within-group variances, thereby refining the computation of the variance-covariance matrix of the model parameters.

To mitigate endogeneity concerns stemming from reverse causality, omitted variable bias, and measurement errors, we utilised the IV-GMM estimation technique. Fintech can influence food security by improving financial inclusion, facilitating access to agricultural credit, and enhancing supply chain efficiencies. Conversely, better food security can contribute to fintech adoption by increasing household disposable income and strengthening demand for digital financial services (Liu & Ren, 2023). Additionally, unobserved factors such as institutional quality, economic stability, and technological infrastructure may simultaneously affect both fintech and food security, potentially leading to biased estimates in Driscoll and Kraay regressions (Rodrik et al., 2004).

The IV-GMM method addresses these issues by employing instrumental variables that are strongly correlated with fintech but uncorrelated with the error term in the food security equation, ensuring consistent and efficient parameter estimation (Arellano & Bover, 1995). This approach also accounts for heteroskedasticity and serial correlation in dynamic panel models, making it particularly well-suited for empirical analyses involving macroeconomic variables (Blundell & Bond, 1998). By leveraging internal instruments, IV-GMM provides a robust and valid estimation strategy, effectively isolating the causal impact of fintech on food security in Africa.

## **4. Results and Discussion**

### ***4.1. Baseline Findings***

Consistent with Figure 2, the baseline findings indicate that an increase in Fintech adoption by African countries translates into a reduction of food insecurity. Column 1 of Table 3 presents the bivariate relationship between fintech and food security, while Models 2 to 5 progressively introduce control variables to better capture the fintech-food security nexus. Across all model specifications, fintech exhibits a consistently negative and statistically significant coefficient, ranging from -2.213 to -2.766. The significance levels ( $p < 0.01$  and  $p < 0.05$ ) confirm the robustness of

the results, suggesting that an expansion in fintech services is associated with a significant reduction in food insecurity. Econometrically, this implies a stable inverse relationship, reinforcing the argument that fintech is an important driver of food security improvements. The economic implication is that greater access to digital financial services enables households and smallholder farmers to mitigate financial risks, invest in agricultural inputs, and smooth consumption during income shocks. These findings align with theoretical expectations, as fintech enhances financial inclusion, reduces transaction costs, and improves market access (Makina, 2019). In the African context, where mobile banking and digital finance have rapidly expanded, fintech has played a transformative role in increasing financial access for previously excluded populations, particularly in rural areas (Demirgüç-Kunt et al., 2022).

The introduction of control variables from Models 2 to 5 provides deeper insights into the factors influencing food security beyond fintech. Industrialisation

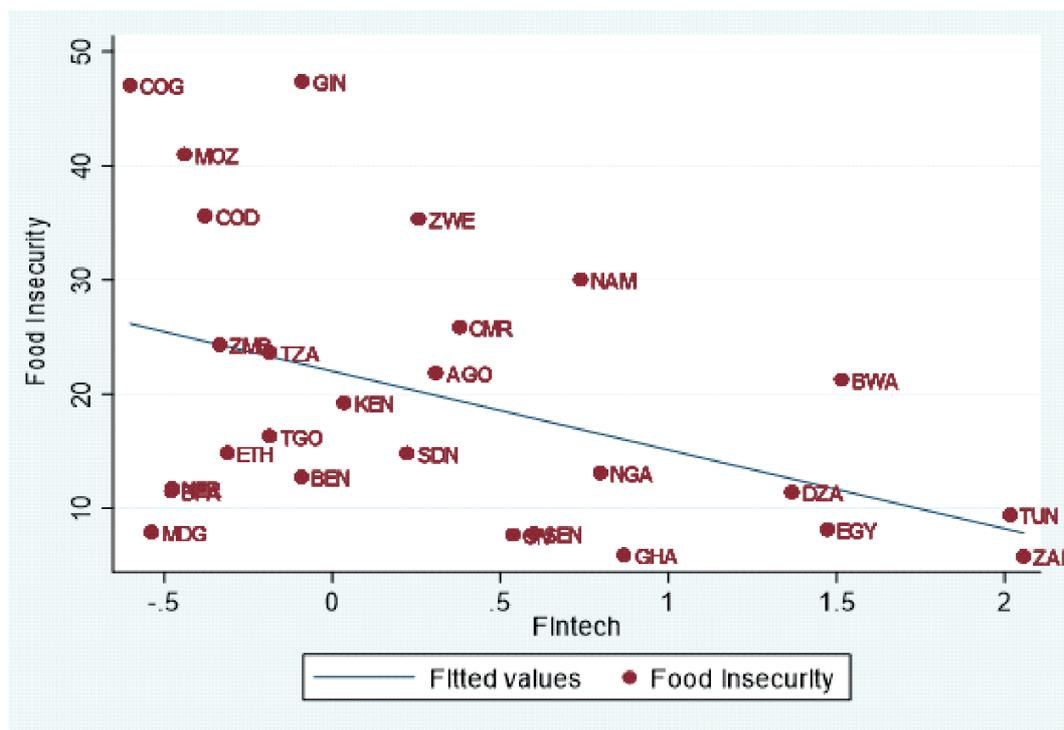


Figure 2: Food security versus Fintech.

Source: Author's Construction

shows a negative and statistically significant coefficient, implying that economic transformation reduces food insecurity by increasing employment, wages, and agricultural productivity (Mohamed & Damin, 2015). Conversely, inflation is positively and significantly associated with food insecurity ( $p < 0.01$ ), confirming the detrimental impact of rising food prices on household purchasing power and nutrition (Obiora et al., 2023). Trade openness appears to alleviate food insecurity, as indicated by its negative and highly significant coefficient, suggesting that greater market integration stabilises food supply through imports and exports (Fusco et al., 2020). On the other hand, population density has a positive and significant effect on food insecurity, highlighting the strain of high population growth on food resources and infrastructure. Compared to existing studies, these findings reinforce the established literature on financial inclusion and food security (Kelly, 2024), while also supporting previous research on the macroeconomic determinants of food security, including industrialisation, price stability, and trade openness. Collectively, the results provide compelling empirical evidence that fintech expansion, when complemented by sound macroeconomic policies, serves as a powerful tool for reducing food insecurity in Africa.

**Table 3: Effect of Fintech on Food Security (Discroll & Kraay)**

VARIABLES	Dependent Variable: Prevalence of Food Insecurity				
	(1)	(2)	(3)	(4)	(5)
Fintech	-2.766*** (0.680)	-2.555*** (0.722)	-2.562*** (0.711)	-2.357** (0.799)	-2.213** (0.879)
Industrialisation		-0.155** (0.0524)	-0.173** (0.0801)	-0.0821** (0.0131)	-0.0834** (0.0133)
Inflation			0.0347*** (0.00894)	0.0404*** (0.00955)	0.0356*** (0.00947)
Trade openness				-0.163*** (0.0151)	-0.105*** (0.0187)
Pop density					0.0974*** (0.00423)
Constant	2.001*** (0.780)	2.180*** (0.609)	2.163*** (0.759)	1.657** (0.429)	1.899*** (0.353)
Observations	255	248	248	228	228
R-squared	0.250	0.453	0.468	0.538	0.626
Number of groups	27	27	27	27	27

Source: Author's construction. Notes: Standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Previous results from the Driscoll and Kraay estimation suggested that the adoption of fintech by African countries leads to a reduction in food insecurity, reinforcing the idea that technological advancements in financial services can play a key role in addressing food security challenges. However, this relationship may still be influenced by the well-documented issue of reverse causality, where improved food security could itself encourage the expansion of fintech, driven by factors such as increased income, greater access to markets, and improved infrastructure. To address this potential endogeneity concern, we apply the IV-GMM approach to our baseline model. The results, presented in Table 4, confirm that fintech continues to have a significant negative effect on food insecurity in Africa, highlighting its robustness. Furthermore, the null hypothesis of instrument validity is not rejected, as evidenced by Hansen J-test P-values exceeding the 10% threshold, which suggests that our instruments are exogenous and uncorrelated with the error term. Additionally, the overall validity of the model is upheld, as indicated by the P-values associated with the Fisher statistics, providing further assurance regarding the reliability of our findings.

**Table 4: Effect of Fintech on Food Security (IV-GMM)**

VARIABLES	<i>Dependent Variable: Prevalence of Food Insecurity</i>				
	(1)	(2)	(3)	(4)	(5)
Fintech	-2.795***	-2.997***	-3.080***	-2.601***	-0.730***
	(0.0845)	(0.173)	(0.197)	(0.0880)	(0.0932)
Industrialisation		-0.481**	-0.561***	-0.555***	-0.534***
		(0.193)	(0.189)	(0.197)	(0.167)
Inflation			0.0160***	0.0167***	0.0173***
			(0.00388)	(0.00352)	(0.00368)
Trade openness				-0.0657**	-0.0625*
				(0.0283)	(0.0319)
Pop density					0.322***
					(0.0134)
Observations	226	220	220	220	220
R-squared	0.204	0.236	0.362	0.437	0.516
Number of id	27	27	27	27	27
Hansen (P-value)	0.130	0.123	0.116	0.340	0.377
Fisher (P-value)	0	0	0	0	0

Source: Author's construction. Notes: Standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## 4.2. Robustness Checks

To confirm the reliability of our findings, we performed two robustness checks. First, we introduced an alternative dependent variable, the Prevalence of Undernourishment, as a measure of food insecurity. This variable is commonly used to capture the proportion of a population that does not have enough caloric intake, making it a valuable alternative indicator to assess the broader effects of fintech on food security. Second, we disaggregated the fintech variable to examine whether the effect holds for each component of the fintech index, providing a more granular understanding of how different aspects of fintech contribute to food insecurity. The results of these analyses are presented in Tables 5 and 6, respectively.

### 4.2.1. Robustness to alternative measures of Food insecurity

The robustness of the results presented in Table 5 demonstrates a consistently negative and significant effect of fintech on food insecurity when using the Prevalence of Undernourishment as an alternative dependent variable. By employing a different measure of food insecurity, we further validated the reliability of the baseline findings, addressing potential concerns about measurement bias or the sensitivity of results to specific indicators. This consistency across various metrics suggests that the observed relationship between fintech and food security holds, reinforcing the credibility of the initial results. Such robustness strengthens the argument that the adoption of fintech can positively influence food security outcomes, supporting the notion that fintech is a determinant of food insecurity in Africa. The control variables exhibit expected signs, giving credit to the robustness of our baseline findings.

**Table 5: Alternative Proxy for Food Insecurity (Prevalence of Undernourishment)**

VARIABLES	<i>Dependent Variable: Prevalence of Undernourishment</i>				
	(1)	(2)	(3)	(4)	(5)
Fintech	-0.298**	-0.387**	-0.281***	-0.200*	-1.060***
	(0.127)	(0.152)	(0.0883)	(0.129)	(0.149)
Industrialisation		-0.107*	-0.112***	-0.136***	-0.104***
		(0.0604)	(0.0544)	(0.0567)	(0.0529)
Inflation			0.0124***	0.0143***	0.0116***
			(0.00433)	(0.00444)	(0.00386)
Trade openness				-0.0335***	-0.0300***
				(0.00556)	(0.00616)

	<i>Dependent Variable: Prevalence of Undernourishment</i>				
VARIABLES	(1)	(2)	(3)	(4)	(5)
Pop density					0.195***
					(0.0142)
Observations	226	220	220	220	220
R-squared	0.206	0.311	0.360	0.486	0.561
Number of id	27	27	27	27	27
Hansen (P-value)	0.214	0.205	0.473	0.575	0.514
Fisher (P-value)	0.005	0.009	0.005	0	0

Source: Author's construction. Notes: Standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

#### 4.2.2. Robustness to disaggregated Fintech variables

**Table 6: Alternative Fintech Variables**

	<i>Dependent Variable: Prevalence of Food Insecurity</i>			
VARIABLES	(1)	(2)	(3)	(4)
Electricity	-0.282***			
	(0.0206)			
Internet		-0.0462***		
		(0.00358)		
Fixed_broadband			-0.254***	
			(0.0287)	
Mobile_phone				-0.137***
				(0.0360)
Industrialisation	-0.564***	-0.610***	-0.517***	-0.574***
	(0.159)	(0.159)	(0.141)	(0.174)
Inflation	0.0193***	0.0180***	0.0146***	0.0112***
	(0.00376)	(0.00375)	(0.00370)	(0.00368)
Trade openness	-0.0493**	-0.0548**	-0.0799**	-0.0844***
	(0.0209)	(0.0267)	(0.0339)	(0.0240)
Pop density	0.166***	0.316***	0.394***	0.205***
	(0.0259)	(0.0164)	(0.0216)	(0.0512)
Observations	220	218	212	219
R-squared	0.506	0.527	0.512	0.525
Number of id	27	27	27	27
Hansen (P-value)	0.384	0.225	0.158	0.194
Fisher (P-value)	0	0	0	0

Source: Author's construction. Notes: Standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

The robustness check results in Table 6 confirm the negative and statistically significant effect of fintech on food insecurity in Africa, even when using its disaggregated components—electricity access, internet penetration, fixed broadband subscriptions, and mobile phone usage—as explanatory variables. Each fintech component maintains a negative coefficient at the 1% significance level, reinforcing the robustness of the baseline findings and suggesting that improvements in digital and financial infrastructure contribute to enhanced food security. The high R-squared values (ranging from 0.506 to 0.527) indicate that the model explains a substantial portion of the variance in food insecurity, while the Hansen test p-values confirm the validity of the instrumental variables in the estimation. Additionally, the significant Fisher test p-values affirm the overall significance of the regression models. Economically, these results highlight the important role of digital financial infrastructure in improving access to financial services, agricultural markets, and real-time information, thereby reducing food insecurity. The observed outcomes may be explained by the fact that electricity access facilitates the use of digital financial services (van Zanden, 2023), internet connectivity enhances information dissemination and financial inclusion (Lenka & Barik, 2018), fixed broadband supports agricultural e-commerce and supply chain efficiencies (Zhu et al., 2021), and mobile phone penetration enables mobile banking and digital payments (Asongu, 2018), which are vital for smallholder farmers and vulnerable populations. Furthermore, the control variables continue to exhibit expected signs, giving credit to the robustness of our baseline findings.

## **5. Conclusion and Policy Recommendations**

Amid Africa's persistent challenges with food insecurity, a critical question arises: Can financial technology enhance food security across the continent? This study contributes to the existing literature by investigating this issue using data from 27 African countries spanning the period 2012 to 2021. Employing fixed effects Driscoll and Kraay estimation alongside IV-GMM regressions, the findings reveal that fintech plays a significant role in reducing food insecurity and promoting economic resilience in Africa. This effect remains robust even after a series of robustness checks, reinforcing the argument that fintech adoption can serve as a vital tool in addressing food security challenges across the region.

Based on the findings, the study recommends that policymakers should prioritise expanding digital financial services by investing in mobile banking

infrastructure and promoting regulatory frameworks that enhance financial inclusion. Additionally, initiatives that integrate fintech with agricultural value chains, such as digital payment systems for farmers, mobile-based credit access, and insurance services, should be strengthened to improve market efficiency and food availability. Furthermore, given the effect of control variables, governments should implement policies that foster industrialisation and trade openness, such as reducing trade barriers and supporting agro-industrialisation, to enhance food supply chains. At the same time, measures to curb inflation, such as prudent monetary policies and strategies to manage rapid population growth through investment in education and family planning, should be adopted to mitigate their adverse effects on food security.

The main limitation of this study is the potential exclusion of informal fintech transactions, which may underestimate the full impact of financial technology on food security; future research could explore micro-level data and assess the role of fintech in rural and informal economies.

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### **Notes**

1. Corresponding Author
2. Algeria, Angola, Benin, Botswana, Burkina Faso, Cameroon, Congo, Dem. Rep., Congo, Rep., Cote d'Ivoire, Egypt, Arab Rep., Ethiopia, Ghana, Guinea, Kenya, Madagascar, Mozambique, Namibia, Niger, Nigeria, Senegal, South Africa, Sudan, Tanzania, Togo, Tunisia, Zambia, Zimbabwe

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