

Effect of financial inclusion on poverty and vulnerability to poverty: Evidence using a multi-dimensional measure of financial inclusion

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Abstract

This study examines the effect of financial inclusion on poverty and vulnerability to poverty of Ghanaian households. Using data extracted from the seventh round of the Ghana Living Standards Survey in 2016/17, a multiple correspondence analysis is employed to generate a financial inclusion index, and three-stage feasible least squares is used to estimate households' vulnerability to poverty. Endogeneity associated with financial inclusion is resolved using distance to the nearest bank as an instrument in an instrumental variables probit technique. Results showed that while 23.4 percent of Ghanaians are considered poor, about 51 percent are vulnerable to poverty. We found that an increase in financial inclusion has two effects on household poverty. First, it is associated with a decline in a household's likelihood of being poor by 27 percent. Second, it prevents a household's exposure to future poverty by 28 percent. Female-headed households have a greater chance of experiencing a larger reduction in poverty and vulnerability to poverty through enhanced financial inclusion than do male-headed households. Furthermore, financial inclusion reduces poverty and vulnerability to poverty more in rural than in urban areas. Governments are encouraged to design or enhance policies that provide an enabling environment for the private sector to innovate and expand financial services to more distant places. Government investment in, and regulation of, the mobile money industry will be a necessary step to enhancing financial inclusion in developing countries.

Keywords: Financial inclusion, Poverty, Vulnerability, Mobile money, Ghana

JEL Codes: D03, D12, D14, I30, O12

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1. Introduction

Financial inclusion (FI), which increases individuals' ownership of transactions and savings accounts, payment facilities, access to credit and receipt of remittances, enhances individual and household welfare through an improvement in entrepreneurial propensities, women's empowerment, investment in education and risk management (Ashraf, Karlan, & Yin, 2010; Bruhn & Love, 2014; Churchill & Marisetty, 2019; Dupas & Robinson, 2013; Zhang & Posso, 2017). With regard to welfare, FI has been widely acknowledged as having the capacity to reduce poverty (Chibba, 2009; Imai, Arun, & Annim, 2010; Mohammed, Mensah, & Gyeke-Dako, 2017; Park & Mercado Jr, 2018; Swamy, 2014) and vulnerability to poverty (VtP) (Choudhury, 2014), as well as aiding in the achievement of inclusive economic growth (Demirgüç-Kunt et al., 2015). Despite the evidence above, existing studies at the household level have mainly focused on the relationship between FI and poverty and less on VtP (Imai et al., 2010; Mohammed et al., 2017; Swamy, 2014). It is imperative to extend the discourse to cover vulnerability to poverty because some currently non-poor households may be at risk of future poverty (Ozughalu, 2016). It is estimated that by the end of 2019, Africa risks being home to 70 percent of the world's poor (Coulibaly, 2019). By 2030, 13 African countries face the risk of experiencing an increase in the proportion of the populace who are considered extremely poor (Coulibaly, 2019).

Despite advances in the measurement of FI, most of the extant studies have mainly conceptualized FI as ownership of a bank account rather than as a multidimensional construct. Such advances include usage of financial products, access to credit, insurance, remittance receipts and mobile money - which is a key driver of the fintech revolution (Demirgüç-Kunt & Klapper, 2012b; Demirgüç-Kunt et al., 2015; Demirgüç-Kunt, Klapper, Singer, Ansar, & Hess, 2018). Studies that have considered other dimensions of the construct have also examined their effects separately (Aslan, Deléchat, Newiak, & Yang, 2017). This paper contributes to the literature by examining the effect of FI on poverty and VtP using a novel multidimensional FI index that was generated by Aslan et al. (2017). Other gaps in the extant literature are substantiated in the ensuing paragraphs.

At the G20 summit in 2010, over 90 countries in the developing world signed the Maya Declaration, which aimed to reduce poverty through FI (AFI, 2015). These countries made up 75% of the world's financially excluded countries. Ghana, Egypt, Uganda, Nigeria and Pakistan were cited as being part of the least inclusive in the world (Jha, Amerasinghe, & Calverley, 2014). Commitment to the Maya Declaration coincides with some empirical evidence of FI's ability to aid in the achievement of Sustainable Development Goal 1 (SDG1), which aims at ending poverty, including VtP, by 2030 (ICSU & ISSC, 2015; Klapper, El-Zoghbi, & Hess, 2016). Despite an improvement in the global levels of FI from 51% (in 2011) to 69% (in 2017) across countries that signed the Maya declaration (Demirgüç-Kunt et al., 2018), to the best of our knowledge, empirical evidence on the FI-poverty-VtP nexus for the countries that committed to the Maya Declaration remain sparse.

Recent evidence from the 2017 Global Findex Database shows that gender and locational gaps exist in FI globally, despite the successes achieved in improving FI by 18% from 2011 to 2017. The gender gap in FI is more prevalent in developing economies, where 59% of women have account ownership compared to 79% of men (Demirgüç-Kunt et al., 2018). With regard to locational gaps, the Global Findex Database does not provide information on global differences due to the difficulty in defining rural and urban characteristics in cross-country surveys. Nonetheless, country-specific information shows that urban residents, especially in developing countries, largely have greater access to finance than rural communities (Demirgüç-Kunt et al., 2018), which implies that the links between FI, poverty and VtP are likely to exhibit gender and locational differences (Swamy, 2014) that require examination.

In this paper, the case of Ghana is used to provide empirical evidence because Ghana is a signatory to the Maya Declaration (AFI, 2015) and a developing country that is making great strides towards achievement of universal financial access (UFA). Ghana recorded a 29% improvement in FI from 2011 to 2017; however, only 54% of females have a transaction account compared to 62% of males (Demirgüç-Kunt et al., 2018). Within the rural population, 61% of males have a transaction account, as compared to only 39% of females, and in urban areas, account ownership for males stands at 54% compared to 46% for females (GSS, 2014). Regarding access to credit, rural residents are refused loans more than their urban counterparts (Koomson, Annim, & Peprah, 2016). In 2016/17, the incidence of poverty was found to be higher among male-headed households (25.8%) than female-headed households (17.6%). With regard to mobile money ownership and usage, Ghana is considered a success story in Africa after increasing take up from 13% of the population in 2014 to 39% in 2017 (Mattern & McKay, 2018).

This study investigates the effect of FI on poverty and VtP using an FI index generated from 15 indicators that cover the FI dimensions of ownership and use of financial products; including insurance and mobile money, access to credit and receipt of remittances. The gender and locational heterogeneities in the effect of FI on poverty and VtP are also examined by estimating sub-sampled models. The specific relationship between the main indicators of the FI index and poverty and VtP are also assessed.

The remaining sections of this paper are arranged as follows. Section 2 presents the theoretical link between FI, poverty and VtP, and Section 3 discusses the methodology, which includes data sources, measurement of key variables and estimation techniques. Section 4 presents the results and discussion and Section 5 concludes and makes recommendations.

2. Theoretical literature on FI and poverty and VtP

The link between FI and poverty is transmitted through direct and indirect channels when explained within the framework of financial development. Directly, FI helps to reduce poverty through broadened access to credit, insurance and other financial services, which provide resources for meeting daily transaction needs for consumption, investment and overall economic growth (King & Levine, 1993; Rajan & Zingales, 1998). Similarly, Demirgüç-Kunt, Beck, and Honohan (2008) have posited that enhanced FI has the capacity to improve beneficiaries' entrepreneurial possibilities, which also improves their income, consumption, level of independence and participation in family and community decision making. According to Jalilian and Kirkpatrick (2002), FI strengthens the productive assets of the poor by enabling them to invest in new technologies, education and health. Such investments by the poor increase their potential to achieve sustainable livelihoods (World Bank, 2001). The indirect channel operates through finance-growth stimulating theories which date back to Schumpeter (1934) and McKinnon (1973). The indirect channel explains how finance-induced economic growth gradually benefits the poor through job creation and increased government social spending on health, education and social protection (Abosedra, Shahbaz, & Nawaz, 2016; Perotti, 1993). Conversely, overuse of innovative financial products that make transactions easy (such as credit cards, ATMs and internet banking) can result in over indebtedness and financial difficulties, which result in poverty (Lyons & Hunt, 2003). Evidence has also shown that greater financial access can worsen income inequality between recipients and non-recipients in the short term, so a better approach is to shift from improving finance for the poor to improving finance for all (Demirgüç-Kunt et al., 2008), which is in line with the World Bank's target of achieving UFA by 2020 as a poverty reduction tool.

With regard to FI and VtP, improvement in FI implies that households or their members can invest in risk-mitigating technologies such as drought-resistant seeds, preventive health

products, and flood-prevention drainage systems. They could also own education, health and agricultural insurance and find it easier to migrate to seek temporary work (Brown, Zelenska, & Mobarak, 2013; Emerick, de Janvry, Sadoulet, & Dar, 2016; Hallegatte, Vogt-Schilb, Bangalore, & Rozenberg, 2016; Mârza, Angelescu, & Tindeche, 2015). Evidence shows that innovations in access to credit and savings products are able to reduce the barriers associated with households' adoption of risk-mitigating technologies, thereby reducing vulnerability to poverty (Brown et al., 2013; Hallegatte et al., 2016). With respect to innovations in savings and account products, an example is mobile money and how it provides an avenue for savings and flexibly expedites payments (Demirgüç-Kunt et al., 2018). Although most banks have account maintenance fees in Ghana, enhanced competition among banks can lower such costs to benefit customers (Amoako, 2012). This shows that FI has the capability to reduce poverty and VtP and steps must be taken to enhance it.

To improve on recent levels of FI, in 2015, the World Bank and the International Financial Corporation (IFC) set an ambitious target to achieve UFA by 2020. The principle of UFA is to ensure that currently excluded adults will be able to have access to a transaction account to store money, send and receive payments. To achieve UFA, the promotion of mobile money is seen as very strategic, because mobile money accounts have made it simpler to provide and use financial services in the developing world (Demirgüç-Kunt et al., 2018; Donovan, 2012). Despite the progress being made in achieving UFA, distance from banks remains one of the main barriers to FI in sub-Saharan Africa (SSA) (Demirgüç-Kunt & Klapper, 2012a). It is therefore prudent to examine the role of distance to banks in the FI-poverty-VtP nexus, especially from the developing country perspective. In this study, we achieve this by employing distance to the nearest bank as an instrument to address the potential endogeneity problem that exists in the FI-poverty-VtP nexus (Imai et al., 2010; Mohammed et al., 2017). In this paper, we focus on the direct channel because our data is cross-sectional and limited to variables for testing the direct link.

The direct link between FI and poverty and VtP is constrained by market failure, which is caused mainly by the transactions costs and information asymmetry that are often present in credit markets (Aghion & Bolton, 1997; Stiglitz & Weiss, 1981). Demand-side transaction costs can be financial, in-kind and psychic (Kon & Storey, 2003). Financial costs include interest on loans, transportation costs or amounts paid to others who help loan applicants in providing information required by the bank or waiting time at the banking hall. In-kind costs include the opportunity cost of time spent in filling in forms or walking to the bank. The psychic cost is the discomfort experienced by borrowers when passing on personal information to third parties and could also include the psychological stress of thinking about the distance needed to travel to reach the bank, or the waiting time at banking halls. Empirical evidence shows that households that are closer to banks are more likely to own and use financial products and services compared to households that are further away (Brown, Guin, & Kirschenmann, 2015). According to Stiglitz (1993), if the drivers of market failure, especially transaction costs, are addressed, it is possible to improve access by the poor to formal finance. This implies that the direct estimated effect of FI on poverty can be biased if transaction costs are omitted. The diverse nature of transaction costs also means that it is difficult to fully account for them in a model. For instance, financial transaction costs can be included in a model, but it will be difficult to include in-kind and psychic transaction costs. Such a limitation is likely to result in FI being endogenous due to an omitted variable problem. According to Houghton and Khandker (2009), to adequately estimate poverty, one needs to consider community-, household- and individual-level characteristics. Since VtP considers a household's risk of being poor in the future, regardless of their current state of welfare (Chaudhuri, Jalan, & Suryahadi, 2002), the determinants of poverty will also influence VtP. Based on the expositions above, we simplify the relationship between FI, poverty and VtP in Figure 1.

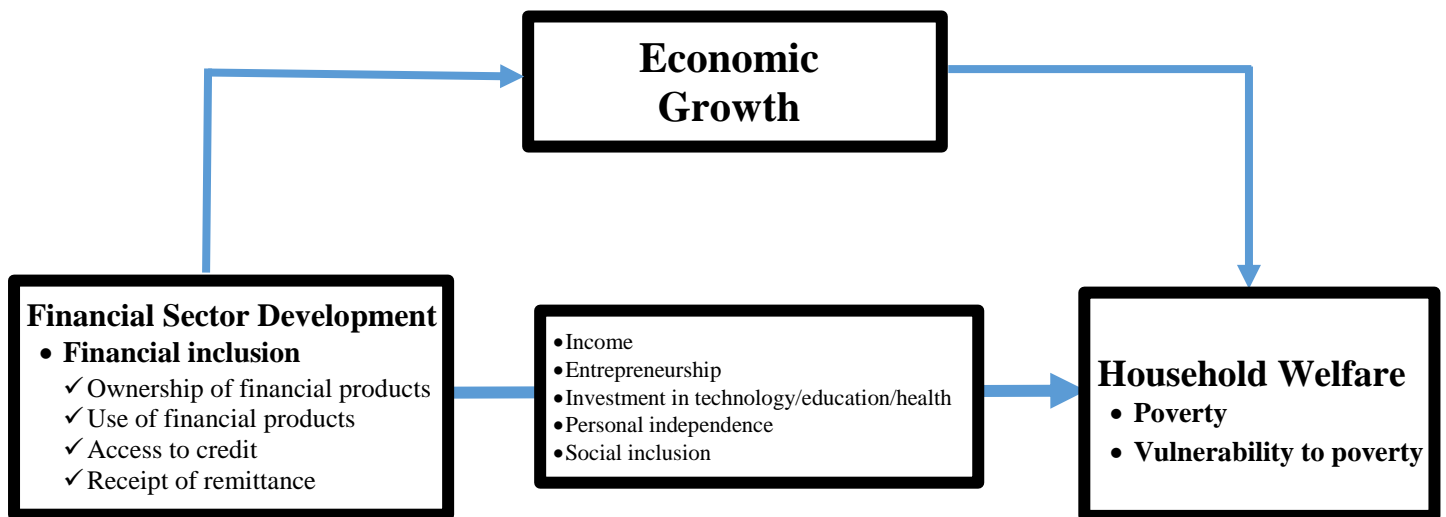


Figure 1: Conceptual link between FI and Poverty and VtP

Source: Authors' Construct

3. Methodology

3.1 Data

The cross-sectional secondary data for this study was extracted from round seven of the Ghana Living Standards Survey (GLSS7), which was collected in 2016/17 by the Ghana Statistical Service (GSS). The survey used a probability sampling approach (two-stage), and included sections on demography, housing conditions, employment, education, water and sanitation, health, access to financial and insurance services, remittance and household assets, disability, migration, agriculture, non-farm activities and governance, among others. The study covered 15,000 households in 1000 enumeration areas (clusters) across the 10 regions of Ghana. With a 93.4% response rate, the final sample size was 14,009 households. After merging information contained in different sections of the survey, the sample size reduced to 13,805 households. The reduction in sample size was due to missing observations for some households in one or more files.

3.2 Definition and measurement of FI

Financial inclusion means that adults have access to and can effectively use a range of appropriate financial services, including mobile money accounts (Demirgüç-Kunt, Klapper, & Singer, 2017; Demirgüç-Kunt et al., 2018). Since 2011, when the World Bank began to measure FI using the Global Findex Database, the measure has evolved to broadly encompass ownership and use of financial products (i.e. credit and debit cards, ATMs, e-banking etc), risk management (insurance), access to credit and receipt of remittances (Demirgüç-Kunt et al., 2015, 2018; Koomson & Ibrahim, 2018). The broadening of the construct is also incorporated into the World Bank's UFA, where the target is to ensure that adults across the globe who are currently financially excluded will be able to have access to a transaction account to store money and send and receive payments (World Bank, 2018). The inclusion of mobile money has become necessary because recent improvements in FI have largely been driven by digital payments, government policies and a new generation of financial services accessed through mobile phones and the internet (Demirgüç-Kunt et al., 2018). In SSA 21% of the population now have a mobile money account (Demirgüç-Kunt et al., 2018). Based on these precursors,

we employ 15 binary indicators of FI (see Table 1) and generate an FI index using multiple correspondence analysis. The FI index provides an indicator of the intensity of the ownership and use of financial products, in addition to remittance receipts and access to credit (Aslan et al., 2017). It also provides an avenue to examine the effect of an individual's FI on welfare outcomes. For some of the indicators that are peculiar to Ghana (e.g. E-zwich), further explanations have been provided beneath Table 1.

3.2.1 Multiple correspondence analysis (MCA)

To generate a composite indicator of FI, methods such as principal component analysis, factor analysis and MCA can be used (Amidžic, Massara, & Mialou, 2014; Aslan et al., 2017; Tuesta, Sorensen, Haring, & Camara, 2015). Amongst these approaches MCA is the most appropriate to apply when the set of variables/indicators are categorical rather than continuous. MCA is a principal component analysis equivalent for categorical data (Abdi & Valentin, 2007; Aslan et al., 2017; Stata, 2015). Aslan et al. (2017) employed the MCA to generate a novel FI index from 8 and 12 indicators using the 2011 and 2014 Findex data from the World Bank. Unlike principal and factor analyses, the MCA is non-parametric and is not associated with preconditions of multivariate normality and linearity (Aslan et al., 2017). We follow the steps of Aslan et al. (2017) by ensuring that: (i) the indicators used are all related to FI; and (ii) personal and environmental characteristics of individuals that could later bias empirical estimations are excluded.

We apply the Burt approach to MCA and use principal normalization, which scales the coordinates by the principal inertias. The analysis presented in Table 2 shows that the MCA with the Burt matrix and adjustments explains 70.5% of the total inertia in the first two dimensions. Stated differently, dimensions 1 and 2 jointly explain 70.5% of the variations in the FI index. The choice of the first two dimensions and their inertia contributions is confirmed by the post-estimation plot of category coordinates presented in Appendix 1 (Stata, 2015). We generate our FI index by retaining dimensions 1 and 2, because beyond dimension 2, the increment of variance explained reduces to 3%, and becomes negligible afterwards. Unlike PCA, the percentage contributions of the dimensions are considered when generating an overall index using MCA. A similar approach has been applied to choose dimensions across the literature (see for example Aslan et al., 2017; Hamid, Aziz, & Huong, 2016; Stata, 2015). Note that the percentage for the principal inertias do not add up to 100% because these are lower bound estimates in the Burt method with adjustments (Stata, 2015). The FI index is a continuous variable for which a unit increase implies an improvement in the level of financial inclusion. Borrowing from Sarma's (2012) classification of countries based on the FI scores, the mean values for the FI indices shown in Table 1 indicate that FI among Ghanaians is quite low and requires improvement through carefully designed policies, such as more investment in mobile money infrastructure.

Table 1: Indicators used in generating the FI index

Financial Inclusion indicators	Units	Mean	Std. Dev.
Dim 1: Ownership of Financial Products			
Ownership of mobile money account	categorical	0.093	0.290
Ownership of current or cheques account	categorical	0.044	0.204
Ownership of investment account	categorical	0.004	0.061
Ownership of savings account	categorical	0.181	0.385
Ownership of susu account	categorical	0.002	0.047
Ownership of fixed deposit account	categorical	0.001	0.029
Ownership of E-zwich account	categorical	0.005	0.069
Ownership of insurance policy	categorical	0.235	0.424
Dim 2: Use of Financial Products			
Transact using cheque book	categorical	0.143	0.350
Transact using ATM	categorical	0.082	0.274
Transact using E-zwich card	categorical	0.006	0.074
Transact using E-banking	categorical	0.007	0.080
Transact using any other financial product	categorical	0.046	0.210
Dim 3: Access to credit	categorical	0.040	0.196
Dim 4: Receipt of remittance	categorical	0.303	0.460
Financial inclusion Index	continuous	0.020	0.842

Source: Authors' computation using GLSS7 data **Std Dev:** Standard Deviation **Dim:** Dimension

Susu: A form of mutual savings scheme widely used in Ghana **Z-zwich:** National Switch and Smart card payment system in Ghana that offers deposit-taking financial institutions (i.e. universal banks, rural banks and savings and loans) a platform to interoperate. **ATM:** Automated teller machine **E-banking:** Electronic banking

Table 2: Multiple correspondence analysis: Burt/adjusted inertias

Dimension	Principal inertia	Percent	Cumulative percent
Dim 1	0.014383	63.29	63.29
Dim 2	0.001627	7.16	70.45
Dim 3	0.000719	3.16	73.61
Dim 4	1.76E-05	0.08	73.69
Dim 5	6.43E-06	0.03	73.72

Source: Computed using the GLSS7 Dim: Dimension

3.3 Measurement of consumption poverty

Poverty can be measured using consumption- and income-based methods (Jäntti & Danziger, 2000; Meyer & Sullivan, 2011, 2012; World Bank, 2001). Despite scholarly arguments in favour of either of these measures, consumption as an indicator of welfare has been widely used (Beegle et al., 2012). Some researchers have asserted that consumption-based measures depict welfare better than income-based measures (Meyer & Sullivan, 2011, 2012; World Bank, 2001). Based on this evidence, we use the consumption-based measure of poverty and employ total household consumption expenditure to estimate VtP. The consumption poverty indicator derived by the Ghana Statistical Service (2018) and used here employs the Foster-Greer-Thorbecke (FGT) model. It categorises the poor as those who lack command over

basic consumption needs, including food and non-food components. The poor and non-poor are identified based on their expenditure on a minimum consumption basket needed by an individual to satisfy his/her basic food and non-food needs. The expenditure, which is known as the poverty line, is constructed at two levels: the upper poverty line (i.e. poverty line) and the lower poverty line (i.e. extreme poverty line). After converting the figures into annual equivalents, the upper poverty line is pegged at GHC1760.8 per adult equivalent per year, while the extreme poverty line is GHC982.2 per adult equivalent per year for 2016/17 (GSS, 2018). The lower or extreme poverty line is calculated by focusing on only food consumption expenditure needed to obtain a minimum food basket that provides 2900 calories per adult equivalent per day (GSS, 2018). From this, being considered extremely poor means that the household's consumption expenditure is not sufficient to meet this calorie requirement. The upper poverty line considers both essential food and non-food consumption expenditure. Having a total consumption expenditure above this line means that the individual is able to purchase enough food to meet the daily calorie requirement and basic non-food needs. The approach used in the GLSS7 is consistent with previous rounds of the survey, especially 2005/06 and 2012/13 (GSS, 2018).

Based on the upper poverty line, the proportion of Ghanaians that were poor in 2016/17 is 23.4%, which indicates a 0.8% decline in the incidence of poverty between 2012/13 and 2016/17. With regard to the extreme poverty line, the proportion of extremely poor Ghanaians is 8.1%, which indicates a reduction of 0.2 percent between 2012/13 and 2016/17 (GSS, 2018). According to GSS (2018), poverty and extreme poverty in Ghana have both been predominantly considered to be a rural phenomenon. The marginal decline in extreme poverty has triggered a call for a change in policy direction if the SDG1 is to be achieved by 2030 (GSS, 2018).

3.4 Measurement of VtP

There are three main econometric approaches to measuring vulnerability: vulnerability as expected poverty, vulnerability as low expected utility, and vulnerability as uninsured exposure to risk (Celidoni & Procidano, 2015; Hoddinott & Quisumbing, 2010). All three measures have two common elements that are defined with respect to welfare and time. The welfare element is usually estimated using consumption expenditure, while the time dimension could be the next day, old age, or a year. Measurement of vulnerability as low expected utility or as uninsured exposure to risk require panel data, but vulnerability as expected poverty can be measured using cross-sectional data (Azeem, Mugeru, & Schilizzi, 2018; Chaudhuri et al., 2002). Since our data are cross-sectional, we employ the vulnerability as expected poverty approach following Chaudhuri et al. (2002) and Christiansen and Boisvert (2000). Vulnerability as expected poverty is the probability of a household (h) at time (t) being consumption poor in time $t + j$.

We use a three-stage Feasible Generalized Least Squares (FGLS), suggested by Amemiya (1977) and described in Chaudhuri et al. (2002). Many researchers have applied this approach to estimate vulnerability using cross-sectional data (see Azeem, Mugeru, & Schilizzi, 2018; Cahyadi & Waibel, 2016; Imai, Gaiha, & Thapa, 2015; Mutabazi, Sieber, Maeda, & Tscherning, 2015; Novignon, Nonvignon, Mussa, & Chiwaula, 2012; Sharaunga, Mudhara, & Bogale, 2016). Although panel data better capture the degree of variation in consumption over time, Chaudhuri et al. (2002) assert that a large cross-sectional data with variations in observable determinants of consumption across different categories of households are an indication of inter-temporal variations in consumption. We summarize the steps in deriving the vulnerability as expected poverty, but for a detailed exposition, readers can consult Novignon et al. (2012) and Mutabazi et al. (2015).

The first step in the FGLS is to specify and estimate the household consumption-generating process as shown in equation (1), and predict the residual using ordinary least squares (OLS);

$$\ln C_h = X_h \beta + e_h \quad (1)$$

where, $\ln C_h$ is per capita total household consumption expenditure; X_h represents household-level and household-head characteristics such as household size and location, gender, employment status, educational level and other determinants; β is a vector of parameters; and e_h is a random error term. Secondly, the estimated residual is squared and regressed on the same explanatory variables in equation (1) to ensure variability in household consumption (see equation (2));

$$\hat{\sigma}_{OLS,h}^2 = X_h \theta + \eta_h \quad (2)$$

The predicted values in equation (2) are obtained and used to transform (2) to obtain equation (3);

$$\frac{\hat{\sigma}_{OLS,h}^2}{X_h \hat{\theta}_{OLS}} = \frac{X_h}{X_h \hat{\theta}} \theta + \frac{\eta_h}{X_h \hat{\theta}} \quad (3)$$

Third, the standard deviation of equation (3) is derived in equation (4) and used to transform equation (3) into equation (5);

$$\hat{\sigma}_{e,h} = \sqrt{X_h \hat{\theta}_{FGLS}} \quad (4)$$

$$\frac{\ln C_h}{\hat{\sigma}_{e,h}} = \left(\frac{X_h}{\hat{\sigma}_{e,h}} \right) \beta + \frac{e_h}{\hat{\sigma}_{e,h}} \quad (5)$$

OLS estimation of equation (5) produces consistent and asymptotically efficient estimates of β . Estimating β_{FGLS} and θ_{FGLS} allows for a direct estimation of expected mean and variance for each household's consumption as shown in equation (6) and equation (7), respectively.

$$\hat{E}[(\ln C_h | X_h)] = X_h \hat{\beta} \quad (6)$$

$$\hat{V}[(\ln C_h | X_h)] = \sigma_h^2 = X_h \hat{\theta} \quad (7)$$

Using estimates from equations (6) and (7), the probability of any given household (h) with characteristics X_h being vulnerable to poverty in the future can be estimated using equation (8) when the poverty line, vulnerability threshold and time horizon are known.

$$\hat{V}_h = \hat{p}_r (\ln C_{h,t+j} < \ln z | X_h) = \Phi \left(\frac{\ln z - X_h \hat{\beta}}{\sqrt{X_h \hat{\theta}}} \right) \quad (8)$$

3.4.1 Poverty line, vulnerability threshold and time horizon

We use the upper poverty line of GH¢1760.8, which was derived by the Ghana Statistical Service and used in the 2017 poverty assessment in Ghana (GSS, 2018). The vulnerability threshold is calculated using the widely accepted benchmark poverty rate of 0.5 and a time horizon (j) of two years, which is consistent with previous studies (Azeem et al., 2018; Chaudhuri et al., 2002; Novignon et al., 2012; Zhang & Wan, 2008). The benchmark poverty rate means that any household that experiences a 50% probability of falling into poverty in the next period is vulnerable to poverty. Based on the benchmark poverty rate of 0.5, the vulnerability threshold for the next one, two and three years will be 0.50, 0.29 and 0.21, respectively. v^* ranges from 0 to 1, so with a time horizon of two years, a household that has a v^* greater than 0.29 is considered vulnerable.

$$v^* = 1 - \sqrt[j]{1 - v_n} \quad (9)$$

Our estimate from the steps above shows that 51% of Ghanaians are vulnerable to poverty, while the observed incidence of poverty is 23.4% (See Figure 2). Of the 23.4% who are currently poor, 92% are vulnerable to poverty, while for the 76.6% who are currently not poor, about 39% are vulnerable to poverty. The Chi-square test shows that the differences in vulnerability status for the currently poor and non-poor households are significant at the one percent alpha level. Using the GLSS5 data collected in 2005/07, Novignon et al. (2012) also found 56% of Ghanaians were vulnerable to poverty when the observed poverty incidence was 29%. Our estimate is expected because the actual poverty rate in Ghana has reduced, so VtP is expected to follow the same trend.

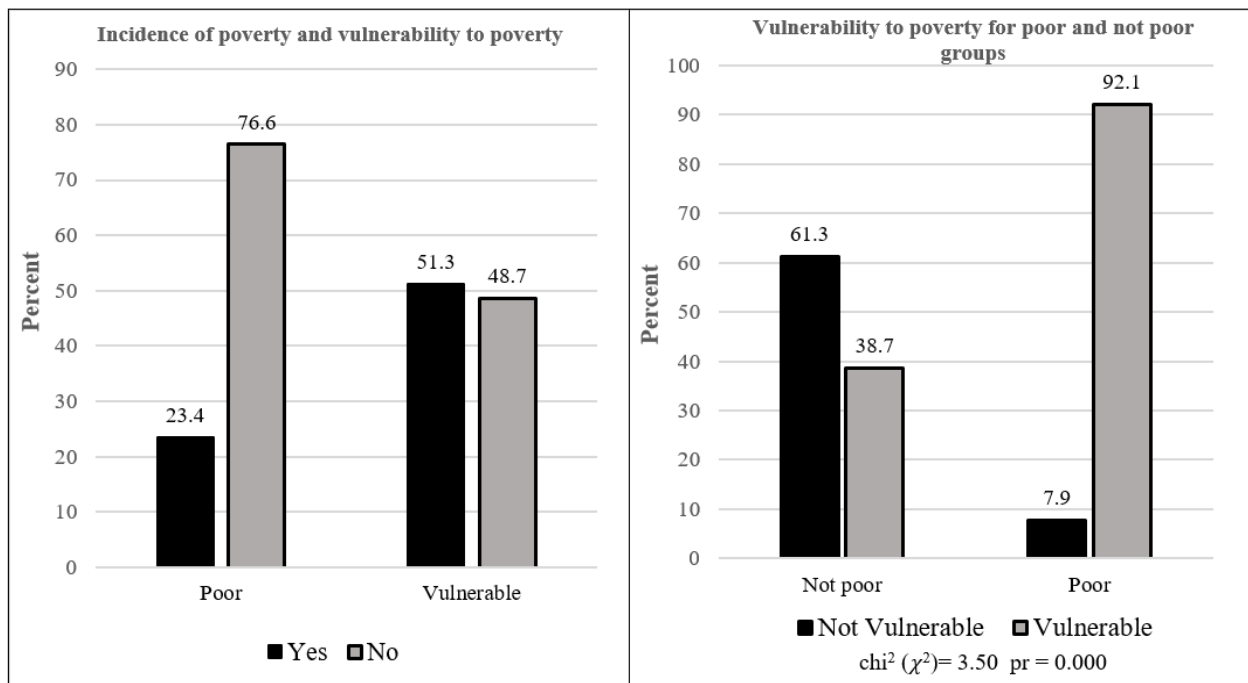


Figure 2: Incidence of poverty and vulnerability to poverty in Ghana

Source: Authors' generated estimates from the GLSS7

3.5 Estimation technique and empirical model

To answer the objectives of this paper, we estimate three main models. First, we test whether FI significantly reduces poverty and VtP. Secondly, we estimate sub-sampled models that show FI's effect on poverty and VtP for rural-urban and male- and female-headed households. Finally, we decompose the FI index to determine the relationship between its main indicators and poverty and VtP; these indicators are; ownership of a mobile money account, ownership of a formal bank account, ownership of an insurance policy, access to credit and receipt of remittances. Since instruments could not be identified for each indicator, we only estimate a probit model for the decomposed indicators. Use of financial product was excluded because it was distributed similarly to the ownership of formal account variable. Both poverty and VtP are captured as binary variables, while FI is captured as an index (i.e. it is continuous), with the indicators being in their binary forms.

The estimation technique employed is the instrumental variable probit (IV probit) technique, which is a two-stage technique. This is adopted because the FI variable is considered potentially endogenous (Imai et al., 2010; Koomson & Ibrahim, 2018; Swamy, 2014). The source of endogeneity can be traced to the unobserved transaction cost in the direct link between FI and poverty and VtP (Figure 1), so distance to the nearest bank (in kilometres) is used as an instrument to address the problem. To be valid, an instrument must satisfy the conditions of having a direct relationship with the potentially endogenous variable but not having a direct relationship with the dependent variable (Cameron & Trivedi, 2010). Distance to the nearest bank satisfies both conditions because, on the one hand, it is directly related to financial inclusion, which is because the longer the distance to the nearest bank, the higher the financial, in-kind and psychic costs and the lower the level of access to financial products and services (Brown et al., 2015; Demirgüç-Kunt & Klapper, 2012a). On the other hand, the distance to the nearest bank only influences poverty through its influence on the indicators of financial inclusion. The validity of the instrument can also be argued from the point of view of the rural-urban dimension by reference to government policies that have aimed at increasing the spread of rural and community banks in Ghana to specifically serve the needs of the rural poor. Additionally, microfinance institutions have also become widespread and are meeting the financial needs of the rural communities through the provision of tailored financial products and services in diverse ways and it is the provision of such tailored services that has been cited as one of the key success factors of the microfinance subsector in Ghana (Reiter & Peparah, 2015).

After justifying the use of distance to the nearest bank as an instrument, we proceed with the analyses by using the IV probit. The first stage uses OLS to estimate the association between FI and distance to the nearest bank and other covariates on FI, while the second stage is a probit model that regresses poverty and VtP on the predicted value of FI and the covariates.

Reduced Form Equation (1st stage)

$$FI_i = \delta_0 + \delta_1 Dist_i + \delta_2 Age_i + \delta_3 Hhsz_i + \delta_4 Hhsz_i^2 + \delta_5 Female_i + \delta_6 Rural_i + \delta_7 Edu_i + \delta_8 Hosp_i + \delta_9 Married_i + \delta_{10} Empstat_i + \delta_{11} Reg_i + \lambda_i \quad (10)$$

Structural Equation (2nd Stage)

$$Pr(PVtP_i = 1 | X_i) = \beta_0 + \beta_1 \widehat{FI}_i + \beta_2 Age_i + \beta_3 Hhsz_i + \beta_4 Hhsz_i^2 + \beta_5 Female_i + \beta_6 Rural_i + \beta_7 Edu_i + \beta_8 Hosp_i + \beta_9 Married_i + \beta_{10} Empstat_i + \beta_{11} Reg_i + \varepsilon_i \quad (11)$$

where, *FI* is financial inclusion, *PVtP* represents poverty or *VtP*, *Dist* is distance to the nearest bank in kilometers, *Age* is the age of the household head, *Hhsz* and *Hhsz*² are the household size and its square respectively, *Female* is a binary variable that is coded as 1 for female and 0

for male, *Rural* is a binary variable for the location of the household (1=rural and 0=urban), *Edu* is a binary variable (1=educated and 0 otherwise), *Hosp* represents hospital consultation (1=consulted and 0 otherwise), *Married* is a binary variable (1=married and 0 otherwise), *Empstat* is a four-level categorical variable for the employment status of the household head, and *Reg* represents regional dummies.

3.6 Summary statistics

From the summary statistics presented in Appendix 2, we can see that while the current poverty rate in Ghana is 23.4 percent, poverty is more pronounced in rural rather than urban areas. Male-headed households are also poorer than female headed households. Similarly, while 51.2 percent of Ghanaian households are vulnerable to poverty, rural households are more vulnerable than urban households and male-headed households are also more vulnerable than female-headed homes. Regarding the main indicators of financial inclusion, ownership of bank account represents any type of formal bank account owned and ownership of insurance also embodies ownership of any type of insurance package owned. Between the two, ownership of insurance (23.5%) is greater than ownership of a bank account (19%). Even when ownership of mobile money and bank accounts are combined, that combined percentage remains below that for insurance. From this, we can deduce that Ghanaians are quite keen on risk management and are willing to own either one or a number of short- and long-term insurance packages compared to bank accounts. Comparatively, the ownership of mobile money and bank accounts and insurance packages is greater amongst urban households than rural households. As expected, rural households also receive remittances more than urban households. Male-headed households own more mobile money and bank accounts than do female-headed households. Female-headed households own more insurance than do those headed by males and they also receive more remittances.

4. Analyses and discussion

Before analyzing the effect of FI on poverty and VtP, we first interpret the endogeneity and weak instruments tests. The Wald test of exogeneity in all the models is significant at the 0.05 alpha level, so the null hypothesis of no endogeneity is rejected (Cameron & Trivedi, 2010; Stata, 2015). This result implies that the standard probit model is inconsistent in explaining the effect of FI on poverty and VtP, so we interpret estimates of the IV probit. Comparing the magnitude of the marginal effects of the IV probit (see Tables 3, 4 and 5) to estimates produced by the standard probit (which does not account for endogeneity) shows that the standard probit markedly underestimates (biases downwards) the effect of FI on poverty and VtP. We also test for weak instruments using the F-statistic from the first stage regression. The values are all greater than 10, which leads to the rejection of the null hypothesis of weak instruments (Staiger & Stock, 1994). After justifying the use of IV probit, we now progress to interpret the findings but note that an improvement in FI is reflected in an increase in the value of the FI index by one unit.

Overall, improvement in FI has two effects on household poverty (see Table 3). First, it reduces a household's likelihood of being poor currently by about 27 percent. Second, it prevents a household's probable risk of future poverty (VtP) by about 28 percent. The poverty-reducing effect of enhanced FI supports findings from previous studies (Imai et al., 2010; Mohammed et al., 2017; Swamy, 2014), but worthy of note is the ability of FI to prevent future risk of poverty for households that are either currently poor or non-poor. We also find that distance to the nearest bank plays a key role in the FI-poverty-VtP nexus through its association with transaction costs, because the difference between the IV probit estimates (that account for

the distance to the nearest bank) and that of the standard probit is about 26 percent. The implication is that the ability of the World Bank's UFA target to reduce current and future poverty will be optimized if concerted efforts are made to jointly enhance both demand-side and supply-side indicators of financial inclusion. For instance, enhancing financial outreach through an increase in the number of bank branches (supply-side indicator) will also increase the number of owners and users of bank products (demand-side).

The poverty-reducing effect of FI found in this paper aligns with financial development theories that establish a direct link between FI and poverty (King & Levine, 1993; Rajan & Zingales, 1998). The findings also lend support to the 2010 Maya Declaration, because countries that signed the declaration have put in place the needed structure to make their financial systems increasingly inclusive through accessibility (AFI, 2015). Improved FI enhances the entrepreneurial ability of beneficiaries, which increases income and consumption and results in a reduction in poverty.

Table 3: IV probit regression for effect of FI on poverty and VtP

Variables	(1)	(2)	(3)	(4)
	Poverty		Vulnerability to Poverty	
	Probit ME	IVProbit ME	Probit ME	IVProbit ME
Financial inclusion index	-0.0136*** (0.0026)	-0.2732*** (0.0050)	-0.0124*** (0.0025)	-0.2798*** (0.0030)
Age of household head	0.0005** (0.0002)	0.0004** (0.0002)	0.0004** (0.0002)	0.0004** (0.0002)
Household size	0.0571*** (0.0028)	0.0531*** (0.0032)	0.0355*** (0.0050)	0.0498*** (0.0026)
Household size squared	-0.0022*** (0.0002)	-0.0024*** (0.0002)	0.0028*** (0.0006)	-0.0018*** (0.0002)
Female (male=0; female=1)	-0.0081 (0.0078)	-0.0034 (0.0068)	-0.0065 (0.0067)	-0.0031 (0.0068)
Rural (urban=0; rural=1)	0.1779*** (0.0068)	0.0847*** (0.0103)	0.1898*** (0.0045)	0.0826*** (0.0096)
Educated (no=0; yes=1)	-0.1077*** (0.0066)	-0.1543*** (0.0072)	-0.1588*** (0.0049)	-0.1591*** (0.0082)
Consulted at hospital (no=0; yes=1)	-0.0799*** (0.0105)	-0.0240*** (0.0093)	-0.0145* (0.0081)	-0.0156* (0.0086)
Married (no=0; yes=1)	-0.0202*** (0.0078)	-0.0515*** (0.0067)	-0.0333*** (0.0065)	-0.0530*** (0.0068)
Employment Status (Base=Unemployed)				
Retired/Inactive	-0.0108 (0.0141)	-0.0170 (0.0143)	-0.0049 (0.0129)	-0.0152 (0.0138)
Employee	-0.0925*** (0.0132)	-0.0403*** (0.0151)	-0.1626*** (0.0116)	-0.0566*** (0.0178)
Self Employed	-0.0555*** (0.0114)	0.0233* (0.0130)	-0.1006*** (0.0102)	0.0111 (0.0146)
Region (Base=Ashanti)				
Other nine regional dummies	Yes	Yes	Yes	Yes
First-stage				
Distance to the nearest bank (km)		-0.0153*** (0.0053)		-0.0153*** (0.0053)
Observations	13,805	13,805	13,805	13,805
Wald chi2	3458.45***	23530.72***	740.35***	22295.71***
Pseudo R2	0.3755		0.1274	
Wald test of exogeneity: chi2		54.10***		63.63***
F-test for first-stage regression		12.02		12.02

Instrumented: Financial inclusion index **Instrument:** Distance to the nearest bank (km)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 ME: Marginal effect
IVProbit: Instrumental Variable Probit

4.1 Locational and gender dimension to the effect of the FI on poverty and VtP

The gender dimension produces quite interesting findings (Table 4). On the one hand, improvement in FI for male heads can reduce the likelihood of being poor currently by about 26 percent, compared to a reduction of about 30 percent for female heads. On the other hand, improving FI for male heads can reduce future risk of being poor by about 27 percent, while it does so for female heads by about 31 percent. Thus, in comparative terms, FI does more in reducing poverty (4%) and VtP (4%) for female heads than it does for their male counterparts. According to the theory which directly links FI and poverty, enhanced financial inclusion strengthens the productive assets of the poor and increases their entrepreneurship propensities. In the Ghanaian context, GSS (2018) states that females are more enterprising than males, and this may explain why male-headed households are poorer than those that are headed by females and why FI reduces poverty more for the latter. Our findings support that of Swamy (2014), who established that women experience greater poverty reduction because they use their resources to improve their family's wellbeing while contributing more to household savings. The implication is that a narrowing of the 8 percent gender gap in FI (Demirgüç-Kunt et al., 2018) will benefit society by reducing poverty further.

Table 4: IV probit regression for effect of FI on poverty and VtP in male- and female-headed households

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Male				Female			
	Poverty		Vulnerability to Poverty		Poverty		Vulnerability to Poverty	
	Probit	IVProbit	Probit	IVProbit	Probit	IVProbit	Probit	IVProbit
	ME	ME	ME	ME	ME	ME	ME	ME
Financial inclusion index	-0.0111*** (0.0031)	-0.2638*** (0.0058)	-0.0105*** (0.0029)	-0.2691*** (0.0034)	-0.0192*** (0.0044)	-0.3017*** (0.0106)	-0.0167*** (0.0043)	-0.3126*** (0.0058)
Age of household head	0.0003 (0.0003)	0.0004* (0.0002)	0.0005** (0.0002)	0.0004* (0.0002)	0.0010*** (0.0003)	0.0002 (0.0003)	0.0009*** (0.0003)	0.0002 (0.0003)
Household size	0.0535*** (0.0031)	0.0553*** (0.0038)	0.0350*** (0.0057)	0.0531*** (0.0031)	0.0887*** (0.0065)	0.0554*** (0.0088)	0.0462*** (0.0104)	0.0466*** (0.0068)
Household size squared	-0.0019*** (0.0002)	-0.0024*** (0.0002)	0.0024*** (0.0006)	-0.0020*** (0.0002)	-0.0051*** (0.0006)	-0.0031*** (0.0007)	0.0030** (0.0013)	-0.0019*** (0.0007)
Rural (urban=0; rural=1)	0.1870*** (0.0086)	0.0817*** (0.0135)	0.1668*** (0.0055)	0.0780*** (0.0117)	0.1578*** (0.0110)	0.0923*** (0.0162)	0.2324*** (0.0081)	0.0950*** (0.0174)
Educated (no=0; yes=1)	-0.1083*** (0.0076)	-0.1464*** (0.0089)	-0.1551*** (0.0054)	-0.1508*** (0.0104)	-0.1099*** (0.0140)	-0.1722*** (0.0128)	-0.1667*** (0.0104)	-0.1774*** (0.0141)
Consulted at hospital (no=0; yes=1)	-0.0759*** (0.0142)	-0.0140 (0.0122)	-0.0084 (0.0108)	-0.0068 (0.0114)	-0.0873*** (0.0150)	-0.0394*** (0.0147)	-0.0264** (0.0128)	-0.0283** (0.0134)
Married (no=0; yes=1)	-0.0161 (0.0102)	-0.0568*** (0.0085)	-0.0450*** (0.0078)	-0.0597*** (0.0086)	-0.0176 (0.0123)	-0.0513*** (0.0120)	-0.0092 (0.0123)	-0.0504*** (0.0122)
Employment Status (Base=Unemployed)								
Retired/Inactive	-0.0092 (0.0183)	-0.0185 (0.0182)	0.0099 (0.0169)	-0.0121 (0.0177)	-0.0150 (0.0218)	-0.0132 (0.0230)	-0.0261 (0.0203)	-0.0159 (0.0230)
Employee	-0.1018*** (0.0165)	-0.0495** (0.0193)	-0.1388*** (0.0136)	-0.0555*** (0.0201)	-0.0542*** (0.0247)	-0.0278 (0.0246)	-0.1624*** (0.0233)	-0.0493 (0.0318)
Self Employed	-0.0526*** (0.0148)	0.0127 (0.0163)	-0.0602*** (0.0129)	0.0114 (0.0159)	-0.0680*** (0.0174)	0.0439** (0.0219)	-0.1640*** (0.0166)	0.0246 (0.0306)
Region (Base=Ashanti)								
Other nine regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-stage								
Distance to the nearest bank (km)		-0.0126* (0.0681)		-0.0126* (0.0681)		-0.0197** (0.0083)		-0.0197** (0.0083)
Observations	9,497	9,497	9,497	9,497	4,308	4,308	4,308	4,308
Wald chi2	2448.88***	15575.01***	475.11***	14249.58***	1014.84***	7943.21***	238.52***	7846.05***
Pseudo R2	0.3869		0.1350		0.3471		0.1129	
Wald test of exogeneity: chi2		33.96***		39.89***		16.04***		18.19***
F-test for first-stage regression		11.31		11.31		10.42		10.42

Instrumented: Financial inclusion index **Instrument:** Distance to the nearest bank (km)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 ME: Marginal effect
IVProbit: Instrumental Variable Probit

Location-wise (see Table 5), improvement in FI for rural households reduces their likelihood of being poor currently by about 38 percent, compared to a reduction of about 22 percent for urban households. With regard to vulnerability, an improvement in FI for rural households can reduce future risk of poverty by about 39 percent, compared to a similar reduction in future poverty by about 22 percent for urban households. Relatively, FI reduces current and future risk of poverty by about 16 percent and about 17 percent more for rural than urban households, respectively. With evidence that poverty is largely a rural phenomenon (Bhavnani, Chiu, Janakiram, Silarszky, & Bhatia, 2008; GSS, 2018), the enhancement of FI can go a long way to better the lives of rural households. The transmission mechanism from the link between distance to the nearest bank and FI to reductions in poverty is further clarified by the examination of the rural-urban differential effect of FI on poverty and VtP, because one may argue that availability of banks within the two locations are not the same. Such an analysis gives an opportunity to avoid biases and to assess the effect of the instrument in optimizing the effect of FI in the two locations.

Table 5: IV probit regression for effect of FI on poverty and VtP in rural and urban households

Variables	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	Rural								Urban							
	Poverty				Vulnerability to Poverty				Poverty				Vulnerability to Poverty			
	Probit		IVProbit		Probit		IVProbit		Probit		IVProbit		Probit		IVProbit	
	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	ME	
Financial inclusion index	-0.0234***	-0.3750***	-0.0146***	-0.3863***	-0.0013	-0.2209***	-0.0095**	-0.2212***	(0.0043)	(0.0074)	(0.0031)	(0.0060)	(0.0024)	(0.0090)	(0.0037)	(0.0035)
Age of household head	0.0005*	0.0002	0.0006***	0.0002	0.0004	0.0002	0.0004	0.0002	(0.0003)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	
Household size	0.0781***	0.0495***	0.0497***	0.0451***	0.0294***	0.0650***	0.0004	0.0647***	(0.0041)	(0.0043)	(0.0068)	(0.0036)	(0.0036)	(0.0072)	(0.0080)	(0.0047)
Household size squared	-0.0029***	-0.0020***	0.0023**	-0.0011***	-0.0013***	-0.0035***	0.0055***	-0.0034***	(0.0003)	(0.0002)	(0.0009)	(0.0003)	(0.0003)	(0.0005)	(0.0009)	(0.0006)
Female (male=0; female=1)	-0.0076	-0.0152	-0.0013	-0.0146	-0.0055	-0.0040	-0.0064	-0.0039	(0.0122)	(0.0098)	(0.0079)	(0.0097)	(0.0076)	(0.0098)	(0.0106)	(0.0097)
Educated (no=0; yes=1)	-0.1468***	-0.1805***	-0.1709***	-0.1873***	-0.0501***	-0.1394***	-0.1410***	-0.1395***	(0.0107)	(0.0101)	(0.0059)	(0.0106)	(0.0062)	(0.0125)	(0.0077)	(0.0137)
Consulted at hospital (no=0; yes=1)	-0.1245***	-0.0454***	-0.0274***	-0.0305***	-0.0184*	-0.0008	0.0077	-0.0005	(0.0159)	(0.0128)	(0.0100)	(0.0118)	(0.0103)	(0.0138)	(0.0124)	(0.0131)
Married (no=0; yes=1)	-0.0156	-0.0580***	-0.0282***	-0.0606***	-0.0233***	-0.0558***	-0.0397***	-0.0557***	(0.0121)	(0.0095)	(0.0077)	(0.0095)	(0.0080)	(0.0107)	(0.0106)	(0.0101)
Employment Status (Base=Unemployed)																
Retired/Inactive	0.0018	-0.0187	-0.0030	-0.0191	-0.0302*	-0.0166	-0.0167	-0.0191	(0.0216)	(0.0189)	(0.0151)	(0.0178)	(0.0157)	(0.0229)	(0.0212)	(0.0178)
Employee	-0.1227***	-0.0217	-0.1791***	-0.0401*	-0.0522***	-0.0383*	-0.1461***	-0.0401*	(0.0213)	(0.0217)	(0.0147)	(0.0242)	(0.0132)	(0.0220)	(0.0175)	(0.0242)
Self Employed	-0.0625***	0.0267	-0.0840***	0.0153	-0.0449***	0.0283	-0.1239***	0.0153	(0.0176)	(0.0166)	(0.0123)	(0.0175)	(0.0126)	(0.0213)	(0.0168)	(0.0175)
Region (Base=Ashanti)																
Other nine regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes								
First-stage																
Distance to the nearest bank (km)		-0.0200***		-0.0200***		-0.0147***		-0.0147***		(0.0055)		(0.0055)		(0.0033)		(0.0033)
Observations	7,904	7,904	7,904	7,904	5,901	5,901	5,901	5,901								
Wald chi2(20)	2187.47***	14050.62***	479.64***	12397.24***	517.72***	10056.45***	312.22***	10821.87***								
Pseudo R2	0.2762		0.1364		0.2483		0.1375									
Wald test of exogeneity: chi2(1)		36.10***		43.76***		12.93***		12.63***								
F-test for first-stage regression		11.71		11.71		10.81		10.81								

Instrumented: Financial inclusion index **Instrument:** Distance to the nearest bank (km)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 ME: Marginal effect
IVProbit: Instrumental Variable Probit

4.2 Relationship between the FI indicators and poverty and VtP

In this subsection, we separately analyze the effect of ownership of a mobile money account, formal bank account and insurance policy on poverty and VtP. We also analyze the influence of access to credit and receipt of remittances. What is excluded is the use of financial products because the ownership and use of financial products dimensions are both defined to be at least one for each household and are thus similarly distributed and exhibit a high level of collinearity. Therefore, we dropped the use of financial product dimension to make the analysis feasible.

Five key findings can be established from the relationship between the FI indicators and poverty (see Table 6). First, ownership of a mobile money account has a negative association with the likelihood of being poor by about 3 percent. Second, ownership of a formal bank account is inversely related to the risk of falling into poverty by about 8 percent. Third, ownership of an insurance policy is negatively linked to the risk of poverty by about 3 percent. Fourth, access to credit has a negative relationship with the likelihood of falling into poverty by about 5 percent. Fifth, remittance recipient households have about 3 percent lower probability of being poor. Our findings support the work of Mohammed et al. (2017), which showed that ownership of formal bank accounts, frequency of withdrawals and access to credit reduce poverty.

Considering future risk of poverty, four findings can be established from the vulnerability-reducing effect of the FI indicators (see Table 6). First, ownership of a mobile money account has a negative association with the future risk of poverty by about 3 percent. Second, ownership of a formal bank account is negatively related to the future risk of falling into poverty by about 6 percent. Third, households that own an insurance policy have about 5 percent lower risk of future poverty. Fourth, access to credit is inversely related to the likelihood of falling into future poverty by about 8 percent. The effect of access to credit is likely due to the fact that credit is usually used to expand businesses, and this has a more sustainable and persistent effect on poverty and household welfare outcomes in general. It is also worth noting that receipt of remittances has a significant negative association with poverty and not VtP. This is likely the case because remittances are usually received for immediate, rather than future, use

Table 6: Probit regression for effect of FI indicators on poverty and VtP

Financial inclusion index	Poverty	Vulnerability to Poverty
	ME	ME
Ownership of mobile money account	-0.0315* (0.0163)	-0.0347** (0.0139)
Ownership bank account	-0.0751*** (0.0146)	-0.0593*** (0.0108)
Ownership of insurance policy	-0.0329*** (0.0103)	-0.0461*** (0.0084)
Access to credit	-0.0456* (0.0243)	-0.0769*** (0.0171)
Receipt of remittance	-0.0260*** (0.0092)	0.0010 (0.0085)
Age of household head	0.0005* (0.0003)	0.0006** (0.0003)
Household size	0.0603*** (0.0042)	0.0347*** (0.0075)
Household size squared	-0.0025*** (0.0003)	0.0028*** (0.0009)
Female (male=0; female=1)	0.0061 (0.0110)	-0.0152 (0.0095)
Rural (urban=0; rural=1)	0.1856*** (0.0096)	0.1849*** (0.0064)
Educated (no=0; yes=1)	-0.0893*** (0.0094)	-0.1455*** (0.0071)

Consulted at hospital (no=0; yes=1)	-0.0703*** (0.0143)	-0.0079 (0.0113)
Married (no=0; yes=1)	-0.0104 (0.0110)	-0.0327*** (0.0092)
Employment Status (Base=Unemployed)		
Retired/Inactive	-0.0155 (0.0197)	-0.0169 (0.0182)
Employee	-0.0895*** (0.0189)	-0.1468*** (0.0165)
Self Employed	-0.0586*** (0.0161)	-0.0938*** (0.0145)
Region (Base=Ashanti)		
Other nine regional dummies	Yes	Yes
Observations	6,921	6,921
Wald chi2(25)	1610.22***	397.11***
Pseudo R2	0.3855	0.1508
Hosmer – Lemeshaw (Prob> chi2)	0.235	0.412
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 ME: Marginal effect		

5. Conclusions and recommendations

The conceptual definition of FI has evolved in recent years beyond simply considering adults who possess a bank account to include other dimensions such as; access to credit, ownership of insurance, receipt of remittances and ownership of mobile money accounts. Despite the multidimensional nature of FI, many household-level studies of the FI-poverty nexus have either used simplistic measure of account ownership or, they have employed a variety of indicators separately, without combining them into an FI index. Hence, studies which explore the combined effect of all FI indicators on household poverty are sparse. The FI-VtP nexus has also not received much attention, and the actual effect of FI on VtP is yet to be estimated. The potential endogeneity that exists in the FI-poverty-VtP nexus due to the multidimensional nature of the construct also requires resolution. This study responds to these gaps in the literature by generating an FI index using 15 indicators. VtP is also estimated using cross-sectional data by employing a three-stage FGLS, which is consistent with the current literature.

We examined the effect of FI on poverty and VtP using an IV probit estimation technique that addresses the endogeneity problem by employing distance to the nearest bank as an instrument. Analyses of sub-samples were also undertaken to ascertain the heterogeneities in the effect of FI on poverty and VtP. We also explore the relative effect of FI on poverty and VtP in male- and female-headed households, as well as rural-urban locations.

The findings from our study show that: (i) although the current incidence of poverty in Ghana is 23.4%, the proportion of Ghanaians that are at risk of being poor in the future is 51%; (ii) of the 23.4% who are currently poor, 92% are vulnerable to poverty, while for the 76.6% who are currently not poor, about 39% are vulnerable to poverty; (iii) in the immediate term, FI can reduce the likelihood of being poor by 32 percent, and has the ability to reduce future risk of poverty by 31 percent; (iv) the likelihood of FI reducing poverty and VtP is greater in rural areas than in urban areas; and (v) FI has a greater likelihood of reducing poverty and VtP for female household heads than for male household heads. These findings make FI an effective policy tool in the fight against poverty and provides evidential support to those countries which have pledged to use FI to reduce poverty through the Maya Declaration. FI is also a viable tool to be used in changing the current narrative of poverty being a rural phenomenon.

Governments are advised to improve on the levels of FI by committing more resources to enhancing their regulatory and institutional frameworks that promote access to the financial system. In addition, governments are encouraged to design policies that provide the business environment necessary for private banks to operate and expand services to more distant areas. Such an expansion in services enhances the provision of more supply-side indicators of

financial inclusion, which also fosters the increase in demand-side indicators. By expanding services to reduce distances to banks, current and future risk of poverty are expected to decline.

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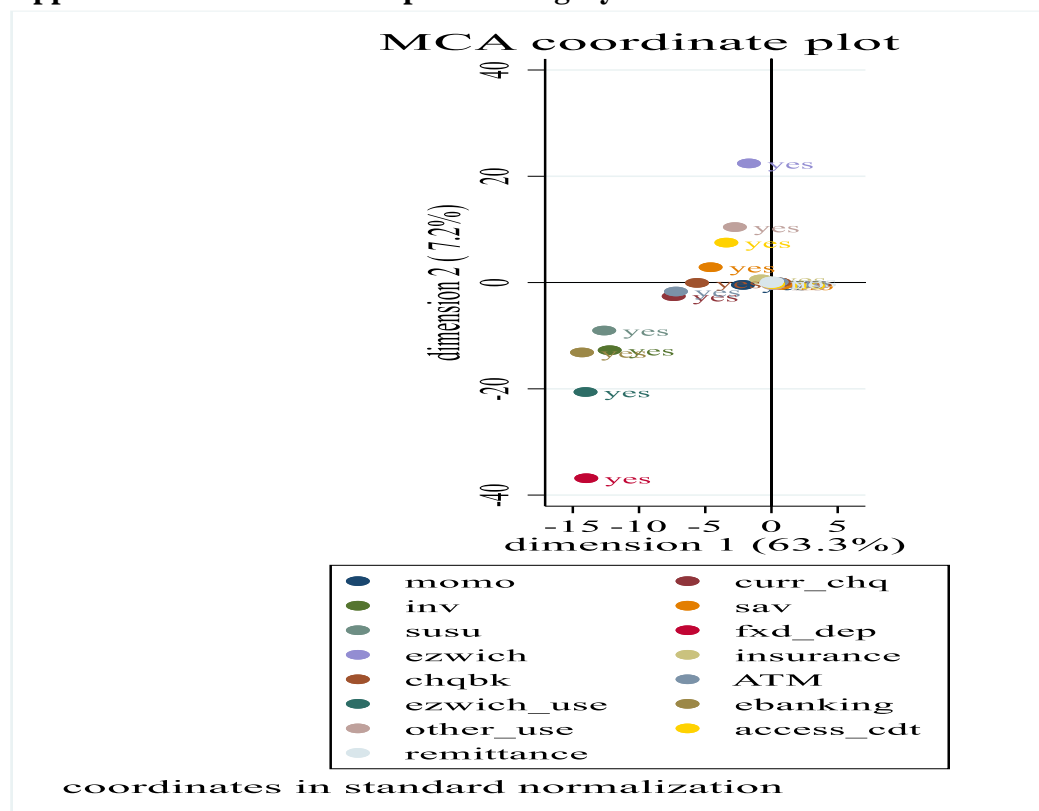
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Appendix 1: Post estimation plot of category coordinates



momo: Ownership of mobile money account
 inv: Ownership of investment account
 susu: Ownership of susu account
 ezwich: Ownership of E-zwich account
 chqbk: Transact using cheque book
 ezwich_use: Transact using E-zwich card
 remittance: Receipt of remittance
 other_use: Transact using any other financial product

curr_chq: Ownership of current or cheques account
 sav: Ownership of savings account
 fxd_dep: Ownership of fixed deposit account
 insurance: Ownership of insurance policy
 ATM: Transact using ATM
 ebanking: Transact using E-banking
 access_cdt: Access to credit

Appendix 2: Summary statistics of variables used in the analyses

Variables	Location						Gender			
	Full		Rural		Urban		Male		Female	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Poor (yes=1; no=0)	0.236	0.425	0.396	0.489	0.079	0.269	0.260	0.438	0.177	0.382
Vulnerability to poverty (yes=1; no=0)	0.512	0.500	0.779	0.415	0.249	0.432	0.527	0.499	0.472	0.499
Ownership of mobile money account	0.093	0.290	0.071	0.258	0.093	0.290	0.083	0.276	0.080	0.272
Ownership bank account	0.190	0.393	0.118	0.323	0.261	0.439	0.203	0.403	0.158	0.365
Ownership of insurance policy	0.235	0.424	0.212	0.408	0.254	0.435	0.228	0.419	0.246	0.431
Access to credit	0.040	0.196	0.033	0.177	0.028	0.164	0.030	0.171	0.030	0.170
Receipt of remittance	0.303	0.460	0.275	0.447	0.269	0.443	0.207	0.405	0.432	0.496
Age of household head	46.994	14.179	47.596	14.602	46.402	13.728	46.360	13.659	48.568	15.286
Household size	5.652	3.291	6.349	3.693	4.968	2.671	6.088	3.483	4.567	2.439
Household size squared	42.772	60.527	53.941	74.803	31.817	39.067	49.198	67.771	26.802	31.558
Female (male=0; female=1)	0.287	0.452	0.248	0.432	0.325	0.468				
Rural (urban=0; rural=1)	0.495	0.500					0.522	0.500	0.428	0.495
Educated (no=0; yes=1)	0.501	0.500	0.373	0.484	0.626	0.484	0.554	0.497	0.369	0.483
Consulted at hospital (no=0; yes=1)	0.098	0.297	0.105	0.306	0.091	0.288	0.081	0.272	0.141	0.348
Married (no=0; yes=1)	0.653	0.476	0.682	0.466	0.624	0.484	0.816	0.388	0.247	0.431
Employment Status										
Unemployed	0.070	0.255	0.066	0.249	0.073	0.260	0.063	0.243	0.087	0.281
Retired/inactive	0.091	0.288	0.084	0.277	0.098	0.298	0.074	0.262	0.134	0.341
Employee	0.249	0.433	0.138	0.345	0.358	0.479	0.301	0.459	0.120	0.325
Self Employed	0.590	0.492	0.711	0.453	0.471	0.499	0.562	0.496	0.660	0.474
Region										
Western	0.100	0.300	0.119	0.324	0.081	0.273	0.104	0.305	0.089	0.285
Central	0.085	0.279	0.093	0.290	0.078	0.268	0.075	0.264	0.110	0.313
Greater Accra	0.162	0.369	0.031	0.174	0.290	0.454	0.161	0.367	0.166	0.372
Volta	0.087	0.281	0.115	0.320	0.058	0.234	0.085	0.279	0.091	0.288
Eastern	0.106	0.308	0.123	0.328	0.090	0.286	0.100	0.299	0.123	0.328
Ashanti	0.194	0.396	0.155	0.362	0.233	0.423	0.174	0.379	0.244	0.430
Brong Ahafo	0.095	0.293	0.106	0.308	0.083	0.276	0.094	0.292	0.096	0.295
Northern	0.101	0.301	0.142	0.349	0.061	0.239	0.129	0.335	0.031	0.175
Upper East	0.042	0.201	0.068	0.251	0.017	0.130	0.047	0.211	0.031	0.173
Upper West	0.028	0.166	0.048	0.214	0.009	0.094	0.033	0.178	0.017	0.130

Source: Computed using GLSS7