A count model of financial inclusion in Ghana: evidence from living standards surveys

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Abstract

Purpose – This paper aims to estimate the determinants of the intensity of use of financial inclusion by households in Ghana.

Design/methodology/approach – Due to the reality of a household using one or more financial products or services, this study uses the generalised Poisson model applied to GLSS6 and GLSS7 data collected in 2012/2013 and 2016/2017 respectively, to estimate the determinants of the intensity of use of financial inclusion. To deepen the analysis, a multinomial probit model is also applied.

Findings – Results show that infrastructural variables such as roads, public transport and banks stimulate the intensity of financial inclusion. In addition, agricultural development characteristics such as markets and cooperatives are essential for the intensity of inclusion.

Research limitations/implications – There is a need to incorporate how many services or depth of services that people use as part of the conceptualisation of financial inclusion, as this can provide more policy-relevant evidence to enhance priority setting in financial inclusion policies. Also, micro-level financial inclusion studies in agrarian economies should consider exploring agricultural development and infrastructure variables in the modelling framework. As lead to further studies, count models of financial inclusion should consider exploring cross-country analysis, the use of panel data, or other methodological approaches to provide more robust evidence.

Originality/value – Previous studies have not modelled financial inclusion based on a count model as a means of measuring intensity though conceptualisations highlight the fact that people use varied financial products or services. Following from this angle, to the best of the authors' knowledge, this study provides the first attempt at analysing the underlying determinants of the number of financial products or services used by households.

Keywords Financial inclusion, Count models, Generalised Poisson model, Ghana

Paper type Research paper

1. Introduction

Financial inclusion is an emerging issue with global relevance. It aims to bring the weaker and vulnerable members of society into the ambit of the organised financial system, ensuring that they access timely and adequate financial products at an affordable price (Chithra and Selvam, 2013; Abel *et al.*, 2018). A significant chunk of financial inclusion studies answers the

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question of the underlying factors that determine individual or household use of financial services and products, especially in developing countries where the use of the services and products is relatively low (see, for example, Allen *et al.*, 2016; Soumare *et al.*, 2016; Zins and Weill, 2016; Klapper and Singer, 2015). These studies use varying statistical and econometric approaches that predict or estimate the factors influencing financial inclusion.

An essential characteristic of these studies is unravelling the determinants of using one financial product or the other. These studies provide evidence that clearly shows that socioeconomic, geographic and macroeconomic variables are vital in stimulating people's access to and use of financial products. Indeed, age, gender, income and education are critical socioeconomic characteristics that influence financial inclusion (Soumare *et al.*, 2016; Zins and Weill, 2016). Further, evidence shows that political stability, proximity to financial intermediaries, legal rights, low account costs, broad money, literacy and internet access are critical macroeconomic variables that determine financial inclusion (see Allen *et al.*, 2016; Evans and Adeoye, 2016). Based on these determinants, policy-relevant recommendations are proffered to guide policy-making.

Despite the important contributions of these determinant studies to policy and literature, an important issue that is fundamentally ignored is the intensity of people's use of financial products (i.e. the number of products or services). In other words, though the extant literature recognises that people use many financial products, it conceptualises and applies econometric models that view these products as stand-alone rather than multilevel concepts. Thus, this study aims to estimate the underlying determinants of the number of financial products used by households in Ghana. By basing the analysis on a different measure of financial usage, this study aims to enhance the financial inclusion literature.

The importance of focussing on the drivers of the number of financial products people use cannot be overemphasised. It is not just enough to be financially included; the depth of inclusion matters. On the supply side of financial inclusion, there are calls to deepen financial inclusion, and some studies (e.g. Adenuga and Omotosho, 2013) have found that financial depth positively influences economic growth. Thus, it is expected that the depth of financial inclusion on the demand side could also improve the lot of people. More importantly, this dimension indirectly relates to the "too much finance" discourse introduced by Arcand *et al.* (2015), which estimated a threshold of financial development optimal for growth. At the micro-level, financial inclusion is viewed to be in layers constituting various products that people access and use. The microeconomic literature has not recognised this not because it is not relevant or theoretically appealing but because financial inclusion is an emerging area.

In terms of policy, gaining insight into the determinants of the intensity of use of financial products is necessary for achieving an all-inclusive and deepened financial system and provides the capacity for people to enjoy the full benefits of financial inclusion. On the empirical front, this dimension presents the first attempt to apply a count model to financial inclusion, thus extending the discourse on financial inclusion. In addition, the studies of financial inclusion determinants conducted at the individual or household level do not prioritise the inclusion of infrastructural variables (such as road, transport and bank), and those that relate to rural economies do not include agricultural variables (such as market and cooperatives). The inclusion of these variables in the analysis in this study represents an added contribution.

Considering financial inclusion as a count variable, this paper applies a generalised Poisson model that can appropriately handle under-dispersion and over-dispersion of count data variables. The evidence highlights that infrastructural variables such as roads, public transport and banks stimulate the intensity of financial inclusion. Agricultural development characteristics such as markets and cooperatives are essential in increasing the number of financial products used by people. While this study does not solve all the empirical issues in the financial inclusion literature, it does provide an essential shift in the conceptualisation and measurement of financial inclusion.

1.1 Policies stimulating financial inclusion in Ghana

The Economic Recovery Programme and the Structural Adjustment Programme jointly implemented by the World Bank and the International Monetary Fund in the early 1980s provided the main policy direction that changed Ghana's financial inclusion landscape. These programmes induced financial sector reforms and liberalisation and laid the foundation for expanding financial services. As a result, several regulatory and legal structures were developed. For example, in 1988, the Financial Sector Adjustment Programme (FINSAP) was implemented to develop money and capital markets, remove interest ceilings, privatise banks and improve the efficiency of savings mobilisation and credit allocation.

A notable action by the Bank of Ghana to ensure broad-based access to financial services was the creation of Rural and Community Banks in 1976 and the passing of the Non-Banking Financial Institution (NBFI) Law in 1993. These specific actions resulted in the emergence of new financial institutions, which added diversity and depth to the financial system. The NBFI law facilitated the growth and formalisation of microfinance institutions, boosting financial access for the unbanked, mostly rural dwellers and the urban poor. The Financial Sector Strategic Plan (FINSSP) launch in 2003 introduced universal banking, where banks were free to roll out various banking services without needing separate licenses. From 2003, the Bank of Ghana primarily concentrated on regulatory reforms to consolidate the gains in implementing earlier reforms.

In recent times, other policy initiatives have been undertaken. For example, Ghana signed the Maya Declaration in 2012, which seeks to develop financial literacy programmes as a member of the Alliance for Financial Inclusion. In 2016, the Ghana Digital Financial Services programme was launched to promote the financial inclusion agenda by facilitating access to low-cost financial services. Mobile money services, electronic banking and branchless banking have been promoted. In 2017, the government abolished the 17.5% VAT imposed on financial services, reducing the cost of accessing them.

We organise the rest of the paper as follows: Section 2 reviews related literature on financial inclusion, while Section 3 presents the method employed in the study. The results and the discussion are shown in Sections 4 and 5, respectively. Finally, Section 6 concludes the study.

2. Literature review

Financial inclusion has become an integral part of development for both developing and developed countries. The basis is the consensus that finance, or financial development stimulates economic growth (Ghosh and Vinod, 2017; Swamy, 2014). Goldsmith (1969) proposed an empirical relationship between financial development and economic growth. McKinnon (1973) and Shaw (1973) later argued that the financial system positively affects growth. Indeed, some empirical evidence confirms that financial development promotes economic growth. For example, Guru and Yadav (2019) have shown that key financial variables (including the size of financial intermediaries, credit-to-deposit ratio and credit to the private sector) positively correlate with economic growth. Also, studies such as Michael and Sharon (2014), Raza *et al.* (2019), Williams *et al.* (2017), Kodan and Chhikara (2013) and Sethi and Acharya (2018) revealed that financial inclusion has a positive impact on economic growth and development. Raza *et al.* (2019) stressed that access to finance enhances the ability of people to engage in economic activities that lead to development.

Given the theoretical and empirical importance of financial inclusion, numerous studies (e.g. Chikalipah, 2017; Allen *et al.*, 2016; Evans and Adeoye, 2016; Soumare *et al.*, 2016; Zins and Weill, 2016; Klapper and Singer, 2015; Aterido *et al.*, 2013) have applied various econometric models investigating the determinants of financial inclusion by using either cross-sectional, time series or panel data.

In general, determinants of financial inclusion studies are partitioned into two: studies examining determinants at the macro-level—that is, at the country-level—and studies at the micro-level—which concentrate on individuals or households. Macro-level studies (e.g. Datta and Singh, 2019; Gebrehiwot and Makina, 2019; Sarma and Pais, 2011; Allen *et al.*, 2016; Evans and Adeoye, 2016) highlight the role of macroeconomic variables in stimulating financial inclusion. There is consensus in these studies that economic growth is a positive correlate of financial inclusion. For example, Gebrehiwot and Makina (2019) provide evidence that lagged and current GDP per capita positively influence financial inclusion, implying that growth stimulates the development of an inclusive financial system. Using an index of financial inclusion involving 47 countries, Sarma and Pais (2011) also observed GDP per capita as a positive correlate with an index of financial inclusion. Datta and Singh (2019) note that the positive effect of growth follows the channel of improved income and enhanced capability, which induce expansion in the financial sector.

Another important macro-level determinant widely discussed in the literature is the role of financial literacy. Evans and Adeoye (2016) and Chithra and Selvam (2013) reveal that financial literacy promotes financial inclusion, while Datta and Singh (2019) observe a positive effect of education on financial inclusion. Rasool and Ullah (2020) argue that innovative financial products stress the importance of financial literacy in boosting financial inclusion. Other key variables determining financial inclusion include the availability of infrastructure such as mobile networks and internet (Evans and Adeoye, 2016; Gebrehiwot and Makina, 2019; Chithra and Selvam, 2013), political stability, proximity to financial intermediaries, legal rights and low account costs (Allen *et al.*, 2016), and population size (Chithra and Selvam, 2013; Nandru *et al.*, 2016).

Micro-level financial inclusion studies highlight the importance of socioeconomic and geographic characteristics on financial inclusion. For example, Soumare *et al.* (2016) revealed that financial inclusion is influenced by age, education, gender, employment status and income, among others in Central and West Africa. These characteristics are confirmed by Zins and Weill (2016), who showed that age, gender, income and education are the influencing factors of financial inclusion in Africa. Other important studies confirming the role of these socioeconomic variables include Ghosh and Vinod (2017), Allen *et al.* (2016), Klapper and Singer (2015) and Aterido *et al.* (2013). In these studies, there is agreement that females are less likely to use financial services than males. Indeed, Ghosh and Vinod (2017) observed that female-headed households are 8% less likely to access formal finance than male-headed households in India. These studies identify education to be a key factor in stimulating financial inclusion. Furthermore, the evidence indicates that more educated people are more likely to use financial services than less educated ones. For example, Soumare *et al.* (2016) found that people with tertiary or more educational attainment are seventeen times and six times more likely to own an account than those with primary education or less in West Africa and Central Africa, respectively.

Following the evidence from these previous studies, this study advances the following hypothesis:

H1. Infrastructure, agricultural development and socioeconomic variables are positive correlates of the intensity of financial inclusion.

Empirical micro-level financial inclusion studies predominantly apply quantile choice models to take care of the binary nature of financial products —whether a person or household uses a particular financial product or not. Specifically, the literature is inundated with the use of the probit model (e.g. Klapper and Singer, 2015; Allen *et al.*, 2016; Zins and Weill, 2016; Ghosh and Vinod, 2017; Aterido *et al.*, 2013), though some studies apply the logit model (e.g. Soumare *et al.*, 2016). Other studies apply the multinomial logit or probit model (e.g. Klapper and Singer, 2015). However, these models become unusable with the conceptualisation of financial

inclusion as a count variable. The appropriate modelling framework for a count-dependent variable is the Poisson distribution model, first developed by Poisson (1837). The empirical literature has extensively applied varying count data models based on the Poisson distribution (e.g. Frome *et al.*, 1973; Frome, 1983; Holford, 1983; Isgin *et al.*, 2008).

3. Method

3.1 Data and variables

We used the Ghana Statistical Service's Ghana Living Standards Survey (GLSS) rounds seven and six (GLSS7 and GLSS6) household-level datasets. The GLSS7 is the newest and latest in the GLSS series (currently 7) and was collected between October 2016 and October 2017, while the GLSS6 dataset was collected between October 2012 and October 2013. The datasets involve a stratified and nationally representative random sample of 14,009 and 16,772 households in 1,000 and 1,200 enumeration areas, respectively. We considered the GLSS7 and GLSS6 because the other series do not have all the data on the essential variables of financial inclusion (e.g. bank, savings, credit and insurance). For example, the GLSS5 has data on credit and savings but not bank and insurance.

Among the datasets in Ghana, the GLSS series is the richest and the most comprehensive and provides the necessary data for monitoring and evaluating the impact of development policies and programmes on the living conditions of Ghanaians. However, the GLSS data series are not built in a panel series as each dataset involves a new resampling of households. Thus, GLSS7 and GLSS6 are not panel data. Instead, we used a repeated or multiple cross-sectional analysis framework to examine the two datasets separately. In this way, we can trace how stable the estimates are over the two time periods covered by the datasets.

In this study, financial inclusion is conceptualised and explicitly defined as four different alternative dependent dummy variables indicating (1) whether a household has a bank account in a formal financial institution, (2) whether a household has a savings account at a formal financial institution, (3) whether a household has applied and received credit from a financial institution and (4) whether a household has an insurance policy. The specific variables used are presented in Table 1.

The literature primarily informs the use of these variables. Studies (Allen *et al.*, 2016; Soumare *et al.*, 2016; Zins and Weill, 2016; Klapper and Singer, 2015) have focussed on modelling the effect of household-specific factors on financial inclusion. Community characteristics (such as roads, means of transport and phone network) provide the opportunity to determine the role of access-proximity costs on financial inclusion. We also include some agricultural variables (such as market access, membership in farmer-based organisations) to capture their effects on financial inclusion.

3.2 Analytical procedures

The four conceptualisations of financial inclusion (see Table 1) provide the basis for an empirical econometric model. In most financial inclusion studies that explore its underlying determinants (see, for example, Allen *et al.*, 2016; Soumare *et al.*, 2016; Zins and Weill, 2016; Klapper and Singer, 2015), standalone modelling frameworks (e.g. binary models such as probit and logit) are used. However, because some households use at least one of these four financial inclusion measures, an alternative modelling framework must be employed to handle this situation. Table 2 presents the descriptive statistics of financial inclusion for the two datasets.

Table 2 shows the reality of households using at least one financial product. The results indicate that there has been an improvement in financial inclusion since the percentage of households who did not use any of the financial inclusion measures dropped from 59 to 42.44% between 2012/2013 and 2016/2017.

Description	Measurement
Financial inclusion (FI) variables	
Ownership of bank account	Dummy: 1 = if yes; 0 = otherwise
Ownership of savings account	Dummy: 1 = if yes; 0 = otherwise
Access to credit	Dummy: 1 = if yes; 0 = otherwise
Insurance policy	Dummy: 1 = if yes; 0 = otherwise
Count of FI variables	Discrete: 4 = use of all four FI variables; 3 = use of any three variables; 2 = use of any two variables; 1 = use of any one variable; 0 = no use of any variable
Socioeconomic characteristics	
Age of household head	Number of years
Male head	Dummy: 1 = if male; 0 = otherwise
Household size	Number of people in a household
Married household head	Dummy: 1 = if married; 0 = otherwise
Educational level	Number of years spent in school
Employed in agriculture	Dummy: 1 = if yes; 0 = otherwise
Self-employed	Dummy: 1 = if yes; 0 = otherwise
Multiple job engagement	Dummy: 1 = if yes; 0 = otherwise
Receipt of remittance	Dummy: 1 = if yes; 0 = otherwise
Ownership of enterprise	Dummy: 1 = if yes; 0 = otherwise
Geographic and community-specific characteristics	
Head in a rural locality	Dummy: 1 = if rural; 0 = otherwise
The community has a motorable road	Dummy: 1 = if yes; 0 = otherwise
The community has public transport	Dummy: 1 = if yes; 0 = otherwise
The community has a post office	Dummy: 1 = if yes; 0 = otherwise
The community has a phone network	Dummy: 1 = if yes; 0 = otherwise
Community has bank	Dummy: 1 = if yes; 0 = otherwise
The community has a periodic market	Dummy: 1 = if yes; 0 = otherwise
Membership in FBO and cooperatives	Dummy: 1 = if yes; 0 = otherwise
Number of times crops are grown/season	Dummy: 1 = if twice; 0 = otherwise

Note(s): FBO represents farmer-based organisation
Source(s): Own elaboration

Table 1. Description and measurements of variables

	GLSS6		GLSS7	
Number of FI products used	Frequency	Percent (%)	Frequency	Percent (%)
0	5,454	59.0	5,946	42.44
1	1,613	17.45	2,946	21.03
2	1,436	15.53	3,397	24.25
3	635	6.87	1,526	10.89
4	106	1.15	194	1.38
Mean	0.737		1.077	
Variance	1.054		1.221	

Source(s): Own elaboration

Table 2. Descriptive statistics of financial inclusion measures

The evidence presented in Table 2 provides a platform to generate a discrete and nonnegative integer-valued count variable that serves as the dependent variable of this study. Such variables follow the Poisson distribution derived by Poisson (1837). Following this distribution, the number of financial products at any given y_i is modelled (Cameron and Trivedi, 2013; Greene, 2008; Maddala, 1983; Winkelmann, 2008) as

$$Prob(Y_i = y_i|x_i)\frac{e^{-\lambda_i}\lambda_i^{y_i}}{y_i!}, \lambda_i \in \mathbb{R}^+, y_i = 0, 1, 2, 3, 4$$

where $\lambda_i = E(y_i|x_i) = Var(y_i|x_i)$ with the mean specified as $\lambda_i = exp(x_i\beta)$. x_i is a vector of variables defined for each household, and β is a vector of estimated parameters. A typical partial effect within the model framework is specified as

$$\frac{\partial E(y_i|x_i)}{\partial x_i} = \lambda_i\beta$$

However, the fundamental assumption of equidispersion, which is a situation where the mean and variance of the count distribution are equal (Greene, 2007; Winkelmann, 2008), represents the weakness of the basic Poisson model, and thus, it is not applied in this study. In the empirical literature, the variance usually exceeds the mean (Harris *et al.*, 2012). Greenwood and Yule (1920) developed the negative binomial distribution as a generalisation of the Poisson capable of dealing with overdispersed data (i.e. variance exceeding the mean) and applied by numerous studies (e.g. Frome *et al.*, 1973; Frome, 1983; Holford, 1983).

In a seminal paper, Consul and Famoye (1992) developed the generalised Poisson model as a generalisation of all Poisson models, following the development of the generalised Poisson distribution (see Consul and Jain, 1973; Consul, 1989). This model is designed to handle both underdispersion and overdispersion of count data and has been applied by some empirical studies (e.g. Wang and Famoye, 1997; Cui *et al.*, 2006; Famoye *et al.*, 2004; Famoye and Singh, 2006; Harris *et al.*, 2012). This study applies the generalised Poisson because of its ability to deal with both underdispersion and overdispersion. For a count variable Y, that can exhibit any of all the possible dispersions (i.e. equi-, over- and underdispersion), the variable is considered to have a generalised Poisson distribution and assumes that it has a probability mass function specified as

$$f(y_i, \lambda_i, \delta) = \frac{(\lambda_i + \delta y_i)^{y_i - 1} e^{-\lambda_i - \delta y_i}}{y_i!}, y_i = 0, 1, 2, \ldots$$

where $\lambda_i > 0 > 0$ and $\max(1, \lambda_i/4) < \delta < 1$. The corresponding mean and variance are specified as: $\mu_i = E(Y_i) = \frac{\lambda_i}{1-\delta}$, $Var(Y_i) = \frac{\lambda_i}{(1-\delta)^3} = \frac{1}{(1-\delta)^2}E(Y_i) = \phi E(Y_i)$

where $\phi = {}^{1}\!/_{(1-\delta)^2}$ represents the dispersion parameter. When $\delta = 0$, we are dealing with the situation of equidispersion; when $\delta > 0$, then there is overdispersion; and when $\delta < 0$, then there is underdispersion. The corresponding likelihood function describing the generalised Poisson framework is specified as

$$\mathcal{L} = \sum_{i=1}^{n} \mathcal{L}(\lambda_i, \delta; y_i) = \sum_{i=1}^{n} lnL(\lambda_i, \delta; y_i)$$

$$= \sum_{i=1}^{n} \{ln\lambda_i + (y_i - 1)ln(\lambda_i + \delta y_i) - (\lambda_i + \delta y_i) - lny_i!\}$$

Following Consul and Famoye (1992) and Consul (1989), we can include explanatory variables into the theoretical set-up to run a regression through the relationship:

$$log\frac{\lambda_i}{1-\delta} = \sum_{r=1}^{\rho} x_{ir}\beta_r$$

where x_{ir} represents the i^{th} observation of the r^{th} explanatory variable, ρ denotes the number of explanatory variables in the empirical model and β_r is the r^{th} regression parameter to be estimated.

To deepen the analysis level, we applied a multinomial probit model to cater for the differences in determinants between households that used only one financial product and those that used at least two products.

4. Results

4.1 Characteristics of the sample

Table 3 presents the descriptive statistics of the individual financial inclusion and explanatory variables. Apart from access to credit, proportionally, there has been an increase in the use of bank accounts, savings accounts and insurance. This may indicate that the policies from the Bank of Ghana to increase financial inclusion in Ghana are yielding the desired impact, albeit gradually. The improvement in financial inclusion between the two datasets is further demonstrated in the statistics from the count financial inclusion variable, where the means are 1.077 and 0.737 for GLSS6 and GLSS7, respectively. However, more still must be done to improve the intensity of the use of financial products in Ghana.

Variable	GLSS7 (n = 14,009) Mean[a]	S.D.	GLSS6 (n = 9,244) Mean	S.D.
Ownership of bank account	0.483	0.500	0.295	0.456
Ownership of savings account	0.294	0.455	0.181	0.385
Access to credit	0.076	0.264	0.083	0.276
Insurance policy	0.225	0.418	0.178	0.382
Count of FI variables	1.077	1.105	0.737	1.027
Age of household head	46.24	15.91	47.27	16.32
Male head	0.688	0.463	0.763	0.425
Household size	4.200	2.867	4.766	2.966
Married household head	0.645	0.479	0.736	0.441
Number of years spent in school	6.472	5.357	5.160	4.886
Employed in agriculture	0.413	0.492	0.734	0.442
Self-employed	0.552	0.497	0.818	0.385
Multiple job engagement	0.137	0.344	0.269	0.443
Receipt of remittance	0.054	0.226	0.353	0.478
Ownership of enterprise	0.426	0.495	0.383	0.486
Head in rural locality	0.570	0.495	0.931	0.253
Community has motorable road	0.968	0.175	0.845	0.362
Community has public transport	0.767	0.423	0.592	0.492
Community has post office	0.168	0.374	0.053	0.224
Community has phone network	0.829	0.376	0.801	0.399
Community has bank	0.362	0.481	0.089	0.285
Community has periodic market	0.046	0.210	0.122	0.327
Membership in FBO and cooperatives	0.135	0.341	0.109	0.312
Number of times crops are grown/season	0.228	0.420	0.326	0.469

Table 3.
Descriptive statistics of the sample

Note(s): "a" denotes means for dummy variables which are proportions/percentages for the "1" groups for the various variables; S.D. represents standard deviation; FBO represents farmer-based organisation
Source(s): Own elaboration

Another significant trend in Table 3 is that there has been an improvement in infrastructure between the two periods, demonstrated by the increase in access to motorable roads, public transport, post offices, phone networks and banks.

4.2 Determinants of the financial inclusion intensity

The determinants of the intensity of financial inclusion are presented in Table 4. We find evidence of underdispersion for the GLSS7 and overdispersion for the GLSS6 dataset since the delta parameters are negative (for GLSS7), positive (for GLSS6) and statistically significant.

This evidence justifies the use of the generalised Poisson model. The results indicate that different factors are significant determinants of intensity for each dataset. However, we concentrate the discussions on factors that simultaneously determine the two datasets. On this basis, we identify the age of the household head, household size, married household head, number of years spent in school, employed in agriculture, self-employed, multiple job engagement, receipt of remittances, ownership of an enterprise, the community has motorable roads, the community has public transport, the community has a bank, the community has a periodic market, membership in FBO and cooperatives and number of times crops are grown/season as the significant factors that simultaneously determine the intensity of use of financial inclusion for both GLSS7 and GLSS6.

All these variables exhibit directionally positive effects on the intensity of financial inclusion for the two datasets except employed in agriculture, age of household head and self-employed. For these three variables, employed in agriculture has simultaneous negative effects, while the age of the household head and self-employment have mixed impacts on the intensity of financial inclusion. The age of the household head is a negative and significant determinant for GLSS7 but a positive and significant determinant for GLSS6. At the same time, the self-employed shows a positive and significant determinant for GLSS7 but a negative and significant determinant for GLSS6.

Further, the results of the Multinomial probit estimate of the determinants of the number of financial products used are presented in Table 5. We got two classes of findings on the evidence from the Poisson estimates. First, variables including the male head, married household head, self-employed, ownership of enterprise, the community has a phone network, and the number of times crops are grown/season exhibit different results from those of the Poisson estimates.

Second, variables including household size, education, employed in agriculture, multiple job engagement, receipt of remittances, head in rural locality, motorable road to community, public transport, bank in community, periodic market in community and membership in FBOs and cooperatives exhibit the same results in terms of the direction of the effect as the Poisson estimates.

5. Discussion

5.1 Theoretical implications

The positive and consistent effect of motorable roads, public transport and banks on the intensity of financial inclusion implies that households with access to motorable roads, public transport and banks are not only financially included but are more likely to use a variety of financial products than their counterparts without this infrastructure in their communities. Households with roads, for example, are 10.4 and 8.4% more likely to use numerous financial products than those without roads, respectively, for the GLSS7 and GLSS6 datasets. These findings demonstrate the importance of infrastructure in stimulating the use of various financial products. The most plausible reason is that the infrastructure provides a platform

Variable	GLSS7 Coefficient	GLSS7 ME	GLSS6 Coefficient	GLSS6 ME
Socioeconomic characteristics				
Age of household head	−0.001*	−0.001*	0.002*	0.001*
	(0.000)	(0.000)	(0.001)	(0.001)
Male head	0.011	0.012	0.058	0.043
	(0.014)	(0.015)	(0.037)	(0.027)
Household size	0.012***	0.013***	0.018***	0.013***
	(0.003)	(0.003)	(0.005)	(0.004)
Married household head	0.032**	0.034**	0.140***	0.103***
	(0.015)	(0.016)	(0.036)	(0.027)
Number of years spent in school	0.039***	0.042***	0.090***	0.066***
	(0.001)	(0.001)	(0.003)	(0.002)
Employed in agriculture	−0.199***	−0.215***	−0.307***	−0.226***
	(0.019)	(0.020)	(0.036)	(0.026)
Self-employed	0.084***	0.091***	−0.177***	−0.131***
	(0.015)	(0.016)	(0.035)	(0.026)
Multiple job engagement	0.104***	0.112***	0.102***	0.076***
	(0.016)	(0.017)	(0.028)	(0.021)
Receipt of remittance	0.049**	0.053**	0.103***	0.076***
	(0.024)	(0.026)	(0.027)	(0.020)
Ownership of enterprise	0.086***	0.092***	0.203***	0.150***
	(0.015)	(0.016)	(0.029)	(0.021)
Geographic and community-specific characteristics				
Head in rural locality	−0.131***	−0.141***	−0.068	−0.050
	(0.013)	(0.014)	(0.044)	(0.032)
Community has motorable road	0.097**	0.104**	0.113**	0.084**
	(0.044)	(0.048)	(0.050)	(0.037)
Community has public transport	0.030*	0.033*	0.227***	0.167***
	(0.016)	(0.017)	(0.036)	(0.027)
Community has post office	−0.065***	−0.071***	−0.081	−0.060
	(0.017)	(0.018)	(0.055)	(0.040)
Community has phone network	−0.012	−0.013	−0.207***	−0.153***
	(0.017)	(0.018)	(0.034)	(0.025)
Community has bank	0.069***	0.075***	0.301***	0.222***
	(0.015)	(0.016)	(0.041)	(0.030)
Community has periodic market	0.107***	0.116***	0.138***	0.102***
	(0.023)	(0.025)	(0.037)	(0.027)
Mem. in FBO and cooperatives	1.040***	0.121***	0.143***	0.106***
	(0.012)	(0.012)	(0.037)	(0.027)
No. of times crops grown/season	0.028**	0.030**	0.089***	0.066***
	(0.014)	(0.015)	(0.028)	(0.021)
Constant	−0.609***		−1.153***	
	(0.054)		(0.091)	
Observations	14,009		9,244	
Wald chi-square	12052.89***		3657.19***	
Log pseudo likelihood	−16044.875		−9777.014	
Delta	−0.182***		0.103***	
	(0.007)		(0.006)	
LR test of delta	612.02***		180.82***	

Note(s): Robust standard errors in parentheses; ME is marginal effect; *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$
Source(s): Own elaboration

Table 4.
Generalised Poisson estimates of the financial inclusion intensity

Variable	GLSS7		GLSS6	
	2 products	3 and 4 products	2 products	3 and 4 products
Age of household head	−0.000	0.002	−0.004	0.008***
	(0.002)	(0.004)	(0.002)	(0.003)
Male head	0.226***	0.247**	0.494***	0.428***
	(0.059)	(0.124)	(0.092)	(0.107)
Household size	0.025***	0.036*	0.030**	0.053***
	(0.010)	(0.020)	(0.012)	(0.014)
Married household head	0.015	0.358***	0.036	0.106
	(0.059)	(0.126)	(0.089)	(0.104)
Number of years spent in school	0.068***	0.090***	0.076***	0.120***
	(0.005)	(0.012)	(0.007)	(0.008)
Employed in agriculture	−0.342***	−0.516***	−0.297***	−0.476***
	(0.069)	(0.160)	(0.085)	(0.096)
Self-employed	0.240	0.010	0.075	−0.296
	(0.260)	(0.140)	(0.088)	(0.397)
Multiple job engagement	0.017***	0.367***	0.226***	0.115***
	(0.008)	(0.121)	(0.069)	(0.007)
Receipt of remittance	0.201***	0.234***	0.275***	0.299***
	(0.007)	(0.011)	(0.066)	(0.076)
Ownership of enterprise	0.045	0.061	−0.031	−0.127
	(0.058)	(0.128)	(0.070)	(0.082)
Head in rural locality	−0.296***	−0.378***	−0.015	−0.220
	(0.054)	(0.130)	(0.113)	(0.142)
Community has motorable road	0.427***	0.255***	0.153***	0.121**
	(0.032)	(0.077)	(0.001)	(0.031)
Community has public transport	0.212***	0.527***	0.154**	0.244***
	(0.061)	(0.146)	(0.017)	(0.015)
Community has post office	−0.326***	−0.064	0.231	−0.209
	(0.072)	(0.145)	(0.155)	(0.181)
Community has phone network	−0.134	0.070	0.032	−0.024
	(0.169)	(0.159)	(0.080)	(0.095)
Community has bank	0.348***	0.234***	0.153***	0.748***
	(0.063)	(0.015)	(0.002)	(0.125)
Community has periodic market	0.012**	0.089***	0.028**	0.644***
	(0.003)	(0.008)	(0.005)	(0.104)
Mem. in FBO and cooperatives	0.174**	5.205***	0.192*	0.256**
	(0.029)	(0.126)	(0.099)	(0.108)
No. of times crops grown/season	−0.055	0.439***	0.057	0.002
	(0.060)	(0.122)	(0.066)	(0.077)
Constant	−0.530***	−3.955***	−0.593***	−2.054***
	(0.176)	(0.424)	(0.221)	(0.257)
Observations	8,063		3,790	
Chi-square	3182.0***		730.71***	
Log pseudolikelihood	−4745.21		−3553.93	

Note(s): Base outcome is households using only one financial product; the sample for those using 4 products are few to support its standalone estimates, thus they combined with those using 3 products; *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Source(s): Own elaboration

Table 5. Multinomial probit estimates of the number of financial products used

for households to reduce transaction costs in accessing and utilising financial products. For example, navigable roads and public transport boost the movement to access various financial products at a relatively reduced cost. In developing economies such as Ghana, transaction costs in the form of transportation fares are based on the nature of the road and the availability of means of transport. Therefore, communities with these roads and transport have lower fares to pay to access financial products.

Moreover, the presence of banks reduces the transaction cost involved in searching for and travelling to financial institutions, thus increasing the intensity of the use of financial products. These findings are consistent with those of Chithra and Selvam (2013) and Sarma and Pais (2011), who also found that road network is a positive and significant determinant of financial inclusion. Sarma and Pais (2011) maintain that a paved road network is a basic requirement for setting up bank branches and ATM networks in rural and less densely populated areas. Moreover, these findings confirm the findings from macro-level studies (e.g. Evans and Adeoye, 2016; Gebrehiwot and Makina, 2019; Chithra and Selvam, 2013) that highlight the importance of infrastructure in stimulating financial inclusion.

Furthermore, the consistently positive effect of the presence of a market, farmer-based organisations and agricultural cooperatives, and the number of times crops are grown per season show the importance of some agricultural development factors for increasing the use of various financial products. Households with community markets are 11.6 and 10.2% more likely to use numerous financial products than households without access to markets, respectively, for the GLSS7 and GLSS6 datasets. Membership of FBOs and cooperatives increases the intensity of use of financial products, respectively, by 12.1 and 10.6% for the GLSS7 and GLSS6 datasets. The presence of markets stimulates agricultural productivity and commercialisation through access to farm inputs and buyers, respectively, boosting the liquidity of households. This consequently stimulates the demand for diverse financial products. For example, increased liquidity demands an avenue for opening bank and savings accounts and increases the demand for insurance. Similarly, an opportunity to farm multiple times in a production season also increases the output for market engagements.

We also find evidence of the influence of employment-related issues on the intensity of financial inclusion. Households involved in multiple jobs and those who own enterprises have higher probabilities of using numerous financial products. Specifically, multiple job engagement increases the probability of using numerous products by 11.2 and 7.6%, respectively, for the GLSS7 and GLSS6 datasets. Extra earnings from multiple jobs provide the financial means to engage in the consumption of diverse financial products. For example, bank and savings accounts may be opened to receive or deposit earnings from these jobs. In the case of enterprise ownership, the demand for credit for enterprise investment and expansion provides the need to use various financial products. However, in comparing agricultural households to other households in other sectors, it is found that the former households are 21.5 and 22.6% less likely to use a variety of financial products relative to households in other sectors, respectively, for the GLSS7 and GLSS6 datasets. A plausible reason may be that farmers lack collateral to obtain a loan and sometimes the minimum amount to maintain a bank account, which happens to be some of the requirements of most formal financial institutions.

Finally, the results also indicate the influence of socioeconomic characteristics on the intensity of financial inclusion. More educated households are 4.2 and 6.6% more likely to use various financial products, respectively, for the GLSS7 and GLSS6 datasets. The reason for this could be that educated households are more enlightened and hence understand the terms and conditions of the formal financial institution, which increases their intensity of use of financial products. This supports the findings of Sarma and Pais (2011), Abel *et al.* (2018), Soumare *et al.* (2016), Zins and Weill (2016), Klapper and Singer (2015) and Aterido *et al.* (2013). Abel *et al.* (2018) argue that educated people can comprehend the various financial products on the market and make informed decisions, improving their access. Also, households that received remittances and those with more members increased the intensity of financial inclusion. A plausible explanation could be that, as household size increases, the family's financial needs increase, leading to an increase in the use of financial inclusion measures. The results on the married household head show a positive effect on the intensity of financial inclusion, consistent with the findings of Klapper and Singer (2015), Allen *et al.* (2016) and Aterido *et al.* (2013). The reason could be that a married household head has

additional responsibilities, increasing the household's intensity of use of financial products. In summary, infrastructure, agricultural development, employment and socioeconomic variables are critical determinants of the intensity of financial inclusion.

When we shift attention to the results on the multinomial model, which partitions the use of at least one financial product to stand alone, the results indicate that relative to using one product, households who have access to infrastructure (motorable road, transport and bank) have a higher likelihood to use at least two products (i.e. two products and 3 or 4 products). This confirms the earlier findings on the effect of infrastructure on financial inclusion. In addition, agricultural development factors (i.e. market and cooperatives) confirm the earlier evidence by indicating that households with access to markets and cooperatives have a higher likelihood of using at least two financial products than using only one product, which is consistent for all the datasets. More educated households, larger households and those with access to remittances are also more likely to use at least two products relative to using one product, also consistent with the earlier evidence. The results further reveal that households in rural areas and those engaged in agriculture are less likely to use at least two products than one product.

Besides, there are a few insights from the multinomial results. While the earlier evidence failed to consistently discriminate between males and females, there is evidence from the multinomial estimates that males consistently are more likely to use at least two products relative to females. The constraints of women in financial inclusion have been highlighted by Klapper and Singer (2015), Zins and Weill (2016), Soumare *et al.* (2016) and Aterido *et al.* (2013). Thus, among financially included people, women are more challenged in terms of using diverse products than men. Self-employed households, households with enterprises and those with phone networks have no explanatory power among financially included households. In addition, married heads and the number of times crops are grown/season do not show consistent evidence relative to the Poisson results.

Finally, we highlight the fundamental difference between the findings of this study and the extant literature. While the determining factors of financial inclusion somewhat confirm earlier studies, our results depart from these studies in not identifying the factors that are important for financial inclusion —the main concentration of previous studies— but in shining the light on what is important for the diverse use of financial products. Indeed, this difference arises from the different methodological approach adopted in this study.

Based on the preceding, an essential implication of this study for academia and research is a shift from the conceptualisation of varied financial services as standalone to "how many services" or "depth of services" used by households. This proposed conceptualisation can provide more policy-relevant evidence to enhance priority setting in financial inclusion policies. The findings also imply that micro-level empirical studies in rural economies should consider exploring agricultural development and infrastructure variables in financial inclusion, as this study demonstrates their importance.

5.2 Managerial/policy implications

These findings imply that to build an inclusive financial system, the government should invest in improving infrastructure such as roads, public transport, banks and markets. For road network, which has been a significant problem of the country, the government, through its ministries of roads and transport, should target the construction of new roads in communities without roads and upgrade the existing ones. In addition, boosting financial inclusion implies encouraging agricultural development through building solid and well-functioning farmer-based organisations and cooperatives, developing markets in vantage communities and stimulating all-year-round production through investments in irrigation infrastructure. Finally, the government must develop employment creation interventions such as skills and entrepreneurial development.

5.3 Limitations and future research agenda

Studies could explore count models of financial inclusion at the cross-country level or use panel data or other methodological approaches to provide more robust evidence. The importance of cross-country analysis is the ability to safely generalise the implications of the evidence, a character that this study lacks due to it being conducted for a single country.

6. Conclusions

In this study, we use a count model to assess the determinants of intensity of financial inclusion in Ghana using the GLSS6 and GLSS7 datasets collected by the Ghana Statistical Service in 2012/13 and 2016/17, respectively. A multinomial probit model is added to expand the analysis. With the reality that some households use at least one of the financial inclusion products, a count model was applied. The results show that the age of the household head, household size, married household head, number of years spent in school, employed in agriculture, self-employed, multiple job engagement, receipt of remittances and ownership of enterprise are the most significant socioeconomic factors that simultaneously explain the intensity of use of financial products for GLSS7 and GLSS6. Specifically, infrastructure (motorable roads, public transport and bank) is vital in stimulating the intensity of financial inclusion. Moreover, agricultural development factors (presence of a market, farmer-based organisations and rural cooperatives and the number of times crops are grown per season) and employment factors (multiple jobs and ownership of enterprises) are essential in boosting the intensity of financial inclusion.

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