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Estimating the effects of formal and informal credit on farm household welfare: A hierarchical competitive welfare model approach

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This paper uses the hierarchical competitive welfare model approach to estimate the effects of credit from formal and informal sources on welfare development of farm households in Ghana. Data used for the econometric analyses came from the Ghana Living Standards Survey Round 5 dataset. The results showed that when a farm household is given GHC100 as formal credit, its welfare expenditure would increase by about GHC6. On the other hand, GHC100 given to a farm household as informal credit reduces its welfare expenses by about GHC10. There are two possible explanations for the negativity of informal credit on household welfare expenses. The first is that most informal credit is delivered in material forms instead of cash, which therefore reduces how much borrowing households expend on those materials. The second possible explanation is that informal credit borrowers get trapped in the vicious cycle of poverty such that it reduces their capacity to expend towards the attainment of their welfare outcomes such as food security, healthcare, education and general well-being. A paradigm shift towards the integration of formal and informal financial markets of Ghana is recommended.

Key words: Ghana, welfare, farm household, credit, hierarchical competitive model.

INTRODUCTION

Credit has over the years been used as a development tool, especially in the developing world mostly targeting poor and vulnerable farm households. Evidence from the empirical literature indicates that credit enables poor households against starvation, illiteracy and all other adversities that impinge on their welfare (Afrane, 2002) and improves household power relations (Pitt et al., 2006). It is, however, important to note that the impact of credit on welfare is context specific. According to Mayoux (1999), the level of impact of credit on livelihoods depends on the context within which beneficiaries find themselves. Whereas access to credit is said to narrow the gap between the poor and rich in some cases, it rather widens the existing inequality gaps in other cases (Mayoux, 2001).

It has been reported in Ghana that credit from formal sources helps boost welfare development (Alhassan and Akudugu, 2012; Al-hassan and Sagre, 2006; Dadzie and Ghartey, 2010). As a result, successive governments in the country (Ghana) have never relented in formulating

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and implementing policy reforms and regulations in the financial sector to ensure increased access to credit by all, especially those in the rural areas where agriculture is the main source of livelihood. Notable amongst these policy reforms and regulations are the establishments of the Agricultural Development Bank (ADB) in the 1960s, Rural and Community Banks (RCBs) in the 1970s, the Financial Sector Adjustment Programme (FINSAP) in the 1980s and the establishment of Microfinance Institutions (MFIs) across the country in the 1990s and 2000s. Most of these policy reforms and regulations with assistance from multinational development institutions such as the World Bank and International Monetary Fund (IMF) were largely designed to do away with the informal financial sector.

Unlike the credit from formal sector lenders such as banks and MFIs, credit from informal sector lenders such as input dealers, traders, relatives, friends, and moneylenders in Ghana has always been seen to have negative effects on the welfare development of borrowers. This is because informal lenders are blamed for charging exorbitant interest payments (Schindler, 2010). That notwithstanding, the informal financial market of Ghana continues to exist with many people across the country relying on it to meet their financial needs. The question therefore is, does informal credit really negatively affects the welfare development of farm households in Ghana? This question has largely not been answered in the empirical literature, as there have been very little investigations into how credit from the informal financial market affects the welfare development of their borrowers. Much of the empirical literature on the influence of credit on welfare development quoted above only considers formal credit. This paper estimates the effects of formal and informal credit on the welfare development of farm households in Ghana using the hierarchical competitive welfare model approach.

METHODOLOGY

The hierarchical competitive welfare model was used in the paper as a means to get valid and relevant instrumental variables (IV) for the estimation processes. It follows the work of Khandker and Faruqee (2003) who used similar approach to estimate the impact of farm credit in Pakistan. A detailed discussion of how the model works is provided in the proceeding paragraphs. The econometric framework employed for the analyses was setup through the following reduced form outcome model:

$$y_{ijk} = X_{ijk}\beta_{yf} + C_{ijkf}\delta_f + C_{ijkt}\delta_t + \mu_j^y + \mu_k^y + \varepsilon_{ijk}^y \quad (1)$$

Where y_{ijk} represents expenditure on health, education, food, performance of socio-cultural activities, shelter, energy and sanitation, a proxy for welfare of household *i*in community *j* in district *k*. $X_{ijk}$is a set of observed characteristics of household *i*in community *j* in district *k*. C_{ijkf} is the amount of formal credit received by household *i*in community *j* in district *k*. C_{ijkt} is the amount of informal credit received by household *i*in community *j* in district *k*. $\beta_{yf}, \beta_{yt}, \delta_f$and δ_t are unknown parameters to be estimated. μ_j^y and μ_k^y represent factors in community *j* and district *k* that affect household welfare, y_{ijk} but are unobservable to the researcher. ε_{ijk}^y is non-systematic errors, partly representing the unmeasured determinants of y_{ijk} that vary across households in community *j* and communities in district *k,* such that:

$$E\left(\varepsilon_{ijk}^y \middle| X_{ijk}, \mu_j^y, \mu_k^y\right) = 0 \quad (2)$$

Assuming all factors were observable to the researcher, the effects of credit from formal and informal sources on household welfare could have been measured by δ_f and δ_t, respectively without bias. Unfortunately, factors contained in μ_j^y and μ_k^y cannot be observed by the researcher and may correlate with $C_{ijkf}$and C_{ijkt} which results in selectivity bias that occurs when there is a correlation between the error term and the independent variables (Heckman, 1976, 1979, 1990; Heckman and Li, 2003; Heckman and Sedlacek, 1990; Hausman and Wise, 1976, 1977; Lee, 1982, 1983, 1994; Das and Vella, 2003; Vella, 1998; Winship and Mare, 1992; Khandker and Faruqee, 2003).

Some of the unobserved variables contained in $\mu_{jf}^y, \mu_{kf}^y, \mu_{jt}^y$ and μ_{kt}^y may be used by lenders to determine, which borrower to grant credit to. For instance, it is possible that lenders in formal and informal credit markets may be advancing credit to only households with certain level of endowments. Under such circumstances, lenders might only select households with the required level of endowment for credit delivery. This is because lenders are rational economic agents who allocate credit in the best possible ways that minimise defaults and maximise repayments. This assertion is in line with the arguments that selectivity bias is pervasive and emanates from human behaviour (Roy, 1951; Gronau, 1974; Heckman, 1990). However, researchers are unable to observe all the underlying factors considered by lenders in their lending activities. In simple terms, not all farmers and farm households in the selected communities across the different districts and ecological zones may have equal chances of selection by lenders for credit advancement hence selectivity bias. As such, analysing the outcome of Equation 1 by the ordinary least squares (OLS) estimation method yields biased estimates because selectivity bias violates the assumption of OLS that the error and independent variables are uncorrelated.

To deal with the selectivity bias in credit delivery as described above, the IV approach was employed. This is estimated through the Two-stage least squares (TSLS) estimation which is the commonly used IV estimator (Murray, 2006b; Hahn et al., 2004). The TSLS estimator is good in dealing with selectivity problems caused by simultaneity, measurement errors or omitted variables among others (Cameron and Pravin, 2005; Greene, 2008; Kennedy, 2003; Angrist and Krueger, 1991; Cameron and Pravin, 2009; Murray, 2006a; Wooldridge, 2009). The choice of the IV approach is in conformity with the assertion that the models for

selection bias are only as good as the assumptions of the way it occurs (Arabmazar and Schmidt, 1982; Goldberger, 1981; Lee, 1982). This approach has been used by a number of researchers in related studies (Campa and Kedia, 2002; Villalonga, 2004; Khandker and Faruqee, 2003). This is further supported by the view expressed by Chmelarova and Hill (2010) that if independent variables are endogenous and there are valid IV available, then it is better to use the IV approach since OLS will yield inconsistent estimates.

TSLS estimation procedure consists of two main stages. In the context of this study, the first stage was the estimation through OLS the determinants of borrowing. It included selected individual household characteristics and IV that were assumed to only influence the amounts of credit farm households could borrow from formal and informal sources but not their welfare outcomes. The second stage estimation included the estimated credit amounts derived from the first stage along with other variables deemed to be influencing household welfare. Equations in the first stage estimations are referred to as selection models and that of the second stage are referred to as the outcome models.

To implement the first stage, the following selection models disaggregated by type of credit market were employed:

$$C_{ijkf} = X_{ijk}\beta_{of} + Z\lambda_f + \mu^o_{jf} + \mu^o_{kf} + \varepsilon^o_{ijkf} \quad (3a)$$

$$C_{ijkt} = X_{ijk}\beta_{ot} + Z\lambda_t + \mu^o_{jt} + \mu^o_{kt} + \varepsilon^o_{ijkt} \quad (3b)$$

Where C_{ijkf} and C_{ijkt} are as defined above. X_{ijk} and Z are household characteristics and IV, respectively that influence the amount of credit farm households could borrow from the formal and informal credit markets respectively. β_{of}, β_{ot}, λ_f and λ_t are unknown parameters to be estimated. μ^o_{jf} and μ^o_{jt} are community level unobservable factors that influence C_{ijkf} and C_{ijkt}, respectively and do not vary across households within community *j*. μ^o_{kf} and μ^o_{kt} are district level unobserved factors that affect C_{ijkf} and C_{ijkt}, respectively but do not vary across communities within district *k*. ε^o_{ijf} and ε^o_{ijt} are non-systematic errors that represent the unmeasured determinants of C_{ijkf} and C_{ijkt}, respectively which vary across households and communities and are such that:

$$E(\varepsilon^o_f | X_{ijk}, Z, \mu^o_{jf}) = 0 \quad (4a)$$

$$E(\varepsilon^o_t | X_{ijk}, Z, \mu^o_{jt}) = 0 \quad (4b)$$

Identifying appropriate IV was a key component of this study. According to Demand theory, the price of a commodity is a good instrument for estimating its demand. In this regard, the price of credit from formal and informal credit markets, which are the interest charges, could be good instruments. Unfortunately, these hardly vary within credit markets. Hence, the interest charges could be good predictors of the inter-market demand for credit but not intra-market demand.

To get valid and relevant instruments, three key assumptions were made in this study. The first assumption was that the lendable funds available to formal and informal lenders in Ghana are fixed and limited. The second assumption was that the demand for credit is more than the supply, which triggers competition among borrowers. The third assumption was that there are many borrowers competing for the limited lendable funds available to few lenders at the formal and informal credit markets of Ghana. Based on these assumptions, it is not the price of credit but the availability of funds and level of competition that matters most in determining how much a household could borrow from formal and informal credit markets. This leads to the issue of credit allocation hierarchy as funds are competed for at the national, regional, district and community levels. At the national level, the different regions compete for lendable funds available to lenders in the formal and informal credit markets. At the regional level, different districts compete for lendable funds. At the district level, different communities compete for lendable funds and at the community level, different households compete for the lendable funds available to lenders. So the lendable funds are subject to competition at each level and the final amounts of credit that households are able to get from the credit markets are the cumulative outcome of all the competitions.

Given the available funds, the amount of credit a household is able to borrow from the formal or informal credit market depends not only on its own characteristics but also on the characteristics of other competing households who also seek credit. The competitor's characteristics were therefore considered as appropriate instruments in estimating how much a farm household could borrow from the credit markets. Competitors to a borrowing household are at the national, regional, district and community levels. The characteristics of competitors at all the levels influenced the amount of credit households are able to borrow from the credit markets. For the purposes of simplification, the researcher assumed competition starting from the district level. Thus the amount of credit households are able to get is a culmination of the competition at all the different levels or hierarchies.

Specific household characteristics relative to district and community level competitors' characteristics were used as instruments (Z_{jt}). These included community and district level average years of formal schooling, community and district level average household savings and the average amounts of formal and informal credit borrowed by computing households at the community and district levels. The selection of these factors were partly informed by the empirical literature that years of formal schooling and savings significantly influence the amounts of credit individuals are able to borrow from credit markets (Khandker and Faruqee, 2003; Ayamga et al., 2006). The community level average characteristics were computed as sampled households excluding household *i,* and that of the district level computed as sampled households across *k* districts excluding those in community *j.* The selection models (Equations 3a and b) were re-specified as:

$$C_{ijkf} = X_{ijk}\beta_{of} + \bar{X}_{j-i}\lambda_{of} + \bar{X}_{k-j}\lambda_{kf} + \mu^o_{jf} + \mu^o_{kf} + \varepsilon^o_{ijf} \quad (5a)$$

$$C_{ijkt} = X_{ijk}\beta_{ot} + \bar{X}_{j-i}\lambda_{ot} + \bar{X}_{k-j}\lambda_{kt} + \mu^o_{jt} + \mu^o_{kt} + \varepsilon^o_{ijt} \quad (5b)$$

Where C_{ijkf}, C_{ijkt} and X_{ijk} are as defined earlier. The Z variables were replaced by $\bar{X}_{j-i}$ and $\bar{X}_{k-j}$ variables which are the community and district levels average household characteristics respectively that influence the amount of credit farm households could borrow from the formal and informal credit markets.

β_{of}, β_{ot}, λ_{of}, λ_{ot}, λ_{kf} and λ_{kt} are unknown parameters to be

estimated. μ_{jf}^{c}, μ_{df}^{c}, μ_{jt}^{c} and μ_{dt}^{c} are unmeasured determinants of C_{ijf} and C_{ijt}, respectively and do not vary across households within community *j* and communities within district *k*. ε_f^c and ε_t^c are non-systematic errors that represent the unmeasured determinants of C_{ijf} and C_{ijt}, respectively which vary across different households within community *j* and are such that:

$$E(\varepsilon_f^c | X_{ijf}, Z, \mu_{ijf}^c) = 0 \quad (6a)$$

$$E(\varepsilon_t^c | X_{ijt}, Z, \mu_{ijt}^c) = 0 \quad (6b)$$

The estimated amounts of credit from formal and informal sources were derived as:

$$\hat{C}_{ijf} = X_{ijf}\hat{\beta}_{cf} + \bar{X}_{j-i}\hat{\lambda}_{cf} + \bar{X}_{k-i}\hat{\lambda}_{kf} \quad (7a)$$

$$\hat{C}_{ijt} = X_{ijt}\hat{\beta}_{ct} + + \bar{Z}_{j-i}\hat{\lambda}_{ct} + \bar{X}_{k-i}\hat{\lambda}_{kt} \quad (7b)$$

Where:

$\hat{C}_{ijf}$ = Estimated amount of credit from formal credit market;

$\hat{C}_{ijt}$ = Estimated amount of credit from informal credit market;

$\hat{\beta}_{cf}, \hat{\beta}_{ct}, \hat{\lambda}_{cf}$ and $\hat{\lambda}_{ct}$ = Estimated parameters;

$X_{ijf}, \bar{X}_{j-i}$ and $\bar{X}_{k-i}$ are as defined above

The corresponding outcome model of Equation 1, which constituted the second stage estimation through OLS, was re-specified as:

$$y_{ijk} = X_{ijk}\beta_{yf} + \hat{C}_{ijkf}\delta_f + \hat{C}_{ijkt}\delta_t + \mu_{jf}^{y} + \mu_{kf}^{y} + \varepsilon_{ijkf}^{y} \quad (8)$$

In this regard, the coefficients of credit in the second welfare Equations 8 measured the effect of one more unit of credit from a credit market on the outcome of interest as defined above. In other words, it measures the effect of one more unit of credit denied by lenders in the credit market on household welfare.

To determine whether or not the use of IV was necessary in this study, the Durbin-Wu-Hausman (DWH) test proposed independently by Durbin (1954), Wu (1973) and Hausman (1978) was conducted. This involves using an augmented regression analysis (Davidson and MacKinnon, 1993) by including the residuals from the first stage estimations in the second stage estimations (Baum et al., 2007; Antonakis et al., 2010; Khandker and Faruqee, 2003). Significant residuals imply credits from formal and informal sources, which are the mediators, are indeed endogenous and thus must be instrumented and thus TSLS should be preferred to OLS. This is because the assumption that the independent variables, in this case formal and informal credits are uncorrelated with the residuals (error terms) is violated. The independent variables were tested for multicollinearity using the variance inflation factor (VIF). Theoretically, VIF is derived as [1/(1-R^2)] for each k – 1 independent variable equations (Robinson and Schumacker, 2009). The rules of thumb for VIF include the fact that 1 means no multicollinearity and 10 means severe multicollinearity which must be corrected (O'brien, 2007). Relevance and strengths of the instruments were determined by their associated t-values. White's variance-covariance estimator was used to circumvent the problem of heteroscedasticity (Davidson and MacKinnon, 1993). Thus heteroscedasticity-corrected (HC) variance and robust standard errors were reported.

The empirical models are specified as (Table 1 for definition and measurement of variables):

$$C_f = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \alpha_6 X_6 + \alpha_7 X_7 + \alpha_8 X_8 + \alpha_9 X_9 + \alpha_{10} X_{10} + \alpha_{11} X_{11} + \alpha_{12} X_{12} + \alpha_{13} X_{13} + \alpha_{14} X_{14} + \alpha_{15} X_{15} + \alpha_{16} X_{16} + \varepsilon_1 \quad (9a)$$

$$C_t = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \alpha_6 X_6 + \alpha_7 X_7 + \alpha_8 X_8 + \alpha_9 X_9 + \alpha_{10} X_{10} + \alpha_{11} X_{11} + \alpha_{12} X_{12} + \alpha_{13} X_{13} + \alpha_{14} X_{14} + \alpha_{15} X_{15} + \alpha_{16} X_{16} + \varepsilon_2 \quad (9b)$$

The effects of credit from formal and informal sources on households' welfare attainments were estimated as (Table 2 for definition and measurement of variables):

$$y = \lambda_0 + \lambda_1 \hat{C}_f + \lambda_2 \hat{C}_i + \lambda_3 R + \lambda_4 DR + \lambda_5 FI + \lambda_6 NFI + \lambda_7 MA + \lambda_8 \delta_1 + \lambda_9 \delta_2 + \varepsilon_3 \quad (10)$$

In all, data from 3,600 households were used in this analysis. The data came from the Ghana Living Standards Survey Round 5, which was conducted in 2005/2006.

This test uses the F-statistic. A significant F-Statistic therefore implies a violation of the assumption in OLS that the independent variable and the residual (error term) are uncorrelated. On the other hand, insignificant F-Statistics means that OLS could have been used for the estimations. The independent variables were tested for multicollinearity using the VIF. Theoretically, VIF is derived as [1/(1-R^2)] for each k - 1 independent variable equations (Robinson and Schumacker, 2009). The rules of thumb for VIF include the fact that 1 means no multicollinearity and 10 means severe multicollinearity which must be corrected (O'brien, 2007). Relevance and strengths of the instruments were determined by their associated t-values. All the estimations were done using STATA Version 11.

RESULTS AND DISCUSSION

Different factors including credit from different sources influence how much households spend on their core welfare outcomes. The study results showed that the amount of credit households received from formal and informal sources significantly influence their expenditures on the welfare outcomes. Thus whereas there is positive relationship between formal credit and how much households spend on payments of healthcare bills, education, housing, sanitation and energy among others, that of informal credit is negative. This means the *a priori* expectations of positive relationships between formal and informal credit on the one hand and household welfare on the other were partially met. Thus a GH¢1.00 increase in the amount of formal credit received by farm households results in their welfare expenditures increasing by about GH¢0.06 and this increase is statistically significant at 1%. On the other hand, a GH¢1.00 increase in the

Table 1. Definition and measurement of variables of selection equations.

Dependent variables	Definition and measurement
C_f	Formal credit (Ghana Cedis)
C_i	Informal credit (Ghana Cedis)
Independent variables	**Definition and measurement**
Gender of household head (X_1)	Dummy (Male = 1; Otherwise = 0)
Purpose for credit accessed (X_2)	Dummy (Agriculture = 1; Otherwise = 0)
Collateral requirements (X_3)	Dummy (Collateral required = 1; Otherwise = 0)
Access to extension services (X_4)	Dummy (Had accessed = 1; Otherwise = 0)
Coastal ecological zone (X_5)	Dummy (Coastal zone = 1; Otherwise = 0)
Forest ecological zone (X_6)	Dummy (Forest zone = 1; Otherwise = 0)
Mean household schooling (X_7)	Total schooling/household size (Years)
Mean community schooling (X_8)	Total schooling/Total sampled in comm. (Years)
Mean district schooling (X_9)	Total schooling/Total sampled in district (Years)
Mean household savings (X_{10})	Total savings/Household size (GHS)
Mean community savings (X_{11})	Total savings/Total sampled in c'ty (GHS)
Mean district savings (X_{12})	Total savings/Total sampled in district (GHS)
Mean c'ty formal credit (X_{13})	Total formal credit/Sample in community (GHS)
Mean district formal credit (X_{14})	Total formal credit/Sample in district (GHS)
Mean c'ty informal credit (X_{15})	Total informal credit/Sample in comm. (GHS)
Mean dist. informal credit (X_{16})	Total informal credit/Sample in district (GHS)

Source: Author's construct, 2013.

Table 2. Definition and measurement of variables for outcome equation.

Dependent variable	Definition and measurement
Welfare (y)	Household living expenses (Ghana Cedis)
Independent variables	**Definition and measurement**
$\hat{C}_f$	Estimated formal credit (Ghana Cedis)
$\hat{C}_i$	Estimated informal credit (Ghana Cedis)
R	Remittance, gifts and grants (Ghana Cedis)
DR	Dependency Ratio (Non-workers/workers)
FI	Farm income (Ghana Cedis)
NFI	Non-farm income (Ghana Cedis)
MA	Market Access (Pre-harvest contract = 1; Otherwise)

Source: Author's construct, 2013.

amount of informal credit received by farm households leads to their welfare expenditures decreasing by about GH¢0.10 and this decrease is statistically significant at 1% (Table 3). In other words, if a household receives GH¢100.00 as credit from formal sources its welfare expenditures will experience a corresponding increase of about GH¢6.00. Similarly, when a household borrows GH¢100.00 from informal lenders, its welfare expenditure will decrease by about GH¢10.00, *ceteris paribus*. One of the possible reasons for this huge difference is the fact

that formal credit is mostly well focused in terms of its usage compared to informal credit. Besides, formal credit comes as a package, which includes other services such as training all of which are critical for the attainment of the core welfare outcomes. Furthermore, informal credit is sometimes delivered in material forms such as food, which means that household expenditures on such items are reduced, *ceteris paribus.* It could also be that informalcredit borrowers get trapped in the vicious cycle of poverty such that it reduces their capacity to expend towards the attainment of their welfare outcomes.

The positive and significant relationship between formal credit and household welfare is consistent with the literature that formal credit enables farm households to expand their farming and related livelihood activities and this helps them improve their living and welfare conditions (Gale and Collender, 2006; Coleman, 1999). It is further corroborated by Khandker and Faruqee (2003), Khandker (2005), Copestake et al. (2005), Dadzie and Ghartey (2010) who concluded in their study that credit helps raise incomes and consumption of poor households in particular and welfare in general. Indeed, similar findings have been reported in related empirical studies in Bangladesh (Khandker, 2005; Pitt and Khandker, 1998; Mahjabeen, 2008; Ahmed et al., 2001; Amin and Sheikh, 2011), China (Li et al., 2011), Indonesia (Okten and Osil, 2004), Bolivia (Maldonado and Gonzalez-Vega, 2008), Vietnam (Duong and Izumida, 2002), Guatemala (Wydick, 1999), India (Imai et al., 2010), Ghana (Al-hassan and Sagre, 2006), Ethiopia (Sebhatu, 2012), Malawi (Swaminathan et al., 2010; Shimamura and Lastarria-Cornhiel, 2010; Hazarika and Alwang, 2003), and Tunisia (Foltz, 2004). These studies generally concluded that formal credit helps improve the welfare of borrowers as it empowers them in their decision-making processes, asset accumulation, political participation and legal awareness among others. It enables poor households stand against starvation, illiteracy and all other adversities that affect their welfare (Afrane, 2002). It also improves household power relations as both women and men are able to earn income, a major determinant of household power dynamics (Pitt et al., 2006) critical in the pursuance of sustainable welfare outcomes. With specific reference to informal credit, the negative relationship found is inconsistent with the views expressed by Schindler (2010) who in a study of informal credit as a coping strategy of market women in northern Ghana concluded that informal credit positively influence the welfare outcomes of women and their households.

It was also found that remittances had positive though insignificant effects on household welfare (Table 3). The *a priori* expectation of a positive relationship was met. This contradicts the finding of an earlier study by Gustafsson and Makonnen (1993) who concluded that remittances do not necessarily lead to poverty reduction and improvement in welfare conditions for that matter. It is however, corroborated by other earlier empirical studies by Diatta and Mbow (1999), Kannan and Hari (2002) and Litchfield and Waddington (2003) among others who concluded that there is positive relationship between remittances and welfare of recipient households. One of the possible explanations for the positive relationship between remittances and welfare expenses is that remittances often come in monetary forms which means that beneficiary households are then in a better position to expend on the core welfare outcomes. It must be noted however, that substantial amount of remittances is also received in material forms.

The level of dependency although negatively related to household welfare expenditures is insignificant. Farm income has negative and significant effects on household welfare expenditures. The *a priori* expectation of positive relationship was thus not met. This means that when farm income of households increases by GH¢1.00, their expenditures on the welfare outcomes decrease by about GH¢0.03 and this decrease is statistically significant at 1% (Table 3). This is inconsistent with the empirical literature that increased income leads to improved livelihoods (Dadzie and Ghartey, 2010; Copestake et al., 2005; Khandker, 2005). One possible explanation to this is that most farm households in rural Ghana are into farming primarily for consumption and are therefore not selling their farm produce for income to finance the attainment of other welfare outcomes. Another possible explanation is that farm income might be mostly used for investments in farm and non-farm production activities as well as savings for 'rainy days' instead of financing welfare expenditures. Besides, wealthier farmers might be spending less on healthcare as they are healthier; education as they are mostly educated; housing as they have their own houses; and so on.

Non-farm income had significant and positive effects on household welfare expenses and therefore the *a priori* expectation of positive relationship was met. The results indicated that a GH¢1.00 increase in non-farm income results in about GH¢0.14 increase in household welfare expenditures. Again, this is consistent with findings of earlier empirical studies noted above. Market access is an insignificant determinant of farm household welfare development. The *a priori* expectation of positive relationship between market access and farm household welfare expenditure was not met (Table 1).

The VIF test indicates that the independent variables are uncorrelated to each other and thus there is no multicollinearity. The significant DWH also indicates that the instrumentation of formal and informal credit was appropriate as they are endogenous and would have yielded biased and inconsistent estimates without instrumentation. The implication of this is that the allocations of credit by formal and informal sector lenders are not done at random. This means that there are some factors which lenders consider in their credit allocations that may not be observable to researchers hence the biasness. The regression specification error test (RESET)

Table 3. Regression results of effects of credit on welfare expenditure (n=3600).

Dependent variable: Welfare Expenses					
Exogenous variables	**Coefficient**	**Robust S.E**	**VIF**	**[95% Conf. Interval]**	
Estimated formal credit	0.0558	0.0122***	2.84	0.0320	0.0796
Estimated informal credit	-0.1029	0.0168***	2.10	-0.1358	-0.0699
Remittances	0.0045	0.0063	1.00	-0.0077	0.0168
Dependency	-0.0158	0.0125	1.03	-0.0403	0.0087
Farm income	-0.0272	0.0085***	1.01	-0.0439	-0.0105
Non-farm income	0.1387	0.0081***	1.09	0.1228	0.1546
Market access	0.0289	0.0644	1.04	-0.0973	0.1552
Constant	29.8979	0.1188***	-	29.6650	30.1308
F(8, 3591)	4330.49	Prob> F	0.000		
R-Squared	0.9021	Root MSE	1.84		
DWH F(1, 3591)	3446.00	Prob> F	0.000		

*** = 1%; VIF stands for Variance Inflation Factor; and RSE is the Robust Standard Errors; Source: Author's computations based on GLSS5 Data, 2013.

test also indicated that the model was correctly specified.

Conclusion

Formal and informal credit has significant effects on the welfare expenses of farm households in Ghana. The effects of formal credit on household welfare expensesare however, positive and that of informal credit are negative. In other words, this paper demonstrates that unlike formal credit, informal credit negatively affects borrowing households' expenditures on the key welfare outcomes - healthcare, education, food, performance of socio-cultural activities, shelter, energy and sanitation. The implication of this finding is that policies to promote welfare conditions of people in rural Ghana should lay more emphasis on the provision of formal credit. Remittances do not significantly influence household welfare expenditures. The effects of farm income on household welfare expenditures are negative and significant. This means that households with appreciable level of income from their farms rather spend less on the attainment of their welfare outcomes.

Furthermore, the effects of non-farm income on household welfare expenditures are positive and significant. The implication of this is that people who have access to non-farm income spend more on welfare expenditures than those without non-farm income sources. The general conclusion is that formal and informal credit significantly affects household welfare development in Ghana. Integration of the formal and informal credit markets with informal lenders acting as community level credit agents is recommended. This might help reduce the negativity of informal credit on household welfare expenditures. Besides, this current paper made used of cross-sectional data and a quasi-experimental design the implication of which is that the estimated effects of formal and informal credit on welfare development is only for the short-term. Thus further research on the subject matter using experimental data and longitudinal research design is recommended.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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