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Does Access and Use of Financial Service Smoothen Household Food Consumption?

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Abstract

The study relies on Ghana's Living Standard Measurement Survey to test the hypothesis of no relationship between credit and household food consumption expenditure. Albeit the plausibility of endogeneity problems, we use single stage and pooled least squares, given the non-availability of national panel data in Ghana and lack of better instruments in the Living Standard data. The is does not provide enough evidence to reject the null hypothesis. This suggests that access to credit does not contribute to the smoothening of household consumption. This observation cuts across different sub-samples based on socio-economic classification. We recommend circumspection in propagating the ability of credit in smoothening consumption.

Keywords: Financial, Household, Consumption, Income

Introduction

The immediate past prolonged oil price hikes and the on-going global financial crisis culminated in diversion of food crop production to bio-fuel and decline of food aid supplies to developing countries. Pingali (2008) observed that a total of 82 high risk countries were expected to increase their spending by 40% as compared to 2007, with food import bills increasing by almost four times as compared to 2000. The adverse impact on food supply as a result of the tumbling global economy has led to high increases in food prices with African economies being the hardest hit (Von Braun 2008 and Pingali 2008). The severity on African economies can be logically inferred as it is the only continent struggling with the objective of halving poverty and hunger as stipulated in the Millennium Development Goals (United Nations 2008). The direct effect of international food price hikes on domestic markets in developing economies have varied depending on factors such as border measures and polices, and cost of intermediation and market structures. In response, households have had to adjust their food expenditure based on the relative weight of the domestic food price increase compared to other factors such as taste, cultural values, quality, convenience and other demographic factors.

Until quite recently, most studies (e.g.Strauss 1982, Strauss 1984 and Udry and Woo 2006, Shamim and Ahmad 2007) which are premised on the Engel's Law, placed premium on income elasticity in determining household food expenditure. These studies focused mainly on income measurement (permanent and transitory and expenditure), model re-specification to capture the nuances of data variability and extensions to reveal the effect of household demographics. From a different perspective, recent theoretical and empirical expositions have emerged in response to volatile income and peculiar living arrangement and coping mechanisms of households. This peculiarity characteristic of developing economies

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[1] The Engel's Law states that household expenditures on food declines proportionately as income rise. That is the rate of increase in food consumption expenditure is lesser than the increase in income.
[2] Risk preference is defined in the context of idiosyncratic and covariate risk via income volatility.

accounts for a variant to the basic economic theory of household's consumption decision making under uncertainty (Morduch 2002). Specifically, behaviour based strategies such as risk preferences and financial service coping mechanism have been identified as important factors in explaining household decision making on food consumption. Exposition of exante behaviour based strategies such as accessing financial service to smoothen consumption have been minimally studied, compared to household decision making in the context of risk preferences. Characteristic of both studies is the assumption of either risk preference homogeneity for all households in the case of the former or perfect financial markets for the latter. Also, these studies (e.g. Kochar 1995, Morduch 1995 & 2002 & Heltberg and Lund 2008) have relied on data from Asia, with little empirical work in sub-Saharan Africa (e.g.Ayalew 2000). This paper builds on the scanty literature of household food consumption decision making based on constraints on financial markets.

Most developing economies have designed financial services to suite rural and agricultural need of poor households. The dispensation of designing financial services for constrained households is informed by the perceived capability of credit as a tool for long-term investment, seasonal input and consumption requirements. Recent evidence shows the degree to which access to finance, and specifically credit, in Africa remains a constraint to rural and agricultural households (Honohan and Beck 2007 and World Bank, 2008). Though recent studies, notably Claessens (2006), unveil the complexity and blurred connection between access and use of financial services, most policy prescriptions thrive on the assumption that access connotes potential use.

The era of global food crisis and policy prescription of access to financial service bring to the fore two waves of connections worth exploring. First, the global effect of food price increases makes the

provision of consumption credit either through Social Safety Net Programmes or commercial consumption loans an imperative. Secondly, the backdrop of access is likely to increase current demand for food commodities with supply decreasing, prices tend to increase. Both scenarios suggest a positive relationship between access to financial service and food prices. As alluded to earlier, the different effect of the global food crisis on domestic countries requires the identification of the responsiveness of household food consumption on access to financial service on a location specific basis. On the presumption that access to financial services explains household demand for food consumption, it will in turn provide an initial platform for country-specific further studies that will estimate the type and amount of financial service required for combating the general increases in food prices. On the other hand, in a scenario where access to financial service proves statistically insignificant then a second best option of a complementary policy intervention must be considered. The latter offers a more intuitive approach based on the failure of Keynesian economics that promotes mainly a continuous increase in aggregate demand with much less emphasis on aggregate supply. By implication, some production incentive must accompany access to financial service to promote the supply of agricultural output with the aim at mitigating domestic output constraints. Also, from a method of study perspective, the potential bi-causal relationship between food prices and access to financial services signal the possibility of endogeneity.

This paper tests a null hypothesis of a lack of a statistical relationship between amount of credit and household food consumption expenditure. The study further tests the regional and time effects as well as potential endogeneity in the traditional structural form of food price determinant's equation. This study uses data from the last three waves of the Living Standard Measurement Surveys (LSMS) of Ghana to assess the nature of the connection between household food consumption expenditure and access to financial services. Using pooled ordinary least squares cross section regression, the study further tests for regional and

time effects based on fourth and fifth rounds of the LSMS. The model is specified based on the traditional structural equation of food consumption determinants with household income and credit received being the main exogenous variables. There are equations that control for the effect of household size, price differentials, and sex and age of the economic head of a household. The raw variables are elicited from the LSMS, merged and recalculated where necessary to fit the demands of both theory and econometric estimation. The main variable of interest, access to financial services, is measured by the total amount of loan received by the household. A limitation of this measurement is the assumption that all households applied for credit. This implied that households with zero amount of credit were not successful with their application. Though this potentially might lead to error in the variable, the definition of the unobserved variable, access to the use of financial service, is quite utopian.

Classens (2006) attempts to use a four point criteria of flexibility, continuity, convenience and reliability to provide at best a qualitative measure of access to and use of financial service. In the paper, other financial instruments such as the effect of savings are explored but prove widely uncorrelated with food expenditure and show a sparse distribution. A possible justification can be attributed to the view point of the peculiarity of Ghanaian rural household savings habits skewed to non-financial instruments (Aryeetey, 2004).

The paper is structured in four parts. In the next two sections, a brief theoretical review precedes the discussion of preliminary results. In the case of the former, the point of departure is household decision making under uncertainty, which sets the tone for modelling an empirical equation to test the effect of access to financial service on household food consumption. The discussion of the empirical findings separates the individual LSMS from the combined and socio-economic classification of households. This offers a validation for the pooled regression estimation. The last section of the paper draws a conclusion to ignite possible recommendation for both future academic work and policy direction. This

paper's contribution is empirical as it uses data from Ghana which to the best of our knowledge, no single paper at the country level has applied econometric tools of pooled independent ordinary least squares to estimate household food expenditure.

Theoretical Framework and Empirical Model Specification

Inter-Temporal Consumption Decisions under Uncertainty

The intertemporal consumption decisions under uncertainty are that the agent's attitudes toward intertemporal substitution and risk aversion are dishevelled. Intertemporal choice, in this view, involves a balancing of two qualitatively different, but both immediate, affective influences; immediate motivations to take specific actions based on immediate costs and benefits, and immediate emotions experienced as a result of thinking about the potential future consequences of our behaviour. Lucas (1976), concerted that there may not be anything that could properly be called a consumption or savings function; the relation between consumption, income and interest rate depends on the wider macroeconomic context and may not be stable overtime, even though consumers are always trying to maximize the same utility function. A higher expected real interest rate makes consumers defer consumption, everything else held constant. The magnitude of this intertemporal substitution effect is one of the central questions of macroeconomics. If consumers can be induced to postpone consumption by modest increases in interest rate, then, movements of interest rates will make consumption decline whenever other components of aggregate demand rise; total output will not be much influenced by changes in those component (Hall, 1988).

However, time and uncertainty represent indispensable ingredients to many of the most challenging resource problems. With respect to the time dimension, agents are generally assumed to have a pure time preference as well as a preference for smoothing consumption over

time. With respect to risk, agents are generally assumed to be Arrow-Pratt risk averse. The discounted expected utility model assumes that aversion to risk and aversion to intertemporal fluctuations coincide. (Traeger, 2009). Moreover, only for homothetic preferences of the risk aversion parameter for good would be independent of the levels of consumption of the other goods. Now, from our understanding, risk aversion of an individual should be a rather primitive quantity in the sense that it determines their general behaviour towards risk. It should not allow that in the same situation individuals are risk averse with respect to one commodity and risk seeking with respect to another when both good yield would give them the same welfare gain.

The consumption behaviour depends primarily on the relation between the long run rate of interest and the rate at which the consumer discounts utility. If the long run rate of interest is greater than the discount rate, then consumption grows without bound as long as the consumer earns a positive income in some period. Intertemporal consistency constraints require that the lower bound on current net wealth be consistent with the borrowing constraint the consumer will face in the next period. This implies that current wealth can never be so low that it may become impossible for the individual to satisfy his borrowing constraint in the next period even if nothing is consumed in the current period. If the long run rate of interest is equal to the discount factor, then consumption generally converges to infinity only if there is sufficient uncertainty in either the income or interest rate sequences. Almost all the empirics have established for the case where both the income and interest rate sequences may be stochastic. In many cases, however, the intuition behind the results and the meaning of the assumptions become more apparent when only the income sequence is stochastic (Gary, 1999).

There has been an extensive argument on optimal consumption-saving behaviour of expected utility maximizing risk averse individuals. There are, however, two limitations of such works. According to Basu, and Ghosh (1993), the widely used time additive Von Neumann Morgenstern

(VNM) preferences may not be suitable for analyzing choice problems in a dynamic context. Since for this class of preferences the coefficient of relative risk aversion turns out to be the reciprocal of the elasticity of intertemporal substitution, these preferences fail to distinguish between the importance of intertemporal substitution and risk aversion in determining the optimal choice for the individual decision maker. Secondly, in analyzing the comparative static effect of an increase in risk, the increase in risk has been usually captured by the mean preserving spread of the distribution of the underlying random variable. But, since the mean of the distribution is stipulated to be unchanged, the mean preserving spread, undoubtedly, provides a restrictive characterization of an increase in risk. In a clear departure from the expected utility maximizing analysis, under the non-expected utility maximizing approach, optimal saving tends to be determined by the elasticity of intertemporal substitution as well as the risk aversion parameter.

Moreover, the course of economic events is often unpredictable and choices about the future have to take into account of this uncertainty. This uncertainty may affect, for example, the future flow of income to the household. Let us consider the two-period and denote the stream of income flows by (Y_1, Y_2). Let us assume that income can take on only two values: Y^a (high) and Y^b (low). Uncertainty means that the actual outcome is a realization from a certain joint probability distribution $P(Y_1, Y_2)$. Given a realization of period-1 income, Y_1, one can use this distribution to calculate the conditional probabilities of period-2 income $P(P_2 \mid P_1)$. We normally assume that agents know this distribution; Therefore, agents can form expectations about the future course of events. For example, given the current realization Y_1, one can calculate the expected value of period-2 income conditional on the information contained in the current state:

$$E_1[Y_2] \equiv E(Y_2 / Y_1 ...) = P(Y^a / Y_1)Y^a + P(Y^b / Y_1)Y^b \qquad (1)$$

We, therefore, embed this form of uncertainty in our two-period model of optimal consumption/saving. Let us assume that there is no uncertainty in the first period so that Y_1 is known. And let us assume that agents use a

riskless bond with return r. All uncertainty is about the second-period value of the income flow Y_2 $E\{Y^a, Y^b\}$. The budget constraint of this agent in the first period is standard: $A_2 = Y_1 - C_1$. Substituting the saving choice in the period-2 constraint, the following obtains:

$$C_2 = Y^a + (1+r)(Y_1 - C_1) \quad \text{, with probability} \quad P(Y^a/Y_1) \quad (2)$$

$$C_2 = Y^b + (1+r)(Y_1 - C_1) \quad \text{, with probability} \quad P(Y^b/Y_1) \quad (3)$$

Period-2 consumption is a stochastic variable as it depends on the realization of Y_2. Given this choice set, the objective of the agent is to maximize the expected value of utility by the appropriate choice of C_1 given by

$$\max_{C_1} \ E(U) = U(C_1) + \frac{1}{1+\eta} E_1[U(C_2)] \quad (4)$$

$$= U(C_1) + \frac{1}{1+\eta}[P(Y^a/Y_1)U(Y^a + (1+r)(Y_1 - C_1)) + P(Y^b/Y_1)U(Y^b + (1+r)(Y_1 - C_1))]$$

The first order condition that characterizes this solution is expressed as;

$$U'(C_1) = \frac{1}{1+\eta}[P(Y^a/Y_1)(1+r)U'(C_2^a) + P(Y^b/Y_1)(1+r)U'(C_2^\beta)]$$

$$U'(C_1) = (\frac{1}{1+\eta}) E_1[(1+r)U'(C_2)] \quad (5)$$

This is the stochastic version of the Euler equation, which holds under more intricate stochastic structures and longer horizons.

On the other hand, let us consider testable implications of a particular version of the model of optimal consumption under uncertainty. We first consider an agent that lives for more than 2 periods so that the objective function is given by

$$E_1[\sum_{t=1}^{T} (\frac{1}{1+\eta})^{t-1} U(C_t)] \quad (6)$$

The optimal decision of the consumer is governed by the same Euler equation as in the 2-period case

$$U'(C_t) = (\frac{1}{1+\eta})E_t[(1+r)U'(C_{t+1})] \tag{7}$$

and by the intertemporal budget constraint, we can show that;

$$U'(C_1) = (\frac{1+r}{1+\eta})^{t-1}E_t[U'(C_t)] \text{ for all } t=2,3.... \tag{8}$$

The budget constraint can now be written by taking expectation of the current period 1 to get

$$\sum_{t=1}^{T} E_t[(\frac{1}{1+r})^{t-1}C_t] = A_1 + \sum_{t=1}^{T} E_t[(\frac{1}{1+r})^{t-1}Y_t] \tag{9}$$

The household instantaneous utility function can be expressed in quadratic form as;

$$E[U] = E\left[\sum_{t=1}^{T} C_1 - \frac{b}{2}C_t^2\right] \quad b > 0 \tag{10}$$

assuming that, both interest rate and discount rate are zero, and individual wealth is such that the marginal utility of consumption is positive: $u'(c) \succ 0$

Although consumers choose different consumption level in different periods according to a certain consumption mode, they cannot make the choices for the future, since they cannot know certain information about their income, property profits and expenditure at the certain time in the future. So, it is unrealistic for consumers to determine their future consumption unless they have special needs (Mei and Wang, 2006).

To describe the household's behaviour, we use the Euler-equation approach. Along an optimal path, a reduction of current consumption C_t resulting in a rise of future consumption Cl should have the same marginal utility.

$$1 - bC_1 = E_1(1 - bC_t) \qquad \text{for all t=2,3} \qquad (11)$$

where, $1 - bC_1$ is the current marginal utility of consumption and $E_1(1-bC_t)$ is future marginal utility of consumption, which implies current marginal utility of savings. The Euler equation now becomes

$$C_1 = E_1[C_t] \quad \text{for all t=2,3...} \qquad (12)$$

Now the budget constraint can be used to solve for current consumption

$$C_1 = \frac{1}{T}(A_1 + \sum_{t=1}^{T} E_1[Y_t]) \qquad (13)$$

The household consumes $\frac{1}{T}$ of her expected lifetime resources.

Things are not too surprising since we can informally regard this Euler equation as the stochastic version of the consumption-smoothen implications studied without uncertainty: it is optimal to adjust consumption so that it is not expected to change. Now this statement is in expected terms and, in general, consumption will change over time in this model due to the underlying structure of the shocks. This is good because in the data we observe changes in consumption.

The Euler equation says that current consumption suffices to predict consumption in the future. Provided that we can write future consumption as the current forecast plus a white-noise error term, $C_{t+1} = E_t[C_{t+1}] + e_{t+1}$ the Euler equation allows us to derive

$$C_{t+1} = C_t + e_{t+1} \qquad (14)$$

In other words, consumption follows a random-walk. This is a process where changes in consumption are permanent. It means that uncertainty exists in the next period's expenditure while current consumption makes inertial effect on it. What we are really interested in is the proportional part which the uncertainty accounts for in the next period's consumption, or,

whether uncertainty plays as a revised random factor, or as an important one determining the trend of future consumption.

More specifically, consumption will respond to unanticipated shocks that change the consumer's estimate of lifetime resources. To see this, we refer to the expression for consumption C_1 shown above, which conveys again the idea that consumption is determined by (expected) lifetime permanent income (the life-cycle/permanent-income hypothesis). Similarly, the expression for C_2 can be written and manipulated as follows

$$C_2 = \frac{1}{T-1}(A_2 + \sum_{t=2}^{T} E_2[Y_t])$$

$$= \frac{1}{T-1}(A_1 + Y_1 - C_1 + \sum_{t=2}^{T} E_2[Y_t])$$

$$= \frac{1}{T-1}(A_1 + Y_1 - C_1 + \sum_{t=2}^{T} E_2[Y_t]) + (\sum_{t=2}^{T} E_2[Y_t] - \sum_{t=1}^{T} E_1[Y_t]) \quad (15)$$

The changes in consumption between period 1 and 2 equals the change in the individual's estimate of his lifetime resources divided by the number of remaining time periods, which implies that changes in consumption are unpredictable. This occurs because of information that was not anticipated initially. Changes in permanent income that were anticipated are already built into the consumption plan.

Homogeneous Income (Equate Permanent and Transitory Income)

The Permanent Income Hypothesis is a theory that links an individual's consumption at any point in time to the individual's total income earned over their existence. The hypothesis is based on two straightforward premises that individuals wish to equate their anticipated marginal utility of consumption across time and that individuals are able to respond to income changes by saving and dis-saving (Aguiar and Hurst 2008). Permanent income hypothesis can be expressed in terms of consumption function as $C = Y^P$. Current income can also be expressed as

$Y = Y^P + Y^T$ where Y^P is the permanent income and Y^T is transitory income respectively: assuming that, $E(Y^P) = 0$ and $Cov(Y^P, Y^T) = 0$

Let us consider a regression of consumption on current income:

$$C_i = a + bY_i + e_i \qquad (16)$$

Where $\hat{b} = \dfrac{Cov(Y,C)}{Var(Y)} = \dfrac{Cov(Y^P + Y^T), Y^P}{Var(Y^P + Y^T)} = \dfrac{Var(Y^P)}{Var(Y^P) + Var(Y^T)}$

$$\hat{a} = \bar{c} - \hat{b}\bar{Y} = \bar{Y}^P - \hat{b}(\bar{Y}^P + \bar{Y}^T) = (1 - \hat{b})\bar{Y}^P$$

When the variation in permanent income is much greater than the variation in transitory income, almost all differences in current income reflect differences in permanent income. Across households, variation in income reflects such factors as unemployment and the fact that households are at different points in their life cycle. Over time, almost all of the variation in aggregate income reflects long-run growth and permanent income increases.

Binding Financial Access Constraints

The microfinance upheaval over the past decade shows some promise in extending financial services in the form of credit, insurance and savings to underserved areas and households.The effectiveness of these efforts nevertheless remains uncertain, especially the extent to which micro financial institutions allow populations previously unable to undertake higher-return activities to access sufficient working capital for investment. Without more widespread access to financial savings and credit, however, binding working capital constraints will continue to trap the poorest subpopulations of rural Africa in low-return, high-risk livelihood strategies (Barrett et al, 2001). The domestic financial markets may be repressed or inadequately developed, or capital controls which impede access to financial markets may exist. Furthermore, when information about the households' credit risk is incomplete or asymmetric, the possibilities of moral hazard and adverse selection indicate that would-be borrowers may be denied access to capital markets (Stiglitz and Weiss

1981). Furthermore, an important stabilization policy in an economy with an occasionally binding financial friction should be set as if the friction were not present when this is not binding, even though the constraint does distort private sector behaviour even in the non-binding state. When the credit constraint is binding, optimal policy is to intervene to subsidize the price of non-tradable consumption. This subsidy increases demand for non-tradable goods and the relative price of non-tradable goods. The increase in income increases collateral and alleviates the effects of the binding borrowing constraint. It was also ascertained that the optimal policy has a small quantitative effect on private agents' behaviour, and particularly precautionary saving. This, however, does not imply that the optimal policy has small welfare effects.

According to De Brouwer (1996), the financial integration affects the ability of households to smooth their consumption over time and constrained intertemporal optimization of consumption. Furthermore, the study suggests that liberalization of the capital account, combined with deregulation and expansion of the domestic financial sector, is necessary for constraints on consumption smoothing to be eased, and financial integration *does* have real effects on the time profile of consumption. An intertemporal budget constraint shows a sequence of one period borrowing constraint. It may well turn out that none of these constraints are actually binding at the optimum, and yet the consumer is still constrained to choose a consumption program whose present value does not exceed the present value of the income stream. Whenever the expected increment in disposable income in the following period is sufficiently small so that the expected marginal utility from consuming out of that increment would be infinite, the consumer chooses to consume less than his current wealth in the current period in order to pass on some of his wealth to the next period. If we allow the expected marginal utility of future income to be finite, however, the borrowing constraint may well be binding, at least occasionally. This will obviously be the case if income received in each period is growing at a sufficiently high rate over time so that the consumer wants to transfer future income to present consumption. But if the income stream is suitably stochastic, a much weaker set of conditions guarantees that the budget constraint is sometimes binding. (Gianluca et al, 2009).

Under the financial crisis, households faced the problem of reconciling realized income shortfall with a desirable level of stable consumption. Households have devised several methods, such as self-insurance and mutual insurance, to protect their levels of consumption against the ex-post risks of negative income shocks.

Let us consider the following expression:

$$\underset{\{A_{t+1}\}_{t=0}^{\infty}}{Max}\ E_0\sum_{t=0}^{\infty}\beta'U(C_t)\quad \text{s. t.}\qquad C_t + A_{t+1} = A_t + Y_t \qquad (17)$$

$$C_t \geq 0 \qquad\qquad A_0 \ \text{is given.}$$

A first order optimality condition implies that;

$$E_t[C_{t+1}] = \beta_1 + \beta_2 C_t \qquad\qquad (18)$$

Euler equations with quadratic preferences are given by

$$U'(C_t) = \beta\, E[U'(C_{t+1})] \qquad\qquad (19)$$

$$\alpha_1 + \alpha_2 C_t = \beta\, E_t[\alpha_1 - \alpha_2 C_{t+1}]$$

Implies
$$E_t[C_{t+1}] = \frac{\alpha_1(\beta-1)}{\beta\alpha_2} + \frac{1}{\beta}C_t$$

$$= \beta_1 + \beta_2 C_t \qquad\qquad (20)$$

If $\beta = 1$, this amount to $\quad E_t(C_{t+1}) = C_t$ \hfill (21a)

The expression (21a) implies that there is no precautionary savings for the household. Now suppose the household faces the constraint $A_{t+1} \geq 0$, then, the lagrangian optimality conditions is given by

$$L = E_0\sum_{t=0}^{\infty}\beta'[U(C_t) - \lambda_t(C_t + A_{t+1} - A_t - Y_t + \mu_t A_{t+1}] \quad (21b)$$

First Order Conditions plus Complementary Slackness Conditions

$$U^{'}(C_{t}) = \beta \, E_{t}[U^{'}(C_{t+1})] + \mu_{t} \qquad (22)$$

$$A_{t+1}\mu_{t} = 0$$

$$A_{t+1} \geq 0$$

$$\mu_{t} \geq 0$$

To show $U^{'}(C_{t}) = Max\{U^{'}(Y_{t} + A_{t}), \beta \, E_{t}[U^{'}(C_{t+1})\} \qquad (23)$

The budget constraint is given by

$$C_{t} = Y_{t} + A_{t} - A_{t+1} \qquad (24)$$

Because $A_{t+1} \geq 0$, we know that $C_{t} \leq Y_{t} + A_{t}$ $\qquad (25)$

If $A_{t+1} = 0$: $C_{t} = Y_{t} + A_{t}$ and $U^{'}(Y_{t} + A_{t}) < U^{'}(C_{t}) = \beta \, E_{t}[U^{'}(C_{t+1})]$ $\quad (26)$

Hence $U^{'}(C_{t}) = \max\{U^{'}(Y_{t} + A_{t}), \beta \, E_{t}[U^{'}(C_{t+1})]\}$ $\qquad (27)$

With quadratic utility we get

$$\alpha_{1} - \alpha_{2}C_{t} = \max\{\alpha_{1} - \alpha_{2}(Y_{t} + A_{t}), E_{t}[\alpha_{1} - \alpha_{2}C_{t+1}]\} \qquad (28)$$

This implies that

$$C_{t} = \min\{Y_{t} + A_{t}, E_{t}[C_{t+1}]\} \qquad (28)$$

If we suppose that at time t the liquidity constraint is not binding while in t + 1 the realization of the income shock makes the household borrowing constrained then, the current consumption choices would not be affected by future consumption. Let's presume that in t + 1 the borrowing constraint is not binding, then $C_{t} = E_{t}[C_{t+1}] = E_{t}[C_{t+2}]$ by using the law of iterated expectations. But when in period t + 1, constraint is binding, then

$C_t = E_t[C_{t+1}] < E_t[C_{t+2}]$,Current consumption choices are affected by future potential borrowing constraints. Due to higher income uncertainty savings increase because agents are aware of their inability to smooth low income shocks via borrowing.

Empirical Model Specification

In this section we look at two strands of Ordinary Least Squares estimations. The first strand looks at the set of variables from the LSMS fourth and fifth rounds and the second strand considers the pooled data which was used for the regression. Suppose a households' income is specified as

$$Y = f(cdt, hhs, seh, aeh, pi, r_t)$$ (30)

Where Y is the income of the household: cdt is the credit availability: hhs depicts the size of the household: seh is the sex of the economics household head: aeh is the age of economic household head: pi is the price index and r_t represents the regions in Ghana, t ranges from 1 to 10. The equation (30) can be formalized as,

$$\log(Y_t) = \psi_1 cdt_t + \psi_2 hhs_t + \psi_3 seh_t + \psi_4 aeh_t + \psi_5 pi_t + \psi_6 r_{tt} + e_t \quad (31)$$

We merge the fourth and fifth rounds of the LSMS dataset to estimate a model to explain household food consumption expenditure. In addition to the combined estimates for the entire dataset, the data was also disaggregated and estimated. The regression equation for the various categories was given by,

$$\log(Y_\pi) = \psi_1 cdt_\pi + \psi_2 hhs_\pi + \psi_3 seh_\pi + \psi_4 aeh_\pi + \psi\, T_\pi + \psi_5 pi_{\pi} + \psi_6 r_{i\pi} + e_\pi \quad (32)$$

where ψ_i are the estimated coefficients, T stands for the time effect dummies and τ represent the pooled data set, i.e. Combined All; Combined Extreme; Combined Poor and Combined Non-Poor respectively.

Results and Discussion

Over time the household dataset of the last three rounds of the LSMS has almost doubled and has been revised to extract more robust information

based on the number and duration of visits (Coulombe and McKay 2008). Notwithstanding the fact that the LSMS is the only available composite national level data on community, households, enterprises and prices, its size, collection procedure and management of the dataset, provide a justification for its reliability. Like any other dataset, though the LSMS is susceptible to some theoretical questioning on the mode of aggregating, some indices such as calibrating absolute poverty lines, its usage is imperative in view of the above.

This paper relies on the household as the unit of analysis and extracts the variables of interest, which are food expenditure, total expenditure, total income, balance on savings account, and total amount of loan received, for the analysis. The LSMS dataset corrects and imputes both direct and indirect incomes and expenditure (See Coulombe and McKay 2008). Table 1 and figures 1-3, show a description of the dynamics over time and regional differences of household food consumption expenditure in relation to income, total expenditure and access to financial service. In each of the three rounds of the LSMS, household expenditure was at least 50 per cent more than income, which suggests the reliance on other coping mechanisms such as credit and remittances in maintaining an average household in Ghana. In spite of the huge proportion of food expenditure to total expenditure (more than 50 per cent), household income is observed almost fully by food expenditure.

In contrast to the Engel's law and consistent with earlier empirical work in Ghana (Udry and Woo 2006), household food expenditure does not fall dramatically as total expenditure increases. This is evidenced by the relatively elastic downward sloping curves from left to right by the graphs for total in all the figures. Significant regional variations are observed in each of the three rounds of the LSMS and over time. In the third round of the LSMS, the Upper West, Eastern and Central Regions, unlike the general pattern, revealed an almost perfectly inelastic curve, suggesting a lack of relationship between food expenditure and total expenditure. This signals the limited options for households to vary their consumption and indicates a survival livelihood system. In the same period, the Northern and Upper East Regions showed segments of positive

and inverse relationship. Over time, this changed as the Upper West and the Central Regions showed an inverse pattern in the fifth round of the LSMS. Obvious changes over time are observed in the Brong Ahafo Region. In the third round, it showed an inverse relationship, changed to positive coefficient in the fourth round and finally to an inverse but concave to the origin in the fifth round. The latter pattern suggests an initial fall in food expenditure at a higher rate as household total expenditure increases. This phenomenon is consistent with the Engel's law but circumspection with this interpretation is prudent as the manifestation is observed on only a segment of the curve. In a similar pattern, figures 1b, 2b and 3b show that the connection between household food expenditure and total expenditure revealed marked differences by poverty groupings in the respective rounds of the LSMS. The patterns were, however, fairly consistent over time relative to the dynamics observed in the case of the regional categorization. The within 'round' relationship between food expenditure and total expenditure for the different poverty groupings in part augments the regional variation on the premise of the stack differences in poverty by region and ecological zones (Ghana Statistical Service 2008). While the extreme poor does not dramatically show patterns consistent with the Engel's Law, other categories of respondents were modest in their deviation from the traditional Law of Economics. A striking observation was the consistent higher coefficient for the poor group compared to the non-poor group. Drawing conclusions at this stage on the coefficient between these two socio-economic groups may be misleading as the equations are simple (just one independent variable) but it is worthwhile noting them for further investigation.

The data on savings and credit showed erratic patterns dominated by extreme outliers and suggesting potential flaws in drawing conclusions based on the averages. The phenomenon is possibly explained by the supply side dominance in determining amount of loan received and the poor's savings habit which is characterized by non-financial instruments. Notable, however, is the significance of credit that is 30 per cent of the difference between household total expenditure and income. Despite the enormity of the amount of credit, though it provides only an iota of

relevance, the source of credit in Ghana still casts doubt on the development of the financial sector. About 55% of households rely on friends, relatives and neighbours for credit compared to other sources, including formal and informal financial institutions. Though the evidence suggests a commendation of the structure and benefits of social capital and the extended family system, it leaves policy makers in a dilemma; as such, sources of loan are clandestine in nature.
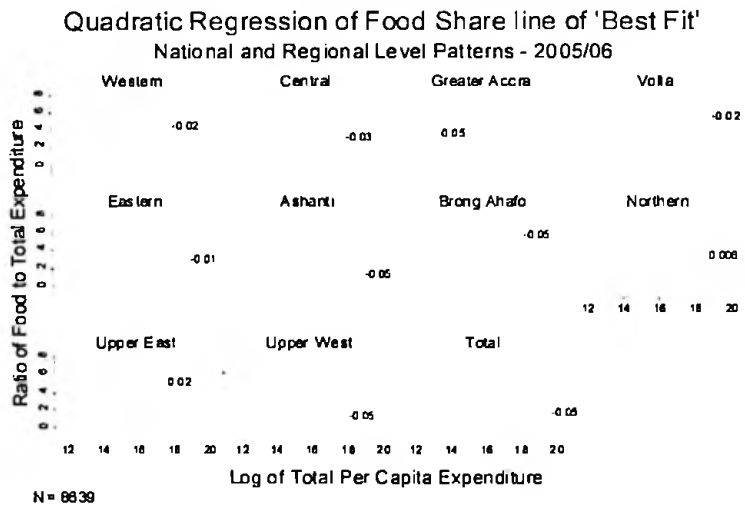
Table 1: Main Variables of Interest

Household Level Variables	LIVING STANDARD MEASUREMENT ROUNDS OF SURVEYS		
	THIRD – 1991/92 N = 4523	FOURTH -1998/99 N = 5998	FIFTH – 2005/06 N = 8639
Mean Total Expenditure	592.90	4,010.11	18,400.00
Mean Total Income	372.70	2,169.00	11,800 00
Mean Total Food Expenditure	330.70	2,271.28	9,389.38
Food Expenditure % of Total Expenditure	56%	57%	51%
Mean Amount of Credit	64.96	289.54	2,189.11
Mean Balance on Savings Account	98.29	351.56	3,066.82
Savings % of Income	26%	16%	26%
Credit % of Diff. b/n Expenditure & Income	30%	16%	33%
Major Source of Credit	Neighbour's – 67%	Neighbour's = 58%	Neighbour's = 53%

Source: Author's computation from raw data of the last three rounds of the Living Standard Measurement Survey's in Ghana.

- Mean Total Income and Expenditure are in Thousands of Cedis at current prices.
- These figures are more informative on the extent to which we are able to correct for the important inflation that occurred between 1991/92 and 2005/06. Ghana Statistical Service (2006) posits a national Consumer Price Index of 455.40 for November 2006 with respect to November 1997 as the base year. The World Bank database shows a respective yearly inflation of 20%, 14% and 13% for 1991, 1999 and 2006. The GLSS computation of household's expenditure accounts for regional price differences across the categories of both food and non-food items and housing.

Figures 1a

Quadratic Regression of Food Share line of 'Best Fit'
National and Regional Level Patterns - 2005/06

Figures 1 b

Quadratic Regression line of 'Best Fit' for Food Share:
National and Poverty Level pattems - 2005/06

Figure 2a

Quadratic Regression Line of 'Best Fit' for Food Share:
National and Regional level pattems - 1998/99

Figures 2b

Quadratic Regression Line of 'Best Fit' for Food Share:
National and Poverty Level patterns - 1998/99

N= 5998

Figure 3a

Quadratic Regression Line of 'Best Fit' for Food Share:
National and regional level patterns - 1991/92

N= 4523

Figures 3b

Quadratic Regression Line of 'Best Fit' for Food Share:
National and Poverty Level patterns - 1991/92

Estimation

The inciting observations offered by the descriptive statistics based on both regional and poverty patterns and trends provide the need for a relatively more rigorous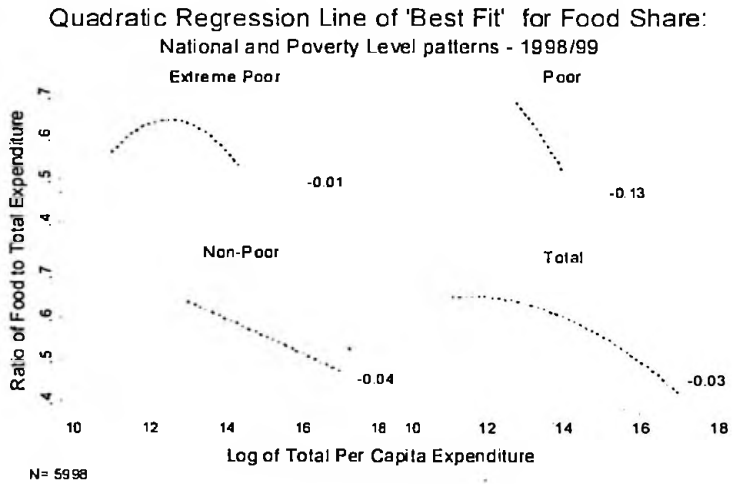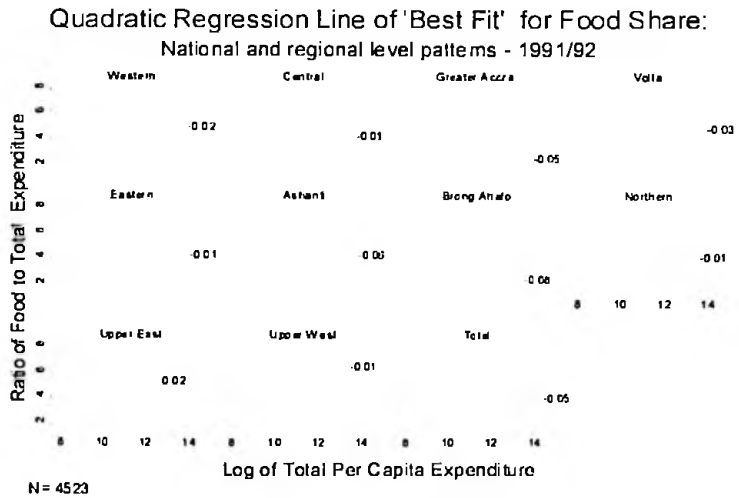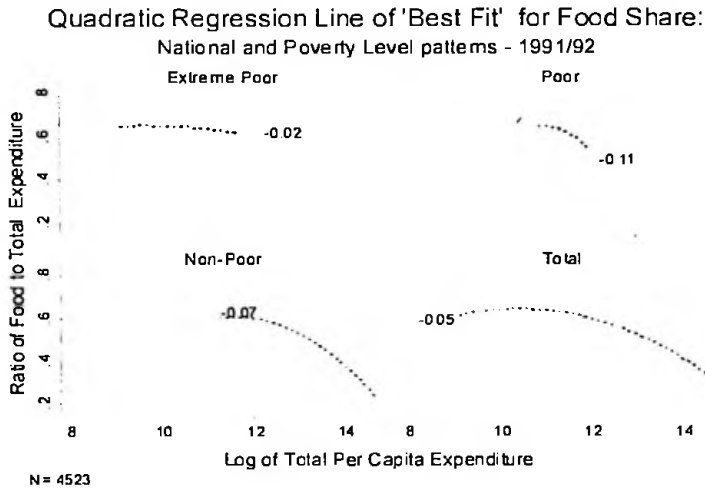 analysis to assert possible attribution and identify coefficients to inform policy. As an initial empirical investigation, the current research is restricted to the fourth and fifth rounds of the LSMS. Table 2, shows the summary statistics of the main variables of interest identified for the regression analysis. It could be observed that both food expenditure and income increase over the last two rounds of the LSMS by about two log points over the six year duration. The summary statistics for credit offers huge standard deviations, which constraints a succinct interpretation of its sign and coefficient in the regression. The regression controls for the effect of household size, sex and age of the economic head of the household and price changes, both across regions and over time. Controlling for the effect of price index, especially across time, is imperative as the mean price index between the rounds of LSMS literally increased by almost 400 per cent. Economic head, defined by the Ghana

Statistical Service as the major earner, seem relatively constant according to age and sex between the last two LSMS.

The log of income coefficient, unlike the traditional total expenditure reveals a positive coefficient in both independent random samples of the fourth and fifth rounds of the LSMS (Table 3). This observation is consistent with basic economic theory strictly from the perspective of income (earning). In both regressions, food share is expected to rise slightly over 21 per cent, given a one per cent change income level. In a broader context, the constraints of Ghanaian households impinge restrictions on the current food consumption and that given the smallest increase in their income level, a fifth will be translated into food expenditure. Though a pill hard to swallow and the obvious data problems with the amount of credit, the sign of the coefficient varies in the two rounds and is approximately zero. This latter suggest the plausibility of the classical error in variable problem of least squares, which will be verified in a later version of this paper. Patterns of the location coefficient within each of the samples showed the expected results in view of the socio-economic characteristics in each of the regions. The order of changes in the magnitude of coefficients is fairly consistent with the ranking of poverty by regions in both LSMS's. The responsiveness of changes in food share is much higher in richer regions relative to the poorer regions. Comparing across the LSMS, the signs of the coefficients for location and price index vary, suggesting some degree of doubt in relying on individual estimates. Though the source of the problem is not eminently known and could be multiple, one approach to resolve such a problem is to pool the data. Wooldridge,(2006) asserts that in view of the obvious attribute of gaining a larger sample size, pooled independent random samples offer more precise estimators and tests statistics with more power.

Table 2: Variables for Multivariate Analysis: LSMS Rounds 4 & 5

Variables	Round 4 N = 5,998		Round 5 N = 8,639		Combined N = 14,637	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Log of Food Expenditure	14.41	0.70	15.81	0.74	15.24	1.00
Log of Income*	14.01	1.26	15.60	1.28	14.94	1.49
Credit+	128.5	589.00	654.98	4,911.73	444.35	3,831.16
Household Size	4.28	2.56	4.20	2.83	4.24	2.72
Sex of Economic Head	0.41	0.49	0.38	0.49	0.40	0.49
Age of Economic Head	43.85	15.26	42.82	15.32	43.24	15.30
Price Index (Accra = 99)	0.89	0.05	3.44	0.38	2.39	1.30
Poverty Status	1.47	0.82	1.60	0.75	1.55	0.78
Time effect (Dummy)	0	0	1	0	0.60	0.49
Regional Effect (Dummy)	-	-	-	-	-	-

* Some Households have negative income therefore the log generates missing values.

+ Credit is measured in thousands of cedis.

Table 3: Robust Estimation of Household Food Consumption Expenditure - Ordinary Least Squares Regression

Explanatory Variables	Round 4 (1999)		Round 5 (2005)	
	Coefficients	t-statistics	Coefficients	t-statistics
Log of Income	0.21	[26.77]**	0.22	[32.89]**
Credit	-0.00	[-0.07]	0.00	[0.17]
Household Size	0.08	[27.07]**	0.08	[31.45]**
Sex of Economic Head	-0.01	[-0.43]	-0.01	[-0.89]
Age of Economic Head	-0.00	[-2.20]*	-0.00	[-3.83]**
Price Index (Accra=1999)	1.75	[7.86]**	-0.42	[-14.36]**
Western Region	-0.07	[-2.19]*	-0.46	[-13.13]**
Central Region	-0.27	[-8.78]**	-0.47	[-12.75]**
Volta Region	-0.20	[-5.66]**	-0.60	[-16.16]**
Eastern Region	-0.25	[-7.70]**	-0.42	[-11.27]**
Ashanti Region	-0.04	[-1.31]	-0.58	[-16.63]**
Brong Ahafo Region	-0.14	[-3.97]**	-0.63	[-16.25]**
Northern Region	-0.36	[-7.89]**	-0.82	[-19.13]**
Upper East Region	-0.37	[-7.02]**	-0.98	[-22.27]**
Upper West Region	-0.68	[-14.22]**	-1.38	[-30.62]**
Constant	9.76	[41.83]**	14.19	[82.89]**
N	5793	-	8330	-
Adj. R^2	0.418	-	0.420	-
F-Statistic	260.97	-	312.40	-
Log-Likelihood	-4582.74	-	-7011.26	-

† $p<.10$, * $p<.05$, ** $p<.01$

[4] Other variants of least square estimation were explored to improve on the specification. Typically, the log of credit was used to examine elasticities but due to loss of data arising from zero responses, we did not report the results.

In Table 4, we merge the fourth and fifth rounds of the LSMS dataset to estimate a model explaining household food consumption expenditure. In addition to the combined estimates for the entire data set, the last three major columns of the table disaggregate the sample by socio-economic well-being. The rationale for using the welfare thresholds is to observe the responsiveness of the identified covariates for each of the socio-economic groups and overtime. This is employed to curb plausible heterogeneity bias, which arises due to the non-availability of a panel dataset at national level. A narrow assessment of the resilience of the pooled data relative to the individual regressions using the R-Squared shows that the models' fit almost doubles. Besides, the main hypothesis of the lack of effect of access to financial services on household food expenditure pooling the data offers a response to the question – what has happened to food expenditure over time after controlling for relevant factors?

Access to financial services measured by the amount of credit shows a positive sign but not statistically significant at even ten per cent with both the entire combined datasets and for each of the socio-economic groups. Though not conclusive at this stage, and through further investigation is necessary for correction of some potential problems, such as error in variable, the initial observation pointing to a lack of direct relationship, upholds the hypothesis of this paper. Holding the potential data problems constant, some explanations can be alluded for the positive, extremely low coefficient and lack of relationship between amount of credit and food share. Firstly, the positive relationship is expected as the constraints on income drive the use of credit for consumption. Secondly, a caveat to the expected positive relationship is the reason and nature of the contract of the credit. As mentioned earlier, amount of credit is potentially a supply-side (financial institutions) determinant or at best co-determined by both demand and supply agents. Hence, its outcome is dependent on the strength of bargain. This impedes the realization of a correlation between households needs such as food and credit. Thirdly, the major source of credit; relatives, friends and neighbours; as is evident from the descriptive statistics, shrouds reasons, nature and other characteristics of the credit in secrecy thereby blurring any expected potential effect on food share. Lastly, intended use of credit in most developing countries is

skewed to production rather than consumption needs. Though access to financial services intuitively is advocated as a coping measure, it is observed from this study that it does directly translate to significant increases in household food consumption expenditure.

Consistent with apriori expectation, household size shows a positive sign with food share showing that food consumption expenditure tends to increase with a greater number of household members. Female economic headed households tend to reduce household food expenditure relative to their male counterparts. This finding, quite intriguing, can be linked to other national-level socio-demographics such as female headed household being relatively well-off than their male counterparts in all the last three rounds of the LSMS. In a similar pattern, age of economic head of household shows an inverse relationship with food share. Thus, older household heads spend less on food expenditure relative to younger head of households. An additional merit of pooled cross section estimation is introduction of a time dummy variable that evaluates the unexplained changes in household food share over time after controlling for the identified covariates. The time effect variable from Table 4 turns out to be utterly significant in all four estimations, suggesting that holding constant household discriminatory factors, food consumption expenditure has changed between 1998/99 and 2005/06. Observing the t-ratio across the different socio-economic groups, the non-poor group offers the most significant changes over time. An early conclusion from this is the skewness of policies in favour or detrimental to non-poor households over the seven year period (1999-2005). This provides a platform for future work to investigate the effect of policies that were non-existent prior to 1999 such as National Youth Employment Programme (NYEP), Rural Infrastructure Project (RIP) and the Highly Indebted Poor Country Initiative (HIPC). Most of the interventions, including the NYEP, RIP and HIPC, at the beginning of the 2000 decade and during the initial tenure of the incumbent government were on pilot basis and scattered unevenly across the country. This potentially offered varied effect on spatial basis and indirectly accounted for different impacts on households with diverse socio-economic characteristics. In Ghana, this needs to be underscored as poverty, for ages has been endemically location-specific.

Across different socio-economic groups, log of income coefficient tends to vary and reveals a u-shaped curvature similar to the relationship between food share and log of per capita expenditure observed from the descriptive statistics. Though all (last three major columns of table 4) show a positive sign, indicating that households irrespective of the socio-economic background on the average will increase their food consumption expenditure as income increases, the coefficient varies. In spite of the need to assess the statistical difference between these coefficients prior to any deduction, the literally observed difference is worth underscoring. Identifying reasons for this pattern readily in this paper is insurmountable but, as alluded, it incite much concern for further academic and intuitive investigation as this will inform greatly the success of development policies.

Table 4: Robust Estimation of Household Food Consumption Expenditure - Ordinary Least Squares Regression

Explanatory Variables	Combined All	Combined Extreme Poor	Combined Poor	Combined Non-Poor
Log of Income	0.22	0.14	0.04	0.14
	[42.88]**	[12.89]**	[3.83]**	[27.65]**
Credit	0.00	0.00	0.00	0.00
	[0.31]	[1.16]	[0.43]	[0.04]
Household Size	0.08	0.13	0.17	0.13
	[40.53]**	[24.24]**	[28.97]**	[54.09]**
Sex of Economic Head	-0.01	-0.04	-0.07	-0.02
	[-0.56]	[-1.77]+	[-3.44]**	[-1.94]+
Age of Economic Head	-0.00	-0.00	0.00	-0.00
	[-4.93]**	[-2.20]*	[0.91]	[-3.32]**
Price Index (Accra=1999)	-0.28	-0.08	0.18	-0.15
	[-12.55]**	[-1.06]	[2.56]*	[-6.97]**

Western Region	-0.28	-0.11	0.15	-0.22
	[-12.93]**	[-1.48]	[2.64]**	[-10.64]**
Central Region	-0.37	-0.13	0.18	-0.25
	[-16.63]**	[-1.91]+	[3.16]**	[-11.41]**
Volta Region	-0.42	-0.13	0.13	-0.30
	[-18.22]**	[-1.99]*	[2.43]*	[-12.95]**
Eastern Region	-0.34	-0.24	0.15	-0.22
	[-15.00]**	[-3.16]**	[2.73]**	[-10.70]**
Ashanti Region	-0.34	-0.06	0.11	-0.25
	[-16.66]**	[-0.91]	[2.02]*	[-12.57]**
Brong Ahafo Region	-0.42	-0.13	0.19	-0.29
	[-18.06]**	[-1.76]+	[3.04]**	[-12.79]**
Northern Region	-0.62	-0.28	0.16	-0.28
	[-22.59]**	[-4.04]**	[2.47]*	[-9.79]**
Upper East Region	-0.78	-0.24	0.20	-0.34
	[-24.86]**	[-3.28]**	[2.86]**	[-9.02]**
Upper West Region	-1.13	-0.45	0.00	-0.55
	[-38.09]**	[-6.47]**	[0.01]	[-11.34]**
Time Effect (=1 if 2005)	1.80	1.25	0.74	1.54
	[30.74]**	[6.11]**	[4.07]**	[27.59]**
Constant	11.70	11.55	12.51	12.56
	[140.96]**	[57.41]**	[77.41]**	[156.19]**
N	14123	2589	1289	10245
Adj. R^2	0.689	0.732	0.861	0.727
F-Statistic	1870.76	421.16	418.91	1655.10
Log-likelihood	-1.2e+04	-1818.06	-364.55	-7016.77

t statistics in brackets ― + $p<.10$, * $p<.05$, ** $p<.01$

Conclusion and Policy Recommendation

The main hypothesis of a lack of relationship between access to financial service and household food consumption expenditure is upheld. Both merits and demerits can be inferred from this observation. In some perspective, it can be argued that credit is intended for production and not for consumption; therefore, revealing undefined relationship with food expenditure is commendable. On the flipside, a plausible initial inference could be that the amount and targeting of credit intended to mitigate food constraints is ineffective. Though each of these responses is contestable household specific questions on patterns, beneficiaries, amount and usage of credit in Ghana are instigated. Either of the possible inferences requires in-depth studies and the correction of potential data and estimation problems including errors, variables and endogeneity.

Other main findings from this paper are that wide regional and socio-economic variations, especially for the coefficient of household income changes over time. Beyond variations based on household characteristics, pooling the last two rounds of the LSMS shows unexplained changes in household food consumption expenditure over time. Drawing definite conclusions based on the current findings is impeded by the nature of data and lack of further statistical test. This notwithstanding, the finding signals a call for circumspection and tailoring of credit access; for financial service should serve as an income boost for household food consumption.

Preliminary policy recommendation points to complementing access to financial service with other food crisis interventional options. Among the options to be verified empirically include provision of agricultural inputs, integrated financial services with a special focus on insurance and extension officers. These are of enormous essence as a stand alone policy of access to credit, at best merely increases food prices and, more importantly, has the potential of instituting a vicious cycle of poverty as insinuated by the World Bank.

The observed findings incite the need for a panel data to reveal both unobserved individual household food consumption expenditure characteristics and variations overtime. Though the pooled data provides relatively more precise estimates compared to individual cross section

regression, it does not capture individual household heterogeneity as sample units vary in the different rounds of the LSMS. Data on specific policy interventions between the two rounds of the LSMS will provide some details and clues to the sources of variations across time, region and socio-economic groups. Further estimation will explore the statistical significance of running separate regressions for the socio-economic categories or plugging into the main structural equation different dummies to test the differences. The Chow Test was applied to verify the statistical significance of the different regressions to offer a more resilient and justifiable results and conclusions.

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