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# **Investigating Endogeneity Effects of Social Capital on Household Welfare in Nigeria: A Control Function Approach**

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## **Abstract**

This study examined the relationship between social capital and household welfare. Primary data was collected from 300 households in the rural southwest of Nigeria. The age of respondents; sex, education, marital status, household size and farming status make a significant contribution to changes in household welfare. Also, the decision making index and meeting attendance are statistically significant and both are positively and negatively related to household welfare, respectively. Results of the two stage least square reveal the exogeneity of social capital. However, the use of the control function model indicates that social capital is truly endogenous to household welfare due to non-linear interactions between social capital and unobservable variables.

**Keywords:** endogeneity, welfare status, control function, social capital, Nigeria

**JEL:** I31

## **1 Introduction / Problem Statement**

The level of poverty in a household is widely recognized as an important indicator of the well-being of the household and this is reflected in the central role that the concept of poverty plays in the analysis of social protection policy. According to OLUWATAYO (2004), poverty exists when an individual or group of individuals fail to attain a level of well-being, usually material well-being which is deemed to constitute a reasonable minimum by the standard of that society. The state of long-term deprivation of well-being is considered inadequate for a decent life, this means that poverty is an ex post measure of a household's well-being (or lack thereof). This deprivation is mostly felt by the rural households because they are invariably the most vulnerable due to the peculiar characteristics inherent in their primary means of livelihood and major income source, agriculture. Therefore, households develop coping strategies to deal

with the risk of income fluctuations and this may involve the use of social network in time of need and/or arranging access to credit.

PUTNAM (2001) and GROOTAERT (1999) believed that social capital has quantifiable effects on different aspects of human endeavour. The duo argued that the effects on different aspects of life include; lower crime rates, better health (WILKINSON, 1996), improved longevity, better educational achievement (COLEMAN, 1988), greater levels of income equality, improved child welfare and low rate of child abuse (KAWACHI et al., 1997). Others include lower corruption and more effective government (PUTNAM, 1993; KNACK, 1999), dispute resolution and enhanced economic achievement through increased trust and lower transaction cost (FUKUYAMA, 1995). All of these mechanisms can potentially affect household welfare and enhance community groups to overcome poverty.

Views differ about what constitutes social capital, how it operates, to whom and what the concept applies, and how to delineate between its sources, manifestations and effects. However, there seems to be broader agreement in the literature about what social capital does, than what it is. In particular, it is widely agreed that social capital facilitates mutually beneficial collective action. It can also be viewed from two angles, i.e. government social capital and civil social capital. COLLIER (1998) differentiates between government social capital as involving the enforceability of societal contracts, rule of law, and the extent of civil liberties and civil social capital which involves common values, shared traditions, norms, informal networks and associational membership. In societies where government social capital is limited, a large proportion of contracts may depend on civil social capital and trust. According to NARAYAN and PRITCHETT (1997), social capital is pervasive and can generate benefits in a subtle range as well as more visible ways e.g. reduce information imperfections, encourage cooperative action in solving problems with a local common property element, facilitate diffusion of innovations by increasing inter-linkages among individuals, increase informal insurance (or informal safety nets) between households, etc.

The linkage between social capital and welfare is particularly relevant in many rural communities throughout sub-Saharan Africa, where households suffer from pervasive and extreme poverty. In Nigeria poverty is especially acute: average per capita income is \$320 per year, well below the World Bank's poverty line of \$1 per day (UNDP, 2002). Social capital refers to the networks and norms which govern interactions among individuals, households and communities; this network is often given a structure through the creation of local associations or local institutions. Social capital can have an important impact on household welfare, either substituting for or enhancing existing forms of capital in communities where traditional forms of capital required to generate income are scarce or depleted. Also, households and villages with

stronger social ties might be more likely to share risk, thereby mitigating the negative impacts of exogenous climatic shocks. Local associations can serve a wide variety of functions in the life of a community. They can play a vital role in the management of the community such as provision of social services, e.g. education and health, provision of infrastructure services, i.e. water, electricity and more. Associations like farmers group, cooperative societies can also help the household obtain access to credit and help farmers manage irrigation and improve access to agricultural inputs facilities.

Poverty alleviation has been receiving increasing global attention more importantly in the developing countries where majority of the people are considered poor. The need to reduce poverty to the barest minimum has been the major concern of the Millenium Development Goals (MDG). Nigeria, has always spear-headed this campaign with a view to achieving poverty reduction in Africa, however, the challenge of implementation has been enormous. Nigeria is a great country endowed with vast economic potentials but the level of poverty has made the realisation of self-sustenance far from being a reality. The Nigerian government, international developing agencies and the civil society devoted considerable resources towards achieving poverty reduction by funding programmes such as “Community Action Programme for Poverty Alleviation” (CAPPA), Family Economic Advancement Programme (FEAP), Community-based Poverty Reduction Project (CPRP), National Fadama Development Project and Local Empowerment and Environmental Management Project (LEEMP).

Irrespective of the efforts at reducing poverty to enhance individual or household welfare, the impact largely remained unfelt by the poor (YUSUF, 2008). This is because the focus of the government programmes until recently, is on provision of infra-structural facilities, with little or no considerations for institutional development which enhance social organizations and community development through the creation of employment opportunities etc at the local level to ensure the delivery of support to the poor (OKUNMADEWA et al., 2005a). The central objective of poverty reduction through rural development involves raising incomes and output as well as increasing the existing assets in order to improve the welfare of rural people in totality. It is, therefore, very important to involve the stakeholders in the planning of these poverty reduction programmes by putting into consideration the gender, age, cultural barriers and socio-political differences of community members. This will help to reduce social constraints and thus, allow for the cross-fertilization of ideas which is particularly important in the rural areas where majority of the population are poor and social connectedness is significant to their daily interactions. The essence of coming together to form a group lies in the expectation of some benefits; the extent to which these benefits are realized could be established through the feedback from the farmers themselves. Studies such as GROOTAERT (1999), GROOTAERT and BASTELAER (2002),

YUSUF (2008) have measured social capital in relation to household welfare, these studies have suggested credit programmes, fertilizer supply and other input supply as a way that farmers' welfare can be improved through improved agricultural productivity; however, these studies are incapable of establishing the contribution of social capital towards farmers' welfare especially in the study area. Also, membership and active participation in group activities in order to acquire social capital can be costly in terms of commitments of time and resources and which could otherwise affect the overall household welfare. The study, therefore, seeks to fill the knowledge gap in welfare analysis by examining the effects of household level social network on economic outcome of farming households and establish the relationship that exist between household welfare and social capital. It also tested the endogeneity of social capital in relation to household expenditures.

The rest of this paper is structured as follows. Section 2 describes the source of data and gives basic information on the study area, it presents the models used to investigate endogeneity of social capitals well as the measurement of variables. Section 3 discusses the findings of the study putting into consideration the socio-economic factors of respondents and dimensions of social capital. It established the relationship between household welfare and social capital with particular reference to endogeneity issues. Section 4 concludes and gives recommendations of the study

## **2 Methodology**

This study was conducted in southwest Nigeria using Ekiti and Oyo states as the case study states. The selection of these states is justified by their high and low incidence of poverty within the southwestern states, respectively (NBS, 2004). Ekiti state was created from the old Ondo state in 1996 while a state was caved out from the old Oyo state in 1991. Both states are located on the southwestern Region of Nigeria. The region is where the Yorubas, one of the major ethnic groups in Nigeria, reside.

With World Bank rating, Ekiti state has the highest incidence of poverty in Nigeria and was therefore selected in 2001 by World Bank for pilot activities in a community based programme for poverty reduction. However, by NBS (2004) rating, it has the highest poverty incidence next to Lagos state in the southwest region. The people of the state are rural dwellers whose poverty is a result of inability to generate enough income from their agricultural and non-agricultural activities to increase production (CEDAR, 2003). On the other hand, Oyo state has the lowest poverty incidence in the southwest region of Nigeria. Both states are agriculture based economies with the production of food crops providing employment and income for more than 75.0% of the population (OLUWATAYO, 2004, and [www.oyostategov.com](http://www.oyostategov.com)). The people are

predominantly farmers while women engage in food processing, trading, in addition to farming activities. The climate favours both states in the cultivation of crops like maize, yam, cassava, millet, rice, plantains, cocoa, palm produce, cashew etc.

The primary data for this study were obtained through the use of a well-structured questionnaire from farming households in the study area. The primary data collected from each household included the following: socio-economic and demographic, participation in local level institutions, household expenditure and asset ownership

A multistage sampling technique was employed for the study. The first stage is the purposive selection of two states from the six states that formed the southwestern region of Nigeria, i.e. Oyo and Ekiti state based on their poverty profile. Ekiti state has the highest poverty incidence next to Lagos but was chosen due to increased urbanization of Lagos state, while Oyo state has the lowest poverty incidence in the southwest Nigeria. The second stage involves the stratification of local government areas (LGAs) of each state into urban and rural strata as indicated by the Ministry of local government and chieftancy offices of both states. A proportionate to size of the total rural LGAs for each state was used i.e. 25%. Given the population of Oyo state relative to that of Ekiti state, four and two LGAs form the 25% rural population respectively. Since Oyo and Ekiti states have 4 and 2 Agricultural Development Programme (ADP) zones, respectively, ADP is a national programme organized by the Nigerian government to foster agricultural development. A random selection of a rural LGA from each of the ADP agricultural zones for both states forms the third stage leading to 6 LGAs in all. ADP agricultural zones were used because the study focused on rural households whose primary livelihood is farming. The number of respondents used in each state was proportionate to the population size of the state, this constitute the third stage of sampling. In all 232 respondents were sampled in Oyo state, while 113 respondents were sampled in Ekiti state. However, only 300 questionnaires were used in the analyses. Inadequate information and inconsistency necessitated the rejection of others.

The analytical tools used to analysed data collected are descriptive and inferential statistics, such as ordinary least square (OLS), two stage least square (2SLS) and control function model. The descriptive statistics used include tables, percentages, and all forms of indices to categorise the welfare status of the respondents.

## **2.1 Social Capital and Household Welfare**

This study applied the analytical framework that was earlier used by NARAYAN and PRITCHETT (1997) and GROOTAERT (1999), GROOTAERT and BASTELAER (2002), OKUNMADEWA et al. (2005b), (2007), AKER (2005), YUSUF (2008). The conventional

model of household economic behaviour under constrained utility maximization was used to relate the level of household per capita expenditure (as money - metric indicator of welfare) directly to household endowments (assets) and variables describing social and economic environment in which decisions are made. The household welfare is hypothesized to be influenced by the independent variables included in the model below:

$$(1) \quad \ln E_i = \alpha + \beta SC_i + \gamma HC_i + \delta OC_i + \sum X_i + Z_i + \mu_i$$

Where

$E_{ij}$  is per capita expenditure of household  $i$

$SC_i$  is a measure of the household endowments of social capital, the variables include: density of membership, heterogeneity index, meeting attendance index, cash contribution ( $\text{₦}$ ), labour contribution (mandays) and decision making index, aggregate social capital index

$HC_i$  is the household head human capital; (education in years)

$OC_i$  is other household assets; (farming equipment, farm size, number of livestock)

$X_i$  is a vector of household head characteristics: (age in years, age squared, sex (dummy), household size (actual number), marital status (dummy), farming enterprise (dummy)

$Z_i$ , is a vector of distance of the village to the nearest urban area (km) and

$\mu_i$  is unobserved disturbances and potential measurement errors.

In the model above all explanatory variables were assumed to be exogenous – household assets are assumed to consist of human capital (measured using years of educational attainment of adult household members), other capitals represent, natural capital (acres of land cultivated), physical capital (access to farm equipment and livestock) and financial capital (access to credit).

The key feature of the model is the assumption that social capital is a capital asset i.e. a stock, which generates a measurable return (flow of income) to the household. Social capital has many “capital features: it requires resources (especially time) to be produced and it is subject to accumulation and destruction. Social capital is believed to be built during interactions which occur purposely for social, religious, or cultural reasons. The key assumption is that the networks built through these interactions will have measurable benefits to the participating individuals, and lead, directly or indirectly, to a higher level of well-being. There is an impact assumption that social capital is embodied in the members of the household. This conforms to the position of PORTES (1998), who advocated that social capital itself is an individual asset, although it is sourced from the relationships which exist among a group of individuals. Contrary to this is the position of PUTNAM (1993), who sees social capital as a collective asset.

For the purpose of this study, the position by PORTES (1998) is adopted. Hence, social capital is viewed as an individual household asset.

### **Measurement of Variables**

#### *Per Capita Expenditure*

The three main approaches to household welfare measurement according to MUELLBAUER (1980) include, estimation of true indices of welfare, total household expenditures and full income concept. This study adopted household total expenditure as a measure for household welfare in the study area considering the advantage of less required data and the fact that getting the actual total income of farming household may be not be possible. The approach has been extensively used in various similar studies by GROOTAERT (1999), GROOTAERT and BASTELAER (2002), OKUNMADEWA et al. (2005a), OKUNMADEWA et al. (2007), YUSUF (2008). This is the household monthly expenditure on food and non-food items which it includes consumed household own production

#### **Social Capital Dimensions**

##### *Cash Contribution (N)*

This is the amount paid as membership due per annum in an association. This was obtained by the summation of the total cash contributed to the various associations which the household belongs. Cash contribution can also reveal respondents commitment to the group. The coefficient is, therefore, expected to be positive (GROOTAERT, 1999).

##### *Labour Contribution*

This is represented by the number of days that household members claimed to have worked for their various groups. It represents total number of days worked by household members or number of days worked per year as membership contribution. The coefficient is expected to be positive as reported by YUSUF (2008), OKUNMADEWA et al. (2005) or negative as reported by GROOTAERT (1999).

##### *Decision Making Index*

This is the summation of how the respondents rank their participation in the decision making of the three most important groups to them. An average of the rank for the three groups was calculated and multiplied by 100 for each household. The expected sign is positive (GROOTAERT, 1999; YUSUF, 2008; OKUNMADEWA et al., 2005).



### *Heterogeneity Index*

This is an aggregation of diversity of members of the three most important institutions to the households, e.g. same kin group, occupation, economic status, religion, gender, age group and same occupation. A maximum score of 10 was allotted for each association to represents the highest level of heterogeneity. The scores by the three associations for each household was then divided by the maximum score of 30 to obtain an index which was then multiplied by hundred. The coefficient is expected to be positively related to benefit received and household welfare (GROOTAERT, 1999; YUSUF, 2008). However, in some studies the index is negative, e.g. OKUNMADEWA et al. (2005).

### *Membership Density*

This is the summation of the total number of associations to which each household belongs. The coefficient is expected to be positively related to both benefit received through social capital acquisition as well as household welfare (AKER, 2005).

### *Meeting Attendance Index*

The index was obtained by summing up attendance of household members at meetings and relating it to the number of scheduled meetings per annum by the associations they belong to. The value was then be multiplied by 100. Meeting attendance is expected to be positively related to benefit received from social group (MALUCCIO, 2000; AKER, 2005).

### *Aggregate Social Capital Index*

This is the multiplicative social capital index. The index was calculated using the products of density of membership, heterogeneity index and decision making index oh household in their various social groups. The expected sign is positive.

## **2.2 Two Stage Least Square (2SLS)**

In order to correct for endogeneity of social capital, instrumental variable (IV) were used. Since social capital can be assessed at a cost (time and resources), the causality between expenditure and social capital runs in both direction and this will cause the OLS estimates to be biased. In order to address the joint endogeneity problem, it will be necessary to isolate the exogenous impact of social capital on household expenditure; Instrumental Variables (IV) were used for the potential exogenous variable in the model, i.e. social capital. The IV used was highly correlated with social capital and uncorrelated with household expenditures. Variables such as length of household residency in the community, household donation in the past year and

membership in a religious group and membership in ethnic group(s) were considered as potential instruments for the social capital variable. The 2SLS reduces the correlation of the explanatory endogenous variable with the error term (OLAYEMI, 1998).

### 2.3 Control Function Approach

The control function (CF) approach is an econometric method that is used to correct for endogeneity problem (WOOLDRIDGE, 1997, 2003; HECKMAN and NAVARRO, 2004), it could also be applied in more general semi-parametric settings (CHESHER, 2003; IMBENS and NEWAY, 2006). It can be used to handle endogeneity in models with linear parameters and it draws comparisons with standard methods such as 2SLS. Certain nonlinear models with endogenous explanatory variables are most easily estimated using the CF method, and the recent focus on average marginal effects may suggest some simple, flexible strategies. The advantage of the use of control function approach is to address the heterogeneity of the potential endogenous variable due to non-linear interaction of the regressor with the unobservables and omitted variables which could bias the estimated structural coefficients.

Most models that are linear in parameters are estimated using standard IV methods, either two stage least squares (2SLS) or generalized method of moments (GMM). An alternative, the control function (CF) approach, relies on the same kinds of identification conditions. In the standard case where endogenous explanatory variables appear linear, the CF approach leads to the usual 2SLS estimator. However, there are differences for models nonlinear in endogenous variables even if they are linear in parameters. And for models nonlinear in parameters, the CF approach offers some distinct advantages. The basic idea behind the control function methodology is to model the dependence of the outcome unobservables on the observables in a way that allows us to construct a function  $K$  such that, conditional on the function, the endogeneity problem will disappear.

Using WOOLDRIDGE (2002) and AJAKAIYE and MWABU (2007), the estimation strategy may be summarized as follows.

$$(2) \quad E = g_1 \delta_e + \beta SC + \varepsilon_1$$

$$(3) \quad SC = f \delta_{sc} + \varepsilon_2$$

$$(4) \quad P = 1 (f \delta_p + \varepsilon_3 > 0)$$

Where

$E$ ,  $SC$ ,  $P$  are expenditure (to capture household welfare), social capital and an indicator function to select the observation into the sample, respectively.

$g$  = vector of exogenous covariates;

$f$  = exogenous variables which consist covariates of expenditure  $g$ , and a vector of instrumental variables which affect social capital  $SC$ , but have no direct influence on expenditure,

$E$ ;  $\delta$ ,  $\beta$  and  $\varepsilon$  are vectors of parameters to be estimated and a disturbance term.

Equation 2 is the structural equation of household welfare whose parameters are to be estimated, the second equation is the reduced form linear probability model of social capital that is the linear projection of the potentially endogenous variable,  $SC$  on all the exogenous variables  $f$ . Equation 4 is the probit for the sample selection. It is the probability of an inclusion of factors that can affect household welfare. It helps to correct sample selection bias in the parameters to be estimated. In order to accommodate the non-linear interactions of the unobservables with the expenditure regressors, the complementarity between social capital and other factors affecting it can be rewritten as

$$(5) \quad E = \alpha_0 + g_l \delta + \beta SC + \alpha_l V + \gamma (V \times SC) + \theta (SC \times R) + \mu$$

Where

$V$  is the fitted residuals of social capital which is derived from a linear probability model, that is observed value minus the fitted value,

$V \times SC$  is the interaction of the fitted social capital variables with the actual value of the social capital variables.

$R$  is the exogenous variables such as donation; religion; length of stay amongst others, which is correlated with social capital.  $\mu$  is composite error term. In equation 5, the terms  $V$ , and  $V \times SC$  are the control function variables which control for the effect of the unobservable factors that will contaminate the estimates of the structural parameters.

The effect of social capital ( $SC$ ) on household expenditure ( $E$ ) from equation 5 is given by the partial derivative expression below.

$$(6) \quad \partial E / \partial SC = \beta + \theta R + \gamma V$$

$\beta$  in equation 6 is the direct effect of  $SC$  on the expenditure  $E$  which should be zero because social capital has no direct effect on household expenditure. However, the role of social capital is to help reduce or share household risk through social connectedness and trust which in return improves household welfare.  $\theta R$  which is not actually estimated, is the indirect or complementarity effect which explain the impact of the

correlation of social capital SC with other sources of capital on welfare. Although this complementarity effect is not obvious, it is readily understood by noting that when both SC and R are increasing, welfare is improving at the rate,  $\theta$ . The parameter  $\theta$  is the effect of the increase in both SC and R on welfare, where the increase is not necessarily proportional. I.e.  $\theta$  is the effect of a unit increase in the interaction term, (SC x R) on welfare. In as much as SC increases, a unit increase in R increases welfare by  $\theta$ . Both SC and R are normalized to zero at the origin. The third term in equation 16,  $\gamma V$  captures the non-linear effect of SC on welfare.

The reduced form social capital residual  $V$  serves as the control for unobservable variables that are correlated with SC. If an observed variable is linear in  $V$ , it is only the intercept,  $\alpha_0$ , that is affected by the unobservable, thus the IV estimates of equation 5 are consistent even without the inclusion of the interaction term. The interaction term, ( $V \times SC$ ), controls for the effects of non-linear interaction of an observable variable with social capital. Specifically, if the effect of SC on welfare is influenced by an observable variable,  $a$ , which is correlated with SC, this unobserved influence ( $a \times SC$ ) is relegated to the structural error term and its source neglected during estimation. The estimated coefficient on SC contains this neglected effect of unobservable variables; other structural coefficients may be similarly affected. The inclusion of the interaction term, ( $a \times SC$ ) in equation 5 purges the estimated coefficients of the effects of the unobservables (CARD, 2001). The interaction of  $V$  with SC captures the idea that the size of  $a$  varies non-linearly with SC. Thus, the unobserved and neglected effect ( $a \times SC$ ) changes in a non-linear way as SC changes, the polynomials of the fitted residual term,  $V$ , and its interactions with exogenous covariates,  $f$ , can be included in equation 5. The IV estimates of equation 5 are unbiased and consistent only when one or the other of the following conditions holds (a) expected value of the interaction between social capital and its fitted residual ( $V \times SC$ ) is zero; (b) the expectation of interaction between SC and its fitted residual is linear (WOOLDRIDGE, 1997).

### 3 Results and Discussions

#### 3.1 Socio-economic Characteristics and Social Capital Dimensions

The socio-economic characteristics of the respondents in relation to the social capital dimensions are presented below.

##### 3.1.1 Age of Respondents and Social Capital Dimensions

As presented in the table 1, participation of households in social institutions reveals that the age range between 40 and 49 accounted for the highest percentage (25.33%) in membership of local institutions, followed by respondents that are between 50 and 59

years (22.80%). Those that are less than 30 years have the lowest membership density (15.46%). On the level of membership diversity, people within the age range of 60 and 69 years have the highest diversity in the association they belong and this accounted for 27.9% while those above 69 years have the lowest diversity. This could be due to weakness or reduction in active farming activities, a consequent of ageing. Attendance of meeting result reveals that all the age groups except the respondents that are less than 30 years have more than average attendance at scheduled meetings by their various associations. However, the highest representation of 58.19% at meeting attendance was recorded for age group within 40 and 49 years. This implies that households attend at least every other meeting scheduled, i.e. one out of every two meetings.

**Table 1. Distribution of respondents age and social capital dimensions**

Age Groups (years)	Membership Density Index (%)	Heterogeneity Index (%)	Meeting Attendance Index (%)	Cash Contribution (₦)	Labour Contribution (manday)	Decision Making Index (%)	Aggregate Social Capital (%)
< 30	15.46 (7.54)	23.12 (9.15)	47.75 (26.45)	5418.12 (5529.36)	10.81 (8.25)	75.70 (26.36)	38.10 (11.07)
30 - 39	21.72 (11.12)	23.33 (10.50)	54.20 (16.89)	5848.54 (8247.52)	18.42 (17.54)	73.84 (19.24)	39.63 (9.68)
40 - 49	25.33 (11.23)	25.40 (14.75)	58.19 (19.35)	9374.95 (12113.31)	23.70 (16.03)	79.95 (19.94)	43.56 (9.29)
50 - 59	22.80 (9.44)	24.24 (13.51)	53.84 (15.26)	7656.32 (9560.54)	21.64 (15.31)	82.27 (18.74)	43.11 (9.02)
60 - 69	20.06 (11.07)	27.92 (13.09)	52.18 (18.74)	5554.98 (6722.66)	23.91 (19.24)	86.42 (18.33)	44.80 (8.96)
> 69	17.75 (6.50)	17.33 (12.65)	51.94 (23.87)	5399.00 (6636.39)	27.20 (12.43)	90.00 (14.30)	41.69 (5.13)

Figures in parentheses are standard deviation.

Source: field survey (2009)

The highest representation of cash contribution to various associations is within age group of 40 and 49 years, followed by 50 and 59 years with mean value of ₦9,374.95 and ₦7,656.32, respectively. The least money contributed, ₦5,399.00, is by respondents above 69 years. The reason for this group least contribution could be traced to reduction in income as age increases or reduction in their income generating activities due to health reasons. On decision making in various associations, 90% of the respondents that are above 69 years, participate in decision making in their associations,

while the least in decision making are those who fall within the age group of 30 and 39 years as represented by 73.8%. The result reveals that all the age groups have well above average in decision making in their various associations. The overall social capital dimensions shows that 44.8% of respondents within age group of 60 and 69 years have the highest aggregate social capital and the least represented by 38.10% are those that are less than 30 years.

### *3.1.2 Education of Respondents and Social Capital Dimensions*

The educational level of the respondents is presented in table 2, respondents with 7-12 years of education have the highest percent of membership density in local institution (24.65%) and this is closely followed by respondents with primary and tertiary education i.e. (24.48%) and (24.27%), respectively. The least, however, in the group are those without formal education. This indicates that educational level can expose households more to local level institutions. On the issue of diversity in membership, respondents with 7-12 years of education are most diversified with 28.1% while the least diversified are those with primary education. Meeting attendance across the educational groups shows that all the respondents have above average attendance except those with above 17 years of education; this could be as a result of their involvement in other activities. However, they (respondents with post graduate education) have the highest value of contribution with an average of ₦11, 588.75 as their monthly contribution to their various associations.

Respondents with no formal education accounted for the least cash contribution with ₦4, 357 as the average contribution. This can be attributed to the fact that this set of people belong to least paid which will likely reflect in their contribution capability to local level institution. While 23.45 mandays of the respondents represent the highest value of labour contribution for those without formal education, respondents with 13-17 years of education have the least value represented by 18.5%. This could be expected since the exchange of physical labour would be more recorded among those without formal education. All the educational groups claim to partake in decision making in their various associations. However, respondents without formal education accounted for the highest average value of 84.9% while the least average value is 76.9% representing respondents with 13-17 years of education. Except for post graduate respondents, it is observed that decision making reduces as the number of year of education increases. On the aggregate, the educational class that has the highest social capital value is the respondents with over 18 years of education (43.55%) and this is closely followed by those with post primary education with an average value of 43.37%. The least, however, is respondents with post-secondary school qualification represented by 40.88%.

**Table 2. Distribution of respondents level of education and social capital dimensions**

Educational Groups (years)	Membership Density Index(%)	Heterogeneity Index (%)	Meeting Attendance Index (%)	Cash Contribution (₦)	Labour Contribution (manday)	Decision Making Index(%)	Aggregate Social Capital(%)
0	18.49 (7.41)	24.93 (14.89)	53.96 (22.59)	4357.86 (4735.30)	23.45 (19.45)	84.93 (20.06)	42.79 (9.07)
1 - 6	24.48 (11.28)	20.14 (8.44)	56.79 (15.41)	5572.50 (7076.32)	20.75 (14.42)	83.33 (13.70)	42.65 (6.62)
7 - 12	24.65 (10.84)	28.10 (14.91)	54.50 (15.90)	9496.85 (13059.72)	23.35 (15.12)	77.36 (21.00)	43.37 (10.35)
13 - 17	21.15 (10.48)	24.55 (13.05)	55.99 (20.37)	9156.92 (10150.96)	18.52 (14.13)	76.92 (22.96)	40.88 (9.67)
≥ 18	24.27 (13.66)	27.22 (11.45)	48.05 (16.37)	11588.75 (11220.24)	21.17 (20.44)	79.17 (20.80)	43.55 (12.75)

Figures in parentheses are standard deviation.

Source: field survey (2009)

### 3.1.3 Respondents Household Size and Social Capital Dimensions

The composition of the household in terms of size is presented in table 3. The household size group that participated most in local institutions are those having between 5 and 8 members with a representation of 23.7% as the average value, while those with least participation in local institution are those with 13 and above members. Households with 9 to 12 members have a highest diversification (29.1%) while those with 13 members and above are least diversified (19.2%). On meeting attendance, households with 13 members and more have an average of about 62.6% meeting attendance while the least representation is an average value of 52.4% for households with 4 members and below. With an exception of household with 9 to 12 members, meeting attendance increases as household size increases.

Respondents having between 5 and 8 household members contributed most to their various associations with an average value of ₦8,103.94. There is a wide difference between the average values of the highest and the least cash contributors. The least cash contribution of ₦1,974.89 made was from respondents with 13 members and above, this could be attributed to their high dependency ratio. On the other hand, this group has the highest labour contribution of 36 mandays while respondents with

members between 1 and 4 have the least average value of about 17 mandays. Results for decision making for various association reveals that all categories of household size participate in decisions made in their various associations. An average value of 83.5% gives the representation of household with 9-12 members while households with 13 members and more have about 76.5% average value. On the aggregate level, social capital increases as the number of household increase except for those with members that are equal or above 13 which has a reduced value of 37.8%.

**Table 3. Distribution of household size and social capital dimensions**

Household Size Distribution	Membership Index (%)	Heterogeneity Index (%)	Meeting Attendance Index (%)	Cash Contribution (₦)	Labour Contribution (manday)	Decision Making Index (%)	Aggregate Social Capital (%)
1 - 4	20.84 (10.67)	21.92 (9.90)	52.14 (19.30)	7777.86 (11377.54)	17.15 (13.23)	79.30 (22.62)	40.69 (10.70)
5 - 8	23.71 (10.74)	25.47 (14.11)	55.40 (18.16)	8103.94 (9769.15)	22.87 (17.12)	81.02 (19.06)	43.40 (9.02)
9 - 12	21.06 (10.00)	29.09 (14.25)	54.60 (17.51)	4284.24 (4555.18)	22.88 (15.43)	83.50 (14.73)	44.55 (7.29)
13	17.78 (9.39)	19.26 (13.82)	62.67 (20.58)	1974.89 (403.96)	36.00 (21.01)	76.54 (22.50)	37.86 (29.81)

Figures in parenthesis are standard deviation.

Source: field survey (2009)

### 3.1.4 Sex of Respondents and Social Capital Dimensions

The male household heads belong to more associations than their female counterparts, and this is reflected in the result of membership index which shows that male household heads have an average of 23.3% memberships. However, the associations that the female household heads belong to are more diversified than the male counterpart. The male household heads attend association meetings on the average level, while the female meeting attendance is below average. Also, the male household heads contributes more to the various groups which they belong with an average cash value of ₦7,813, while the female heads contributes about ₦5,455. Although labour contribution is closely related but the female heads have a higher value of 21.8 mandays when compared with 21.74 mandays for the male heads. As expected in decision making, the male household heads have a higher index of 81.2% as well as with the social capital aggregate level of 43%.



**Table 4. Distribution of respondents sex and social capital dimensions**

Sex of Household	Membership Index (%)	Heterogeneity Index (%)	Meeting Attendance Index (%)	Cash Contribution (₦)	Labour Contribution (manday)	Decision Making Index (%)	Aggregate Social Capital (%)
Female	18.14 (10.33)	25.26 (12.14)	47.86 (18.64)	5455.88 (7454.75)	21.84 (18.91)	78.00 (22.50)	40.56 (10.90)
Male	23.36 (10.54)	24.56 (13.50)	50.06 (18.18)	7813 (10131.15)	21.72 (15.91)	81.25 (19.19)	43.06 (8.96)

Source: field survey (2009)

### 3.1.5 Marital Status of Respondents and Social Capital Dimensions

Table 5 presents the marital status of the respondents in the study area. The married respondents have a higher average value of membership density in local institution (23.0%), heterogeneity (24.9%) ( i.e. they are more diversified in the associations they belong to), they also have higher values for meeting attendance (56.2%), labour contribution (22.1 mandays) and contribute more to their local associations in terms of cash (₦7,593.75) than their single counterparts. However, in decision making, the singles value is slightly higher than that of the married. In all, the married have higher aggregate social capital than the singles in the study area.

**Table 5. Distribution of respondents marital status and social capital dimensions**

Marital Status	Membership Index (%)	Heterogeneity Index (%)	Meeting Attendance Index (%)	Cash Contribution (₦)	Labour Contribution (manday)	Decision Making Index (%)	Aggregate Social Capital (%)
Single	14.29 (8.07)	22.22 (9.39)	34.19 (16.38)	5010.95 (4957.79)	16.67 (11.89)	80.95 (21.70)	39.15 (10.30)
Married	23.09 (10.60)	24.92 (13.51)	56.20 (17.73)	7593.75 (10008.4)	22.12 (16.67)	80.68 (19.68)	42.90 (9.24)

Figures in parentheses are standard deviation.

Source: field survey (2009)

### 3.2 Social Capital and Household Welfare

The result of the ordinary least square method is presented in table 6. Two models were used for the OLS estimation for comparison. Model 1 presents the OLS estimation of the effect of household socio-economic variables on household welfare while model 2 includes the potential endogenous variables of farm equipment, livestock and crop owned. The OLS result for model 1 indicate that age, age squared which captures the life cycle of the household head, sex, education, marital status, household size and farming status make significant contribution to percentage changes in household welfare. The adjusted  $R^2$  slightly increased in model 2 as household assets (farm equipment, livestock and crop) are included to model 1, and the model suggests that household demographic characteristics play a significant role in explaining variations in household welfare. For example, a unit increase in household size is associated with decrease in household expenditures by 0.479 whereas an increase in the level of educa-

**Table 6. Result of the OLS estimate of social capital and household welfare**

Variable	Model 1		Model 2		Model 1 with Additive Social Capital		Model 2 with Additive Social Capital	
	Coeff	t	Coeff	t	Coeff	t	Coeff	t
Constant	16.0572***	(8.29)	15.9886***	(8.21)	14.9366***	(7.34)	14.8136***	(7.30)
Age	-0.2575***	(-3.45)	-0.2525***	(-3.37)	-0.2566***	(-3.41)	-0.2431***	(-3.23)
Age Squared	0.0027***	(3.61)	0.0026***	(3.50)	0.0025***	(3.39)	0.0024**	(3.17)
Sex	0.8831*	(1.78)	0.9285*	(1.84)	0.7496	(1.49)	0.8253	(1.63)
Education	0.1134***	(3.56)	0.1072***	(3.31)	0.1306***	(4.00)	0.1268***	(3.87)
Marital Status	-3.1667***	(4.34)	-3.2279***	(-4.41)	-2.6662***	(-3.54)	-2.6553***	(-3.53)
Household Size	-0.4790***	(5.67)	-0.4906***	(-5.71)	-0.4022***	(-4.66)	-0.4158***	(-4.77)
Farming Status	-2.0218***	(-5.01)	-2.0766***	(-5.13)	-1.8122***	(-4.37)	-1.9129***	(-4.60)
Disturb	0.0042	(0.60)	0.0037	(3.69)	0.0020	(0.28)	0.0011	(1.08)
Farm Size	0.0421	(1.41)	0.0196	(0.59)	0.0318	(1.05)	-0.0010	(-0.03)
Farm Equipment			0.0163	(0.57)			0.0271	(0.90)
Livestock			0.00098	(0.88)			0.0013	(1.19)
Crop			0.00181	(1.00)			0.0023	(1.22)
Cash Contribution					0.012	(0.60)	-0.0029	(-0.14)
Labour								
Contribution					-0.0111	(-1.01)	-0.0106	(-0.96)
Decision Making					0.0280**	(3.12)	0.0290***	(3.22)
Heterogeneity								
Index					-0.0129	(-0.99)	-0.0162	(-1.23)
Membership								
Density					-0.0211	(-1.16)	-0.0195	(-1.07)
Meeting								
Attendance					-0.0149	(-1.49)	-0.0185*	(-1.81)
Number of								
Observation	300		300		300		300	
Adj R <sup>2</sup>	0.4088		0.4089		0.4245		0.4283	

\*\*\* significant at 1 % level, \*\* significant at 5% level and \* significant at 10% level

Source: data analysis (2009)

tion by one unit is associated with an increase in household expenditures by 0.113. This high coefficient is due to the peculiarity in the household structure in the study area and generally in Nigeria. Usually, a household may comprise of the nuclear family (which is sometimes made up of more than one wife at a time and each with their children) as well as extended family members.

An inclusion of social capital variables to model 1 increases the model's explanatory power, from 40.88% to 42.45% and from 40.89% to 42.83 % in model 2. Variables, such as age, education, household size, farming and marital status are statistically significant, participation in decision making in a social group is statistically significant and positively related to household expenditures. This suggests that household welfare improve as household get involved in the affairs of their social group. Meeting attendance is also significant but negatively related to household welfare. This is an indication that scheduled meetings is in excess such that it consequently affect household welfare negatively. Though, a positive relationship with household welfare is reported by AKER (2007). The negative effect as discovered in the study is in line with the study conducted by YUSUF (2008).

### **3.3 Endogeneity Effects of Social Capital under Different Approaches**

In the earlier analysis social capital has been treated as exogenous variable. However, membership in social groups is at a cost i.e. time and other resources. It, therefore, becomes important to isolate the exogenous impact of social capital on household expenditure. The study tested for the existence of a causality effect with the aid of instrumental variable (2SLS) and control function approach. Earlier studies have always used a common instrumental variable to verify the endogeneity effect of social capital. The instrument commonly used is "trust" as used by NARAYAN and PRICHETT (1997), GROOTAERT (2001), GROOTAERT and BASTELAER (2002), OKUNMADEWA et al. (2005) and YUSUF (2005). The limitation of the use of trust as an instrument for social capital was acknowledged by PUTNAM (2000) and YUSUF (2005). This study, however, used another instrument for social capital as used by AKER (2005). The proposed instruments include household length of residency in their present locations, a binary variable indicating charity contribution in the past year, membership in a religious body as well as membership in an ethnic group.

According to GLAESER et al. (2000) it is assumed that length of residency is highly correlated with social capital and uncorrelated/ weakly correlated with household expenditure given the time it takes to build social networks. Also, charity donation (e.g. financial support during social functions) is an indication of households' sense of kinship with the community as donation is not associated with the level of wealth of the household because some poor households will donate to maintain their relationship

with the community; therefore, it is correlated with social capital and not with household welfare (AKER, 2005). Thirdly, household membership in religious body offers an opportunity to build social capital and it is not associated with access to resources therefore correlate with social capital and lastly, communities with more homogenous ethnic composition would develop and maintain social relationship easily and uncorrelated with household expenditure (MIGUEL, 2004).

The heterogeneity of per capita household expenditure due to non-linear interaction of social capital with unobservable and omitted variables could bias the estimations of the structural coefficients. A control function approach is hereby employed in this study in order to address this issue (WOOLDRIDGE, 1997; CARD, 2001, and AJAKAIYE and MWABU, 2007). The application of control function estimated through Heckman two-step procedure becomes more suitable for the study in order to take care of sample selection bias since households without per capita expenditure are excluded from the estimation and thus help to correct sample bias in the estimated parameters. The correction factor is the inverse of the “Mills Ratio”.

A correlation analysis between aggregate social capital (multiplicative) and proposed instruments for social capital was made and the result reveals that household membership in ethnic group has the highest correlation coefficient (0.2267) with the social capital and it is therefore used as the instrumental variable for social capital in the 2SLS analysis.

**Table 7. Correlation values of instrumental variables with multiplicative social capital**

	<b>Length of Residency</b>	<b>Charity Donation</b>	<b>Membership in Religious Group</b>	<b>Membership in Ethnic Group</b>
Multiplicative social capital	0.0081 (P>0.1)	0.0950 (P>0.1)	0.0623 (P>0.1)	0.2267 (P<0.001)
Remark	Not significant	Not significant	Not significant	Significant

Source: field survey (2009)

The estimation of the endogeneity effect of social capital under different approaches is presented in table 8, the result of the instrumental variable shows an improvement in the adjusted  $R^2$  from a value of 0.4049 (with actual social capital index) to 0.4215 in the second stage where social capital was instrumented for. Also, the result revealed that there is an increase in the coefficient of social capital index in the 2SLS relative to the OLS estimates from 0.0190 to 0.0280. This implies the absence of significant reverse causality, since there is increase in the coefficient of social capital index and

the adjusted  $R^2$  in the instrumental variable method compared with the estimates of the OLS method. The exogeneity of social capital is therefore inferred. This result is in line with NARAYAN and PRICHETT (1997), GROOTAERT (1999), OKUNMADEWA et al. (2005), AKER (2005) and YUSUF (2008).

**Table 8. Estimation of endogeneity effects of social capital under different approaches**

Variables	OLS		2SLS (Use of Instrumental Variable)		Control Function (using Heckman)			
	Coefficient	t- value	Coefficient	t- value	Linear Interaction of Social Capital with Unobservables		Non-Linear Interaction of Social Capital with Unobservables	
					Coefficient	t- value	Coefficient	t- value
Age	-0.2333***	-3.05	-0.2381***	-3.18	-0.2606***	-3.39	-0.2606***	-3.40
age_sqr	0.0024***	3.26	0.0024***	3.29	0.0026***	3.44	0.0026***	3.45
Sex	0.9819*	1.95	0.8890*	1.78	-0.6157	1.22	0.6164	-1.22
Education	0.1159***	3.52	0.1026***	3.19	0.1727***	5.61	0.1729***	5.61
Marstatu	-3.1244***	-4.26	-3.2805***	-4.53	2.8832***	4.02	2.8913***	4.03
Hhdsiz	-0.4985***	-5.78	-0.4733***	-5.52	-0.4828***	-5.66	-0.4814***	-5.62
Famgstatus	-2.0106***	-4.92	-2.0226***	-5.02	-0.6647**	-1.93	-0.8133**	-2.66
Dsturn	0.0053	0.72	0.0040	0.56	0.0121	1.67	0.0122	1.70
Famsiz	0.0177	0.55	0.0312	0.26	0.0311	-0.99	-0.0323	-1.02
Famequip	-0.0035	-0.25	0.0037	0.26	0.0101	-0.72	-0.0103	-0.74
Livestock	0.0013	1.19	0.0011	1.01	0.0014	1.25	0.0014	1.29
Crop	0.0022	1.25	0.0009	0.51	0.0016	0.95	0.0016	0.94
Socapaggr1	0.0190*	1.77	0.0280**	2.52	0.0287**	2.70	1.0606	2.76
cons	15.5976***	7.91	15.4430***	7.94	11.0834***	4.88	10.9880***	4.8
Reduced form Social Capital Residual					0.1048***	7.83	0.1305***	10.77
Social Capital x Social Capital Residual							0.0560***	7.16
Inverse of Mills Ratio					0.1124	0.02	0.1295	0.21
$R^2$	0.4351		0.4467					
Adjusted $R^2$	0.4049		0.4215					
Sample Sizes	300		300		300		300	
Censored obs					5			
Uncensored obs					295			

Source: data analysis (2009)

The problems due to endogeneity and neglected non-linearities are revealed by a comparison of the of 2SLS estimates with the estimates derived from the control function approach. The improvement in the adjusted  $R^2$  and coefficient of social capital index over OLS estimates infers that social capital is truly exogeneous. The result on

the table indicates that the endogenous effect of social capital on household welfare largely depend on method of analysis. The coefficient of social capital in the control function method is more than that of the OLS estimate, and this better explain the effect of social capital on household welfare. A comparison of the two stage least square (2SLS) estimates with that of control function approach reveals the problems due to endogeneity and neglected non-linearities. The 2SLS estimate of the effect of social capital on household welfare is 0.0280, which is an improvement on the OLS estimate of 0.0190, indicating that the coefficient changes very little when social capital is instrumented for. However, with linear interaction of social capital with the unobservables in the control function approach, the coefficient is about four times more than that of the 2SLS estimates i.e. 0.1048. Nevertheless, accounting for non-linear interactions of social capital with unobservables further increases the coefficient to 0.1305. The result therefore, results reveals that social capital has effect on household welfare in the study area.

Also, in the control function approach, the coefficient of the fitted social capital residual is statistically significant at 1% (table 8). Also, the coefficient of the inverse of the Mills ratio is insignificant, this according to AJAKAIYE and MWABU (2007) suggest that sample selection bias is not a problem in the data set. The estimated coefficients of the household welfare (endogenous) while addressing the linear interaction of social capital (potential endogenous) with its fitted residual under control function approach are identical to the estimates of instrumental variables (WOOLDRIDGE, 1997, 2003; HECKMAN and NAVARRO, 2004). The coefficient on the fitted residual without controls for linear interactions is 0.1048 and significant at 1%. However, with the controls for non-linear interactions between social capital and unobservables, this coefficient increases to 0.1305 and it is significant at 1percent; this indicates that social capital is endogenous to household welfare.

The control function approach is, therefore, an appropriate estimation strategy because it takes into account both the endogeneity of social capital and the heterogeneity of response of household welfare to social capital. This heterogeneity issue, however, arises from the non-linear interaction of social capital with unobserved determinants of household welfare, such as the behavioural attitude of households towards their own welfare and the environment. Inclusion of the control function variable ( $V \times SC$ ), in the household welfare equation thus purges the estimates of any effects of heterogeneity and reveals endogeneity effect of the endogenous exogenous variable in the models.

Since the control function takes into account the interaction between social capital and the unobservables revealing that social capital is truly endogeneous, it, therefore, permits to reject earlier stated null hypothesis that social capital is not endogenous to household expenditures; hence, the alternative hypothesis is hereby accepted.

## 4 Conclusions and Recommendations

The study provides empirical evidence that social capital and its dimensions have an effect on household welfare. It is evidenced from the study that education can complement social capital in improving household welfare. The problem of endogeneity of social capital on household welfare was addressed using two different approaches. The results from these approaches are different. The result of the control function approach is adopted, because it takes into account the non-linear interactions between social capital and the unobservables in its effect on household welfare.

The government should also create an enabling environment (friendly) for the emergence of local organizations in terms of their registration and the constitution governing formation of such especially ethnic groups. Since social capital serves as a compliment to human capital in enhancing household welfare, a policy that will attract and encourage the rural dwellers to formal education should be put in place. Farming households should be encouraged to be involved in social group activities as a way of reducing poverty, which consequently will improve rural households' welfare and agricultural productivity at large. It is not enough to belong to a local organization, active participation in such organization is very crucial and this can be achieved through regular meeting attendance and partaking in the decision making of the group.

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