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SOCIAL CAPITAL EFFECT ON RURAL HOUSEHOLDS' FOOD AND NUTRITION SECURITY IN NORTH-CENTRAL BURKINA FASO

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Abstract

This article focuses on the issues of food security which arise with acuteness in Burkina Faso. It investigated especially the influence of social capital on food and nutritional security of rural households in the north-central region of Burkina Faso. For this, the Catholic Relief Services database, collected in 2011 from a sample of 434 households, is used to construct the Food Consumption Score and two social capital indicators (cognitive and structural). A logistic model is then estimated and the results show that only the structural aspects of social capital strengthen households' food security. In particular, they show that households receiving transfers, who can count on the help of their relatives, and who participate in farmers' organizations meetings are more likely to be food secure (OR = 1.959). Thus, to achieve food security, it is necessary to promote social support networks and strengthen farmers' organizations.
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Jel Codes: *L66, O13, Q18, R20, Z13*

1. Introduction

Food insecurity continues to threaten the existence of many households in most sub-Saharan Africa (SSA) countries, which regularly face famines due to climate change and population growth. Indeed, FAO et al (2022) indicate that of the 923.7 million people in a situation of severe food insecure in 2021, approximately 322 million are in Africa, including 293.8 million in SSA and 3.9 million in Burkina Faso. The COVID-19 health crisis and terrorist attacks with their corollaries of internally displaced persons (IDPs) have contributed to worsening the food situation in Burkina Faso in recent years, especially in rural areas. According to statistics from the National Council for Emergency Relief and Rehabilitation (CONASUR), in March 2023 Burkina Faso had more than 2,062,534 million IDPs, with 628,464 people in a serious famine situation (phase 4). In addition, of the 45,000 people suffering from hunger to a catastrophic degree (phase 5) in the Sahel, 42,000 live in Burkina Faso during the same period. According to the results of the nutrition survey carried out as part of Performance Monitoring and Accountability 2020 (PMA2020) program, hunger is still persistent and access to adequate food remains low, especially in rural areas where severe food insecurity affects more 24.9% of households against 15.3% in urban areas. Food insecurity, which refers to the lack of access to enough good, healthy, and culturally appropriate food,

therefore presents itself as one of the main challenges faced by most rural households in Burkina Faso.

Among the factors mentioned to explain this situation of households' food security, the weakness of social capital or the low use of this asset occupies pride of place. Viewed as a resource embedded in the structure of social relations, social capital can indeed help individuals access certain resources that cannot be provided through the traditional mechanisms of the market (Jones and Woolcock, 2007). This is why social capital is increasingly considered in many studies as one of the main determinants of households' food security (Kaiser et al., 2020; Nosratabadi et al., 2020; Abafita et Kim, 2014). Most of these studies show that social capital can help alleviate food insecurity especially in low-income countries where it acts as a social safety net to help households overcome situations of food shortages, of serious diseases and natural disasters by strengthening their resilience. Social capital is thus perceived in terms of social networks, relationships of trust, norms of reciprocity, abilities to cooperate, and group membership. The general idea is that households can permanently have access to adequate food which enables them to be healthy, through their personal networks of relationships and their ability to cooperate, trust each other and become involved in community life (Dzanja et al., 2015 ; De Silva and Harpham, 2007).

The theorists of social capital argue indeed that it increases the chances of accessing various forms of resources and social support that can help overcome difficult times (Kaiser et al., 2020; Dzanja et al., 2015). Thus, individuals who maintain solid social relationships based on trust and reciprocity with those around them (parents, neighbors, friends and colleagues) can benefit from food supplies transfers and loans allowing them to cope with a possible consumption shock. As such, even the poor who have no other assets can improve their food situation through their involvement in networks of lasting relationships. In the United States, for example, Martin et al. (2004) have shown that households with a high level of social capital are less likely to experience hunger even if their financial resources are limited. According to Liverpool-Tasie et al. (2011), social capital can directly affect food security, by increasing food availability, and indirectly through the channel of agricultural productivity.

On the one hand, the multiple social interactions create strong relationships of trust that allow individuals to seek help from their social networks in an emergency. In some SSA countries, this assistance takes the form of food supplies transfers that allow households to subsist during lean periods (Gelli et al., 2017 ; Dzanja et al., 2015). Many other studies show that in communities where the level of social capital is high, households are able to recover easily after the occurrence of a natural disaster (flood or drought) by helping each other out (Kehinde et al., 2021 ; Kaiser et al., 2020). In this way, social capital increases the resilience of populations to food insecurity (Dzanja et al., 2015). As a multiplier of the other forms of capital, social capital also enables strengthening food security through individual incomes because food insecurity is generally linked to poverty. On the other hand, several empirical studies show that social capital, particularly membership of associations or community organizations, can facilitate access to agricultural inputs and influence cropping practices through the adoption of new production technologies (Kehinde et al., 2021; Liverpool-Tasie et al., 2011). It results an increasing in agricultural productivity which can improve household food security. Furthermore, many empirical works show that social capital significantly improve nutritional status of individuals (De Silva and Harpham, 2007). Most of these works place particular emphasis on the nutrition of children under five years of age because malnutrition is one of the main causes of the global burden of disease in this age group. However, social capital has a dark side that can negatively affect households' food security. It's about for example the negative influence that the peer group can have on the adoption of certain eating behaviors and thus deteriorate health status (Di Falco and Bulte, 2011). The results of several other studies also show that some forms of social capital, such as the close

social ties between members of a group, can constitute a brake on the achievement of individuals' food and nutrition security (FNS) (Abafita and Kim, 2014). On the other hand, there are some works that have found no significant effect of social capital on food security (Chhabra et al., 2014).

Overall, the review of the literature at least suggests the existence of a relationship between social capital and household FNS, although the nature of this relationship is not fully determined. This review shows that the results reached by these studies are controversial and often fragmentary. Moreover, the effect of social capital on household food security has not been widely researched in Burkina Faso. Further studies are therefore needed to better understand the mechanisms by which social capital affects households' food security especially in low-income countries such as Burkina Faso. This research is part of this logic and aims to fill this gap in the literature. It will help generate knowledge about the factors that increase households' resilience to food insecurity in a difficult socioeconomic context. The article is interested here to the particular case of the north-central region of Burkina Faso and presents the advantage of combining food security and nutrition through the concept of FNS which is measured by dietary diversity scores. Indeed, food security is a necessary but not sufficient condition for achieving nutritional security (Maxwell, 1996). It is a concept based on four main pillars. These are the availability of food in sufficient quantity (food supply), the physical and economic access to this food, the body's use of this food, and the stability of the supply. With FNS, the emphasis is on the health and cultural aspects of the food supply without necessarily taking into account where its origin. This paper uses a varied range of variables characteristic of social capital and aims to assess their potential effects on rural households' FNS in Burkina Faso. These different variables were used to construct two synthetic indicators of social capital (cognitive and structural) using the Multiple Correspondences Analysis (MCA) technique. In this context, it is hypothesized that households with high levels of social capital are more likely to be food secure than others.

The remainder of the paper is organized as follows. Section 2 presents the methodological approach and the data use to implement the model. Section 3 summarizes and discusses the main results. The last section concludes the paper and outlines its main economic policies implications.

2. Methodology

2.1. Data Source

We use survey data from "Beoog biiga[1]" project of Catholic Relief Services (CRS) carried out between January and February 2011 in Burkina Faso. This is a project that was funded by the United States Department of Agriculture (USDA) against the backdrop of recurrent food crises and persistent malnutrition in the Sahelian zone. It was carried out in the provinces of Bam and Sanmatenga in the north-central region. This part of the country was chosen for the implementation of the project because it has relatively low FNS levels. Indeed, the north-central region constantly faces a cereal deficit which exposes around 35.7% of households to food insecurity and nearly 40% of children under five to stunted growth. Since then, the food situation has further deteriorated in this region, which has seen an increase in the terrorist attacks in recent years, resulting in thousands of IDPs. The data collected from households focused in particular on hygiene practices and access to a varied diet. The systematic sampling procedure was used in first step for the choice of villages in the provinces concerned by the project. A total of 104 villages were selected. The second step of this method focused on the choice of households in the 104 project villages. The selective rotation method or "revolving bottle method" was used for this purpose to randomly identify the first household in the selected village. The number of households selected per village is proportional to the size of

the village. This procedure allowed to obtain a final sample of 434 households. It was from these households that the FNS data was collected. Although there are other fairly recent databases on food secure in Burkina Faso, but these are not always complete to integrate social capital and FNS variables at the same time. We therefore deemed useful to use the database of CRS which, although it dates from 2011, presents a set of information making it possible to capture both social capital and household dietary diversity.

2.2. Measurement of Food Security

In this research, FNS is measured by the Food Consumption Score (FCS) method that reflects the household's diet for the last seven days prior to the survey. Developed by the World Food Program (WFP), this method has been used in many other previous studies (Kaiser et al., 2020; Nugroho et al., 2022 ; Martin et al., 2004). This method has the advantage of taking into account more food indicators over a relatively long period compared to the others. It's a composite indicator whose calculation is based on assigning weights to the frequency of consumption of each foods' group during the last seven days. In practice, the foods consumed by the household in the last seven days are grouped into nine foods' groups and then weights are applied to each of these groups. The FCS of household i is obtained from the following formula:

$$FCS_i = \alpha_{cerealtub}x_{cerealtub} + \alpha_{legumin}x_{legumin} + \alpha_{veget\&leaves}x_{veget\&leaves} + \alpha_{fruit}x_{fruit} + \alpha_{animalprotein}x_{animalprotein} + \alpha_{milk}x_{milk} + \alpha_{oil}x_{oil} + \alpha_{sugar}x_{sugar} \quad (7)$$

With α_j is the weight of each food group, and x_j ($\leq 7^2$) the number of days of consumption of foods' group j.

In equation (7), cereals and tubers (rice, sorghum, maize, sweet potato) are weighing 2 points; legumes (beans, ground's peas, groundnut paste, cake) are weighing 3 points; vegetables and leaves (green leafy vegetables, carrots) are weighing 1 point; fruits (bananas, guava, mangoes, papayas) are weighing 1 point; animal proteins (meat, fish, eggs) are weighing 4 points; milk is weighing 4 points; sugar is weighing 0.5 point; oil is weighting 0.5 point. The value of the FCS is always between 0 and 112. From the FCS values calculated, two standard thresholds (28 and 42) were defined to determine three levels of food security.

-       $FCS \leq 28$: situation of poor consumption or severe food insecurity;
-       $28 < FCS \leq 42$: situation of limit consumption (qualitatively inadequate) or moderate food insecurity;
-       $FCS > 42$: situation of adequate consumption or food security.

Graph 1 shows that over a quarter of rural households are food insecure, of which 68 households are in severe food insecurity. Definitively, households are either food secure or food insecure, which can be severe or moderate. The food security indicator can then be considered as a dichotomous variable taking the value 1 if the household is food secure and 0 otherwise.
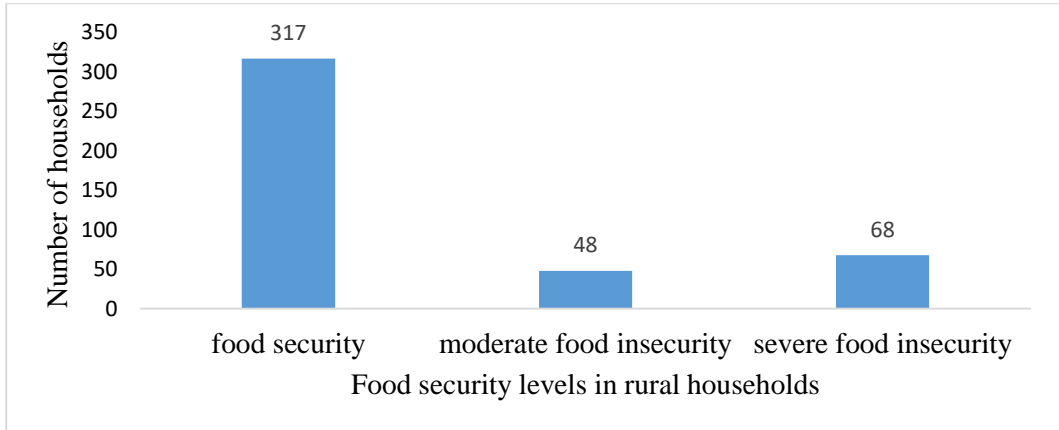
Graph 1. Rural Households Food Security

2.3. Measurement of Social Capital

Following the methodology of the Integrated Questionnaire for the measurement of social capital (SC-IQ), developed by Jones and Woolcock (2007), and other works on the determinants of food security in developing countries, we can identify several variables characteristic of social capital (Nugroho et al., 2022 ; Kehinde et al., 2021 ; Dzanja et al., 2015). These characteristic variables are based on norms of trust and participation in socioeconomic activities. These include the household head's involvement in community life, which is a set of items allowing to understand the household's participation in community life. It is made up of membership in an association, participation in decision-making on issues of community interest and participation in meetings of farmers 'organizations, the municipal council, the village development committee and the parents' associations (APE). These binary variables are generally used in previous works as one of the dimensions of social capital (Agboola et al., 2016 ; Jones and Woolcock, 2007). It is assumed indeed that local organizations (associations) are potential supports for their members and venues for the dissemination of knowledge that can influence their eating practices. Belonging to associations and attending their meetings allow the individual to mobilize resources that he needs to be food secure (Nugroho et al., 2022; Oni et al., 2011). Help potentially mobilizable from the entourage in emergency are also one of the social capital aspects that can affect food security. In this paper, we use five sources of help that the head of household declares he can mobilize in food emergencies to capture the solidarity of the entourage. These are help from the relatives, friends, third party groups, support structures and religious structures, which are all binary variables. Being able to count on help from the entourage can improve access to food because food insecurity often includes the fear of running out of food and not having the necessary means to obtain it (Dzanja et al., 2015 ; Aragie and Genanu, 2017).

Moreover, citizen engagement, measured here by the household head's point of view of how his fellow citizens are involved in community development activities, is also one of the social capital indicators that can affect food security. Seeing that villagers are involved in the well-being of the community may reflect the social trust that the individual places in others, or "citizen action" (Agampodi et al., 2015). This trust refers to the belief that individuals will act as expected in a given situation so that social relationships are less conflictual (Kaiser et al., 2020). It predisposes people to help each other knowing that others will do the same if the situation was reversed itself. Receiving transfers is also one of the determinants of food

security identified in the literature (Dzanja et al., 2015 ; Oni et al., 2011). It refers to whether or not the household receive money transfers and in-kind donations from his entourage. Indeed, receiving money or food can influence positively the household food situation, especially during lean periods (Gelli et al., 2017).

Furthermore, control variables are introduced into the model to improve the estimates. The choice of these variables is made here from a review of the literature on the determinants of food security (Gazuma, 2018; Aragie and Genanu, 2017; Matchaya et Chilonda, 2012). These are among other things income, income-generating activities (IGAs), the number of inactive people, age, sex, literacy and occupation of the head of household. Table 1 summarizes all the variables that are used for the estimation of the model as well as their expected signs.

Table 1. Definition of Variables and Expected Signs

Variable	Description of the variable	Exp. sig.
Dependent variable		
FNS Status	Food Consumption Score	
Social capital indicators		
Potential support	Can you mobilize help from your entourage to deal with an emergency?	+
Transferts	Have you received money, material or food from your entourage?	+
Farmers' organizations meetings	Do you attend meetings of farmers' organizations?	+
Municipal council meetings	Do you attend meetings of municipal council?	+
CVD meetings	Do you attend meetings of the village development committee (CVD)?	+
APE meetings	Do you attend parents' association (APE) meetings?	+
Association	Do you belong to a local association or organization in your village?	+
Decision-making	Do you participate in decision-making bodies that involve the village?	+
Involvement	Do people carry out activities of general interest in the village?	+
Control variables		
Income	Annual income from the sale of agricultural and livestock products	+
Gender	Sex of the head of household	+/-
Age	Age of the head of household	+
Literacy	The head of the household can read and write	+
IGAs	How many IGAs do you have?	+
Inactive persons	Number of children under 14 living in the household	-
Primary Occupation	Is agriculture or breeding the primary occupation of the head of household?	+
Motorbike	Does the household have a motorcycle?	+
Credit	Does the household receive credit from formal institutions?	+

Sources *:* Author's construction

2.4. Theoretical and Empirical Models

The theoretical framework used here to analyze the factors influencing household food security is inspired by the works of Strauss (1983). In these works, the household is assumed to maximize a utility function defined over leisure, goods and services acquired on the market and goods produced at home. Adapted to the analysis of food security, these models show that the household maximizes its utility through the satisfaction it derives from the consumption of food goods. It is assumed that households maximize their utility by consuming goods (food and non-food) and leisure. These models also take into account the specificities of developing countries, where many households participate in food production and consume all or part of what they produce (Feleke et al., 2005). Under these conditions, households are assumed to maximize a utility function such that:

$$U_i = f(F_{ih}, F_{im}, NF_i, L_i / X_i) \tag{1}$$

where U_i is a utility function that is twice differentiable and increasing in its arguments; $F_{ih}, F_{im} \, NF_i, l_i$ and X_i are respectively goods produced at home, goods acquired on the market, non-food goods, leisure and a vector of the household's socio-economic characteristics.

Assuming that the household is both producer and consumer, it maximizes its utility by consuming the goods given its agricultural production, income and time constraints. Following Strauss (1983), it is assumed that the household first makes the decision to produce, allocating its time between work and leisure, and then allocates part or all of the income thus obtained to the consumption of food and non-food goods (Rono et al., 2023; Feleke et al., 2005). This is the hypothesis of separability of consumption and production decisions. As a result, consumption decisions are influenced by production decisions. Once the production decision is made, the household maximizes its utility by equalizing the marginal rate of substitution between consumption of the goods and leisure with the marginal product of labor. These different constraints can be written following the works of Singh et al. (1986) and Rono et al. (2023).

Thus, for a short agricultural production cycle, the production constraint is given by:
$$f(Q_{ih}, L, A_0, K_0) = 0 \tag{2}$$
With Q_{ih}, L, A_0 and K_0 respectively the quantities of food goods produced on the farm, total labor used on the farm, the size of the farm and a stock of fixed capital.

The production activity generates income, from the sale of part of this production, which the household can use with its off-farm income to buy other food and non-food goods on the market, or to hire additional labor for its farm. Assuming that the household spends all its income, the income constraint can therefore be written as follows:
$$P_{ih}(Q_{ih} - F_{ih}) - P_{im}F_{im} - P_{nf}NF_i - w(L - L_f) + N = 0 \tag{3}$$
Where $P_{ih} =$ the market unit price of the food good produced by the household;
$P_{im} =$ the unit price of food products purchased on the market,
$P_{nf} =$ the price of non-food goods purchased on the market,
$w =$ the prevailing market wage rate,
$L_f =$ family labor used in household food production,
$N =$ non-farm income which is an adjustment variable,
$(Q_{ih} - F_{ih}) =$ the remainder of household production sold on the market.

The household has a total number of hours T which it devotes to work L_f and leisure l such that the time constraint is given by:
$$T = L_f + l \tag{4}$$
Substituting the time constraint for the income constraint and rearranging the new equation, we get:

$$P_{ih}Q_{ih} + wT + N - wL = P_{ih}F_{ih} + wl + P_{im}F_{im} + P_{nf}NF_i \qquad (5)$$

From this, we can obtain the household food security equation by solving the first-order conditions of the utility maximization problem given the above constraints. Thus, we have:

$$FS_i = f\big(P_{ih}, P_{im}, P_{nf}, w, R^* (P_{ih}, w, A_0, K_0, N)\big| X_i\big) \qquad (6)$$

By observing this equation, we can say that the food security of household i depends on market the prices for food and non-food products on the market, the household's socioeconomic characteristics, the wage rate, and the optimal income of the household, noted here by $R^*(.)$. This income is also a function of the market price of household goods, the wage rate, the size of the farm, and the stock of fixed capital.

Since the dependent variable used here is binary it is then suitable to use logit or probit models. Indeed, linear probability models, which can also be used, have certain limitations such as aberrant predictions and the constancy of the marginal effects of the explanatory variables in levels. The logit model was in fact introduced as an approximation of probit model which requires complex calculations. Because of its simplicity and the fact that it generally yields efficient estimators, logit model is therefore used here (Gazuma 2018). The logit model indeed allows to establish a parametric relation between a binary variable $Y \epsilon\{0, 1\}$ and a set of explanatory variables $x = (x_1, x_2, x_3, …, x_p)'$ including social capital indicators and covariables. Let Y_i^*be an unobservable continuous random variable called the latent variable underlying the probability that Y_i takes the value 1. The definition of the latent variable in fact allows to take into account the unobserved heterogeneity. This variable can be represented by:

$$Y_i^* = x_i'\beta + \mu_i \qquad (8)$$

where μ_i represents the error terms and the β_j the parameters to be estimated.

The relationship between the response variable and the latent variable is given by:

$$Y_i = \begin{cases} 1 \ si \ x_i'\beta + \mu_i > 0 \\ 0 \ si \ x_i'\beta + \mu_i \leq 0 \end{cases} \qquad (9)$$

The estimation of this model is made using the maximum likelihood method. As the coefficients thus obtained are not directly interpretable, one proceeds to the calculation of the marginal effects in order to quantify the desired effects.

3. Results

3.1. Descriptive Statistics

As we have a fairly large number of binary qualitative variables characterizing social capital, the technique of multiple correspondence analysis (MCA) is therefore used to construct two composite indicators of social capital, as shown in graph 2. According to this graph, transfers, attending to farmers' organizations meetings, and potential support from the entourage are closer to the second factorial axis. Meanwhile, variables such as association membership, participation in decision-making and community involvement are closer to the first factorial axis. Given that the first dimension includes the elements that relate to collective action and cooperation, we propose to consider it here as the cognitive form of social capital. It relates to individuals' community involvement, shared values and norms, and how they perceive social relations. The second dimension, which results from the quality of an individual's social relations, is called here structural social capital. It refers to the instrumental and informational resources that one can mobilize through social networks and participation in the activities of village groupings.

Discrimination Measures

Object Principal Normalization.
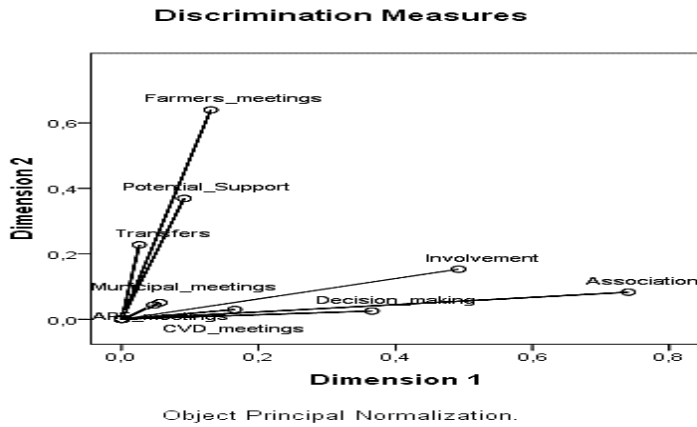
Source: Author's construction

Table 2, summarizes the statistical characteristics of the variables in the model, shows that nearly 35.71% of households receive money transfers and donations in kind. About 66.04% of households belong to local associations or organizations and 80% declare that they can count on the help of those around them in an emergency. However, we note a low participation in meetings. The high participation is recorded at the level of farmers' organizations where 45.37% of households declare having participated. The lowest participation is recorded at the level of the municipal councils where only 4.04% of households are active.

Table 2. Summary of Descriptive Statistics

Variable	Observations	Min	Max	Percent/ Means	Std. deviat.
FNS Status	434	0	1	0.7327	-
Cognitive Social capital	434	-5.2128	1.9283	-0.0540	1.1628
Structural Social capital	434	-1.8428	2.9784	0.1034	1.090
Gender	434	0	1	0.8686	-
Age	433	19	90	47.2309	13.2861
Inactive persons	434	0	29	5.6797	6.9658
Literacy	434	0	1	0.3548	-
IGAs	425	0	5	1.6847	1.1469
Income	434	2000	6730000	305161.9	529514.1
Primary occupation	434	0	1	0.7419	-
Motorbike	431	0	1	0.4562	-
Credit	434	0	1	0.0276	-
Age squared	433	361	8100	2406.875	1319.185

Source: Data from the "Beoog biiga" project survey of CRS (2011)

3.2. Model suitability

We begin estimating the logit model by excluding the social capital indicators. The results of this estimation are reported in the second column of Table 3 (basic model). According to these results, only the coefficients of the variables access to credit and availability of a motorcycle are not statistically significant. We then included all social capital items in the model to see how household food security would evolve if households were more involved in activities that foster social capital formation. However, the third column of Table 3, which contains the results of this estimation (additive model), does not show a significant improvement in food security following the inclusion of the social capital variables (Chi2 decrease from 68.02 to 67.27). Of the nine social capital items, only transfers received and the household's ability to mobilize help from the entourage in an emergency positively influence food security. The other control variables, which were statistically significant in the basic model, are still significant. By integrating the composite social capital indicators (structural and cognitive) we obtain the multiplicative model, the results of which are reported in the fourth column of Table 3. The results show that the inclusion of aggregate social capital variables improves food security, since Chi2 increases to 81.48. Alongside the results of the additive model, these results show that the structural aspects of social capital, i.e., transfers, potentially mobilizable aid from the entourage and attending to farmers' organization meetings, positively influence household food security. Therefore, the results of this model are adopted to bring out the implications of economic policies. For this, marginal effects and odds-ratios are calculated and reported in the fifth and sixth columns of Table 3 respectively. Now, we can verify the relevance of this model in estimating the effects of social capital on household FNS. Model estimation yielded a *pseudo-R^2* of 0.2466 meaning that the model specified with the explanatory variables differs from the model estimated with the only constant. In addition, the likelihood ratio means that at least one of the coefficients is significantly different from 0 (LR = 131.99 and $Prob > chi2 = 0.000$). The results of Hosmer-Lemeshow test show that the null hypothesis, which states that the number of observed values is equal to the number of predicted values, cannot be rejected since the risk of first species is very high ($Prob > chi2 = 0,1594$). Furthermore, the value of this statistic (11.82), which reflects the distance between the observed and predicted values, is relatively lower.

3.3. Discussion

According to the results of the multiplicative model, the effects of social capital on FNS depend on the forms of the social capital. Structural social capital increases the probability that the household is in FNS while cognitive social capital does not significantly affect it. As a reminder, cognitive social capital here refers to the way in which heads of households perceive the degree of community involvement of the local population, their capacities to cooperate and to join together to make decisions that are of interest to the community. In light of the results, we can say that these aspects of social capital are not relevant in the determination of rural households' food security. These results are not consistent with our theoretical expectations since they suggest that the level of social capital of the household does not influence its food situation. They are consistent with those of Agboola et al. (2016) who find in Kwara State, Nigeria, that a high level of involvement in associations, especially active participation in decision making, reduces the productivity of large agricultural producers. They explain this result by the fact that producers who are strongly involved in associations devote it more time to the detriment of fields' works.

Table 3. Results of the Logit Model Estimate

VARIABLES	Basic model	Additive model	Multiplicative model		
			Logit Coef.	Marg. effects[3]	Logit Odds Ratio[4]
Gender	-0.647* (0.382)	-0.795* (0.474)	-0.687* (0.415)	-0.096* (0.057)	0.502* (0.208)
Age	-0.142** (0.064)	-0.136* (0.078)	-0.141** (0.062)	-0.019** (0.008)	0.867** (0.054)
Age squared	0.001** (0.0006)	0.001* (0.0008)	0.001** (0.0006)	0.0002** (0.0000)	1.001** (0.0006)
Inactive persons	-0.046** (0.018)	-0.054** (0.021)	-0.035** (0.018)	-0.005** (0.002)	0.964** (0.017)
Literacy	0.567** (0.271)	0.879** (0.342)	0.647** (0.284)	0.091** (0.038)	1.911** (0.544)
IGAs	0.467*** (0.154)	0.568*** (0.190)	0.453*** (0.154)	0.063*** (0,020)	1.574*** (0.243)
Income	0.000001** (0.0000)	0.000001** (0.0000)	0.000001** (0.0000)	0.000001** (0.0000)	1.000** (0.0000)
Primary occupation	1.095*** (0.327)	0.625 (0.426)	0.788** (0.354)	0.109** (0.049)	2.181** (0.760)
Motorbike	-0.052 (0.254)	0.180 (0.296)	0.141 (0.265)	0.015 (0,037)	1.117 (0.296)
Credit	0.916 (0.579)	0.688 (0.764)	0.730 (0.587)	0.102 (0.080)	2.076 (1.221)
Potential support		0.853** (0.340)			
Transferts		0.791** (0.383)			
Farmers' org. meetings		0.661 (0.429)			
Mun. council meetings		-0.271 (1.176)			
CVD meetings		0.179 (0.424)			
APE meetings		-0.526 (0.473)			
Association		0.221 (0.451)			
Decision-making		-0.419 (0.524)			
Involvement		-0.338 (0.610)			
Cognitive Social capital			-0.065 (0.124)	-0.009 (0.017)	0.936 (0.116)
Structural Social capital			0.672*** (0.145)	0.094*** (0.017)	1.959*** (0.284)
Constant	2.699* (1.447)	2.070 (1.987)	2.893* (1.452)		
Observations	424	313	424	424	424

Prob > chi2	0.000	0.000	0.000		0.000
Log pseudolikelihood	-198.183	-141.840	-185.957		-184.942
Pseudo R-squared	0.1971	0.2794	0.2466		0.2507
Chi-square	68.02	67.28	81.48		75.69

Notes : Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source *: Author's construction*

Unlike cognitive social capital, structural aspects of social capital seem to contribute significantly to the improvement of household FNS. These are potential help, which the head of the household believes he can mobilize when needed, transfers received and participation in meetings of farmers' organizations. The results show indeed that these aspects of social capital significantly improve household FNS. These results are consistent with theoretical expectations in that they show that households with a high level of structural social capital are more likely to experience food security than others (Nugroho et al., 2022; Kehinde et al., 2021 ; Kaiser et al., 2020). Indeed, the fact of attending meetings of farmers' organizations not only allows household to acquire knowledge on agricultural practices from their peers, but also to access certain resources because of their membership in these organizations (credit, agricultural inputs, etc.). Attending to farmers' organizations meetings can also allow the household to mobilize an abundant agricultural workforce through farm's mutual aid, the operating principle of which is reciprocity. All of these aspects can increase the volume of agricultural production and contribute indirectly to the achievement of FNS. These results corroborate that of Dzanja et al. (2015) who also found that membership in farmers' organizations and the size of household social networks improve food security in rural Malawi. It can then be said that strengthening the operational capacities of farmers' organizations is a necessary condition for achieving household food security in Burkina Faso. As a result, special attention must be paid to revitalizing these structures, through technical and financial support, in order to enable them to fully play their role in strengthening the food security of rural households. In addition, receiving transfers or knowing that one can be helped by one's entourage in times of crisis can have incentive effects on the household and increase its propensity to consume food that was economically inaccessible to it because of its low income. Whether in kind (food) or in cash, transfers also play a crucial role in the survival of rural populations (Gelli et al., 2017 ; Sultana et Kiani, 2011). They often play the role of social nets and informal microinsurance to increase the resilience of households vulnerable to economic shocks. In fact, inter-households resource transfers are quite common in Burkina Faso where most rural households have emigrants within (mostly urban areas) or outside the country. These migrants generally send remittances to their families of origin so that they can improve their living conditions. The funds that they send can be used to buy agricultural inputs, pay school fees or finance health expenses in order to increase the productivity of households and thereby strengthen their FNS. They can also be used directly to buy food in the market. This should then require an investment in social relations through the consolidation of kinship, friendship and neighborhood ties that can facilitate access to resources in a context of low credit markets.

Beyond structural social capital, the results also indicate that the likelihood of achieving FNS increases with income, number of IGAs, literacy and occupation of the head of household. Indeed, the results indicate that an increase in household income increases its likelihood of being food secure. Given that access to food is most often conditioned by purchasing power, the wealthier the household the higher its probability of food secure. An additional income enables households to acquire various food products on the market and then satisfy their food demand (Matchaya et Chilonda, 2012). Policies against food insecurity should therefore

strengthen household purchasing power by subsidizing for example large consumption products and supporting the creation of IGAs in rural areas. The results also indicate that an increase in the number of IGAs by one unit is likely to increase the probability of achieving food security by 0.063 points on average, ceteris paribus. These results are also in line with theoretical expectations according to which ones that having IGAs can increase household resilience (Gazuma, 2018 ; Obayelu, 2012). It is therefore important to diversify household activities in order to get more chance of overcoming food insecurity even though the results also indicate that being active in agriculture enhances food security. Indeed, the coefficient of the occupation variable of the head of household is positively related to the probability of achieving FNS. This result shows the importance of local production in the fight against food insecurity and argues for more support for local producers. The literacy of the head of household has also a positive effect on the probability of achieving FNS at the households' level. Results show indeed that being educated increases the likelihood of being food secure. Thus, the more educated the individual, the more capable he is of producing and earning a higher income that enables him to be food secure. Similar results were found by Jabo et al. (2017) in Nigeria. Investment in education, through extensive literacy programs, is therefore one of the best ways allowing to reduce the risks of food insecurity and malnutrition in rural areas.

The results also indicate that the coefficient of the household head gender is negatively linked to the likelihood of achieving food security. In this way, households headed by women are more likely to be food secure than those headed by men. This result is contrary to the initial hypothesis that households headed by men are more food secure than those headed by women because of unequal access to agricultural inputs (Aragie and Genanu, 2017). These results plead in favor of empowering women within households in order to improve the nutritional status of children especially. Contrary to theoretical expectations, the results show that the older the household head, the less food secure the household. Moreover, the number of inactive persons negatively affects the household's FNS. Indeed, the results indicate that an additional child under 14 years of age decreases the probability that the household is food secure by 3.5% compared to the probability of being food insecurity, ceteris paribus. The more the number of mouths to feed increases, the more the pressure on the household's food resources increases. As a result, the risk of food insecurity can increase. Resources should therefore grow faster than the number of mouths to feed for the household to be food secure.

4.   Conclusion

The main objective of the current paper is to estimate the effect of social capital, structural and cognitive, on rural households' FNS in Burkina Faso especially in the provinces of Bam and Sanmatenga. The results show that the effect of social capital on FNS depends on the social capital dimension considered. Indeed, the results show that cognitive social capital is not relevant in determining the households' FNS. Social capital regains its relevance in the explanation of food security when the structural aspects are included. Indeed, the results indicate that households that participate in farmers' organizations meetings and that receive help from their relationship networks are more food secure than others. It is therefore necessary to revitalize farmers' organizations, which play a crucial role in improving FNS in rural areas, by providing them with the necessary technical and financial supports. It is also important to encourage farmers to become more involved in these peasant structures in order to receive substantial support. Given that the transfers received and the assistance that can potentially be mobilized from the entourage improve food security, it is necessary to promote interpersonal solidarity networks by strengthening the institutional mechanisms that enable emigrants to send remittances safely to their families. Beyond the social capital indicators, the results also indicate that factors such as income, number of IGAs, literacy and primary occupation

contribute to strengthening food security in rural Burkina Faso. It is therefore necessary to consider these factors in the development of public policies focused on research of the FNS in rural areas. These policies, which aim to strengthen the resilience of households to economic shocks, must therefore sustain, among other things, local initiatives for the creation of IGAs, the development of rural schools to promote adult literacy and technical support for agricultural producers. Moreover, the gender of the head of household and the number of inactive persons hinder the achievement of food security in rural areas. This implies the need to promote the empowerment of women and their access to local production assets in order to boost the food security of the whole community. The results obtained here could be improved if the data had been collected during the lean period (precisely between July and August of the year) on dietary diversity and the quantities consumed in calories throughout the Burkinabe territory.

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[1] Child of tomorrow in the Mooré national language

[2] When household consumes more than seven times a given foods' group in the week, we reduce x_j to 7.

[3] Only the means of the individual marginal effects are reported here.

[4] It is given by the formula: $100 \times \left(e^{\hat{\beta}_k} - 1\right) = 100 \times (1,993 - 1) = 99,3\%$