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## REVUE CEDRES-ETUDES

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# SOMMAIRE

# IMPACT OF REMITTANCES ON HOUSEHOLD FOOD SECURITY IN RURAL BURKINA FASO

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## Abstract

This paper investigates the impact of remittances of migrants on household food security in rural Burkina Faso. Half of households are food insecure in this area. The household food consumption is not enough diversified. There are high regional differences in household food security, with apparent paradoxes: the Sahel region (with low natural resources) and the South West (with high natural resources) are respectively the highest and lowest food security in rural Burkina Faso. Remittances improve food security, while decrease dietary quality and diversification. The main implication of this study is promoting remittances in rural Burkina Faso. Our future investigation will focus on explaining the negative effect of remittances on household dietary in rural Burkina Faso.

***Keywords :*** Remittances, migration, food security.

***J.E.L. classification :*** F24, O15, I12, I31, D12.

# IMPACT OF REMITTANCES ON HOUSEHOLD FOOD SECURITY IN RURAL BURKINA FASO

## Introduction

Household food insecurity is high in rural Burkina Faso (Isoto and Kraybill, 2014). Long-term hunger issue is alarming, while 10 % of population is undernourished in Burkina Faso (FAO, 2005; IFPRI, 2010). Chronic food insecurity is endemic in rural Burkina Faso (Mathys et al., 2009). "Food security exists when all people, at all times, have physical, social and economic access to sufficient food which meets their dietary needs and food preferences for an active and healthy life" (FAO, 1996). Household food utilization, food access and food availability affect its food security status (figure A1, Annexes). Households in rural Burkina Faso have many constraints to these food security determinants. With regard to food availability, households are particularly constrained to production, including input and credit limited access, insufficient rainfall, poor soil quality, poor post-harvest storage (Mathys et al., 2009). Constraints to food accessibility are related to poor access to credit and markets, weak income diversification, and weak agricultural value chain. Similarly, household food utilization is restrained by poor hygienic and feeding practices, and poor access to safe water and health services (Mathys et al., 2009). Subsequently, poor households are particularly vulnerable to food insecurity in rural Burkina Faso.

Poor households have high income elasticity of food consumption in Burkina Faso (Isoto and Kraybill, 2014). Then, increase in household received remittances may contribute dealing with household food security issues. Remittances are defined as sending of money or goods by immigrants to their country or household of origin. Indeed, remittances are important external source of household income for investment, insurance, capital accumulation, and poverty reduction. (Chami, et al., 2003 ; World Bank, 2004 ; Yang, 2008 ; Lu and Treiman, 2007). About one Burkinabe out of 10 is an emigrant (World Bank, 2011). The main international destination is Côte d'Ivoire, while internal migration is dominated by rural to urban move and North to South-Western rural move. The estimated net inflow remittances were US $ 133 million in Burkina Faso on 2013, representing about 0.1 % of the Gross Domestic Product (International Organization for Migration, 2014). Remittances may improve economic direct access to food. In addition, allocating remittances to investment may widen production stream, and then economic or physical access to food.

Literature on remittances and food security includes various conclusions. The main results point out positive effects of remittances on household food security. The poorest recipients are likely to spend remittances they receive on basic needs as food (Rosen and Shapoury 2009; Rosser, 2011; Acosta et al., 2007; Antón, 2010; Orozco 2009; Babatunde and Martinetti, 2010; Carletto et al., 2011). Antón (2010)

shows that remittances have positive effects on consumption smoothing strategy to deal with income shocks. In contrast, some studies argue that remittances have negative effects on household dietary (Kroeger and Anderson, 2011). Remittances decrease household nutritional intakes by substituting rich nutrition foods (e.g. fruits, vegetables) with cheaper and poor dietary ones. The main reason of this food substitution is consecutive lost labor earnings and other migration consequences that remittances do not compensate enough (Gibson et al., 2009; Kroeger and Anderson, 2011; Davis, 2013; Kanaiaupuni and Donato, 1999; Hamilton et al., 2009). The extent of remittance negative effect is often gender sensitive (Kroeger and Anderson, 2011). More nuanced literature argues that remittances are countercyclical with respect to receiving household, and pro-cyclical with regard to destination country (Rosser, 2011; López et al. 2009 ; Carling, 2008 ; Stark and Lucas, 1988; Orozco, 2009b; Orozco, 2009c). Thus, remittances increase with negative income shocks in receiving household, while decrease with negative income shocks in migrant destination country. Remittances have opposite impact on household food security, considering respectively its downturn risks and its use for consumption smoothing.

Analyses of remittance impact on household food security in rural Burkina Faso are not common. What is the impact of remittances on household food security in rural Burkina Faso ? What are differences in this impact across distribution of household food security ? Several authors have analyzed the impact of remittances on food security. However, answering these specific questions is still a key challenge. Cautious investigation into these research questions are the focus of our study. Indeed, several factors, including household structure, affect household receiving and use of remittances (Kroeger and Anderson, year ?). We efficiently control these effects. This paper analyzes the impact of remittances on household food security. Remittances would have positive effects on household food security. We also anticipate greater impact of remittances on lower household food security measures than upper measures.

## 2. Theoretical model

We analyze household food security using demand functions for dietary intake functions. The current theoretical framework is based on a household utility model, following the literature on the demand for household wellbeing, particularly, Becker (1981), Behrman and Dealalikar (1988), and Strauss and Thomas (1998). The household maximizing its utility in choosing consumption of foods and non-foods C, and leisure L. this utility is maximized under budget and health production function constraints.

$\max_{H,C,L} U = u(H, C, L; X_h, \varepsilon)$ (1)

$X_h$ is a vector of household characteristics, while $\varepsilon$ is an unobserved heterogeneity in preferences. Let consider the household food security function as follows:

$F_h = f(X_h, X_c, \xi_h)$ (2)

$X_c$ is a vector of community characteristics as availability, accessibility, and quality of public food-related infrastructures (safe water, markets, socio-cultural norms, etc.). $\mu_i$ and $\xi_h$ are unobserved exogenous food security endowments. The household income (Y) constraint is as follows:

$Y = P_C C + WL$ (3)

$P_C$, and $W$ are the price vectors of respectively consumption goods, and leisure inputs. Let write the household food security reduced form function from equation 2 and 3 as :

$F_h = d(X_h, X_c, Y, P_C, \varsigma_h)$ (4)

Where $\upsilon_i$ and $\varsigma_h$ are unobserved food security characteristics. Choosing the appropriate functional forms of $d(.)$ is governed by relations between various factors, as household and community characteristics.

## 3. Estimation strategy

Below is our estimation equation we derive from equation 4:

$F_h = \chi + X_h\rho + X_c\kappa + \varrho_h$ (5)

## 2. Theoretical model

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## 3. Estimation strategy

Below is our estimation equation we derive from equation 4:

$F_h = \chi + X_h\rho + X_c\kappa + \varrho_h$ (5)

$F_h$ is the household *h* food security dependent variable as direct dietary intake, food consumption score, cost of basic needs, copying strategy index, or dietary diversity score. $\varrho_h$ represents an error term. $\chi$, $\rho$, and $\kappa$ stand for unknown parameters to be estimated. Additive quantile regression approaches are used in this paper. Moreover, we compared related results with those of OLS.

Mean regressions are the most common approaches used in food security analyses. They include the standard Ordinary Least Squares that models the relationship between conditional mean of a dependent variable and independent variables. However, a quantile regression models the relationship between conditional quantiles of dependent variable and independent variables. Quantile regression allows better comprehensive analysis of the independent variable effects on dependent variable, based on the spectrum of this dependent variable. In addition, quantile regression is compatible with heteroscedasticity and does not require errors to be identically distributive. Quantile regression is also robustness to outliers, flexible for data with heterogeneous conditional distribution.

To the best of our knowledge, few studies distinguish effects on specific quantiles of food security indicators. Mean regression describes the expected household food security status, while quantile regression allows focusing on specific group as lower or upper quantiles of the distribution of household food security. Remittances may have different effects on household food security depending on the distribution of related indicators. Such comprehensive effects could help tackling household food insecurity.

## *3.1. Quantile regression model*

Let describe a linear quantile regression using the following equation :

$S_i = x_i' \delta_q + \eta_{qi}$ (6)

$S_i$, $x_i$, $\delta_q$, and $\eta_{qi}$ are respectively the dependent variable (as household food security indicator), a vector of explanatory variables (for example, household characteristics), a vector of unknown parameters associated with the $q^{th}$ quantile,

and independent errors. These errors are subject to $\Phi_{\eta_{qi}}(q) = 0$, where $\Phi_{\eta_{qi}}(q)$ is a cumulative distribution function.

The OLS minimizes $\sum_i \eta_i^2$ , while quantile regression minimizes $\sum_i q|\eta_i| + \sum_i(1-q)|\eta_i|$ , implying asymmetric penalties $q|\eta_i|$ for underprediction and $(1-q)|\eta_i|$ for overprediction. Indeed, median regression or least absolute-deviation regression minimizes $\sum_i|\eta_i|$.

Let represent the corresponding loss function by the following minimization problem:

$\hat{\delta}_q = \underset{\delta_q}{\operatorname{argmin}} \sum_{i=1}^{n} \varphi_q(S_i - x_i'\delta_q)$, (7)

With the check function: $\varphi_q(\delta) = \begin{cases} \delta q & if\ \delta \geq 0 \\ \delta(q-1 & if\ \delta < 0 \end{cases}$

Let consider equation 6 and extend the linear predictor $x_i'\delta_q$ with nonlinear effects of covariates; thus, we can lead to an additive quantile regression as follows:

$S_i = x_i'\delta_q + \sum_{j=1}^{q} \psi_{qj}(s_{ij}) + \eta_{qi}$ (8)

Functions $\psi_{qj}(s_{ij})$ are estimated using nonparametric approach and qualitative assumptions on their smoothness.

The statistical inference is mainly based on boosting process as an iterative gradient algorithm. The functional gradient boosting is commonly used to find the solution to the minimization problem: $\theta^* = \underset{\theta}{\operatorname{argmin}}\, \mathbb{E}[L(S,\theta)]$ , where $L$ and $\theta$ are respectively loss function and a regression model predictor. Practically, $\theta^*$ is estimated by minimizing the empirical loss: $\frac{1}{n}\sum_{i=1}^{n} L(S_i,\theta_i)$ . It can consist of iterative fitting of simple base-learning procedures to the negative gradient of the loss function or updated residuals: $\delta_i^{[m]} = -\frac{\partial}{\partial\theta} L(S_i,\theta)|_{\theta=\hat{\theta}_i^{[m-1]}}$, $i = 1, \dots, n$.

The optimal number of boosting iterations $(m_{stop})$ is the main crucial tuning parameter. The selection of $m_{stop}$ implies a bias-variance tradeoff. This parameter is commonly chosen based on a bootstrap or cross-validation procedure.

Most of quantile regression frameworks in applied economics are based on the conditional regression method. It mainly consists in assessing a covariate impact on

an outcome quantile conditional on specific values of other covariates. The generalization of such results is very limited.

We consider unconditional quantile regression method for overcoming some limitations from alternative conditional option. Indeed, a conditional regression assesses an explanatory variable effect on an outcome, conditional on specific values of other covariates. However, the unconditional method marginalizes a covariate impact over distributions of the other covariates, leading to more comprehensive results. For example, the quantile regression method is suitable for understanding the unconditional expectation of changes in household food security from a variation in the unconditional distribution of remittances.

### *3.2. Instrumental variable quantile regression estimation*

Endogeneity biases are part of the most challenging issues in analyzing impact of remittances on household food security. Indeed household makes several decisions simultaneously, including those related to migration, remittances, and household food concerns. In addition, some unobserved factors explaining food security may also impact remittances, and vice versa. For example, food availability, food access, food utilization, or economic shocks can generate more remittances. Similarly, more educated, healthier or wealthier household member would be more or less likely to migrate and then remit to origin household. We need to explicitly account for these biases. Instrumental variables approach is used for dealing with these issues. The main challenge in using this method is about finding appropriate instruments. The common used instruments in related literature include the distance, natural or economic shocks, community, cultural and political factors, and migration intensity in a community. There are two main assumptions for the IV method:

- Relevance : at least one instrument strongly explains the endogenous variable.
- Exogeneity : at least one instrument does not explain the dependent variable of interest.

The assumptions should be tested, particularly the relevance one, in addition with identification tests (weak identification, underidentification, and overidentification). Coefficients in the model will be biased if the endogeneity problem is not solved (Wooldridge, 2002). We use migration intensity variable to instrument remittance receiving status of the household. For the sake of simplicity, let rewrite equation 5 as follows:

$H_i = \lambda + X_i\beta + R_i\alpha + \varpi_i$ (5")

with *R* a remittance variable. As *R* is endogenous ($cov(R_i, \varpi_i) \neq 0$), and correlated with some household characteristics, $\mathrm{E(R_i|X_i)} = \omega_0 + \mathrm{X_i}\omega_1$ . Thus, the OLS estimates will be biased by $\omega_0\alpha$ and $\omega_1\alpha$. Following Amemiya (1982) and Powell (1983), we use a two stage quantile regression approach. For ease of presentation, suppose we have the following simple model:

$$\begin{cases} H = X_1\alpha + X_2\beta + \mu \\ X_2 = X_1\alpha + Z\delta + \varepsilon \end{cases} \quad (10)$$

Where $H$, $X_1$, $X_2$, and $Z$ are respectively dependent variable, vectors of exogenous regressors, endogenous variables, and instrumental variables. $\mu$ and $\varepsilon$ represent random errors terms. We first regress by OLS $X_2$ on $X_1$ and $Z$. In the second stage, the structural equation is estimated by quantile approach, and replacing the endogenous variables $X_2$ by their predictable values from the first stage. Note that. We use bootstrap method dealing with the biased resulting standard errors.

The dependent variables included in this paper are: household food security (calorie intake per capita, cost of daily basic calorie needs, dietary diversity score, food consumption score, and dietary quality). We derived cost of basic calorie needs from food expenditure, while dietary quality expresses the share of calories from fruits, vegetables and animal products. Dietary diversity reflects the proportion of food groups the household has consumed. This indicator is a measure of household dietary nutritional quality (Steyn et al., 2006) or household food access (Hoddinot and Yohannes, 2002). Undernourished individuals are those with calorie intake below the energy requirement norm (Vhurumuku, 2014). Explanatory variables include:

- Household head characteristics (age, sex, education, ethnic group),

- Household characteristics: size, income, remittances, asset score, including housing, women' status (decision-making power and social gender equality).

We use the cost of calorie function proposed by Greer and Thorbecke (1986) as follows.

$\ln E_h = \alpha_0 + \alpha k_h + \vartheta_h$ (11)

With $E_h$, $k_h$, and $\vartheta_h$ the food expenditure per capita, daily per capita calorie consumption in household *h*, and a random error term. $\alpha_0$ and $\alpha$ are unknown parameters to be estimated. These estimates are used to calculate the cost ($cr_h$) of minimum recommended energy ($r_h$): $cr_h = e^{(\alpha_0 + \alpha r_h)}$. The cost of daily per capita calorie consumption in household *h* is $c_h = e^{(\alpha_0 + \alpha k_h)}$. If $c_h$ is greater (lower) than $cr_h$, then, household *h* is considered food secure (insecure). Energy intake equivalent scale is used to calculate recommended and household actual per capita daily energy intake. This scale is set as follows: 0.4, 0.7, and 1 for respectively children under 6-years old, children from 6 to 18 years old, and adults above 18-years old.

## 4. Data and descriptive statistics

We use a household panel dataset from a rural representative survey on 2004-2006. These data have been collected by the *Programme National de Gestion des Terroirs – deuxième phase* (*PNGT2*), a national program for rural development in Burkina Faso. They included 60 villages, and 33 households per village. Detailed information is collected, including demographic characteristics, remittances, consumption, health, education, food security, assets, or prices.

### 4.1. Brief description of household food security in rural Burkina Faso

In this sub-section, we describe household dietary quantity, cost, quality, and diversity. These indicators include daily per capita calories, cost of daily basic calorie need, share of calories from fruits, vegetables and animals, and share of the

number of consumed food groups. In addition, we present household food security copying strategies.

Almost households missed constant food secure status on 2004 – 2006 period. About one half of households are food secured on 2004-2006 in rural Burkina Faso, with average daily needs (2.8 kcal) just above the minimum requirement (2.3 kcal) (Table 6). The food quality and diversification are relatively low at respectively 11% and 54%. The FAO found similar results in 2007 estimating cereal and meat shares in total dietary energy consumption at respectively 73% and 3% (Mathys et al., 2009). Surprisingly, the food quality and quantity are significantly better in households without remittances than those receiving remittances, implying higher incidence of food insecure households in this later subsample (Table 6). Conversely, food consumption is more diversified in remittance receiving households. Man headed households have better quality and diversified food, and smaller energy quantity than households with female head.

Copying strategies for household food security include using less prefer food, food intake reduction, meal skipping, and food purchasing. About 41% of households have used food rationing strategy on 2005-2006 period (Table 6). Severe food rationing is relatively low, up to 4% of households. For example, severe reducing of child food intake and severe meal missing a whole day are respectively about 1% and less than 1%. In addition, child food rationing is smaller for remittance receiving households than households without remittances (Table 6).

## Table 1: Statistics on household food security, 2004 – 2006

| | Pooled sample [N=5,129] | | Has received remittances (R) [N=1,868] | | Man headed (M) [4,834] | | Mean differences and t-test | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Standard Deviation | Mean | Standard Deviation | Mean | Standard Deviation | R - Nr | M - F |
| **Household food security: Quality (%), diversity (%), quantity (kcal), and cost (CFA)** | | | | | | | | |
| Calories from fruits/vegetables/animals | 11.2 | 17.5 | 9.9 | 17.1 | 11.6 | 17.8 | -2.1* | 5.8*** |
| Household Dietary Diversity Score / 7 | 3.2 | 1.2 | 3.3 | 1.2 | 3.3 | 1.2 | 0.1*** | 0.6*** |
| Low household dietary diversity score | 55.9 | 49.7 | 51.8 | 50.0 | 54.7 | 49.8 | 5.1*** | -18.0*** |
| Daily per capita calories | 2.8 | 2.6 | 2.7 | 2.5 | 2.8 | 2.6 | -0.2*** | -0.6** |
| Cost of daily per capita energy need | 94.6 | 10.1 | 94.6 | 10.1 | 94.8 | 10.1 | -0.1 | 1.7 |
| Cost of daily per capita calories | 94.7 | 10.1 | 94.6 | 10.1 | 94.8 | 10.1 | -0.1 | 1.7 |
| ***Food secure households*** | ***50.3*** | ***50.0*** | ***46.7*** | ***49.9*** | ***49.5*** | ***50.0*** | ***-5.4****** | ***-11.2*** |
| Chronic food secure households | 19.8 | 39.8 | 15.3 | 36.0 | 19.6 | 39.7 | -6.6*** | -2.9 |
| Food secure in 1 year out of 3 | 28.6 | 45.2 | 31.4 | 46.4 | 28.0 | 44.9 | 4.1*** | -8.6* |
| Food secure in 2 years out of 3 | 27.8 | 44.8 | 28.7 | 45.3 | 27.4 | 44.6 | 1.4 | -5.9 |
| Chronic food insecure households | 22.4 | 41.7 | 23.7 | 42.6 | 23.5 | 42.4 | 1.9*** | 15.4** |
| **Household food security copying strategies (%)** | | | | | | | | |
| Severe use of less preferred food | 4.3 | 20.2 | 3.1 | 17.4 | 4.2 | 20.2 | -2.1 | -0.3 |
| ***Food rationing strategy*** | ***41.3*** | ***49.2*** | ***43.2*** | ***49.6*** | ***40.6*** | ***49.1*** | ***2.9*** | ***-10.0****** |
| Severe reducing man food intake | 4.0 | 19.7 | 4.0 | 19.6 | 4.1 | 19.8 | -0.5 | 0.5 |
| Severe reducing cook food intake | 3.7 | 18.9 | 4.5 | 20.7 | 3.6 | 18.5 | 0.1 | -1.9 |
| Severe reducing child food intake | 1.2 | 10.8 | 1.0 | 9.8 | 1.2 | 10.9 | -0.7** | 0.6 |
| Severe meal skip | 2.1 | 14.5 | 2.9 | 16.8 | 2.1 | 14.4 | 0.5** | -0.2 |
| Moderate meal missing a whole day | 3.1 | 17.4 | 1.5 | 12.3 | 2.8 | 16.4 | -1.4* | -5.3*** |
| Severe meal missing a whole day | 0.6 | 7.8 | 0.7 | 8.3 | 0.5 | 7.3 | -0.3 | -1.2*** |
| Food purchasing | 55.7 | 49.7 | 62.1 | 48.5 | 54.5 | 49.8 | 9.5 | 17.3*** |
| Severe food deficit on last 5 years | 16.1 | 36.8 | 23.2 | 42.2 | 14.8 | 35.5 | 8.8*** | -18.9*** |

*Source : PNGT2 2004-2006, author's computations.*

Test of the equality of means: * Significant at 10%, ** Significant at 5%, *** Significant at 1%

Note : Nr and Rn are dummy variables representing respectively household without remittances, and household with internal remittances.

The Est and Sahel Regions are the best Regions based on food security indicators, while the worst are Nord and Sud Ouest Regions (Table 7). The highest regional incidences of food secure correspond to the Est and Sahel Regions, while the lowest percentages are in Cascades, Nord and Sud Ouest Regions (Table 7). The energy costs are higher in Centre Nord and Cascades Regions. Food rational strategy is more frequent in Sahel and Sud Ouest, and less experienced in Cascades and Hauts Bassins Regions.

## Table 2 : Regional household food security statistics (%)

| | Daily per capita calorie cost (CFA) | Food secure | Chronic food secure | Chronic food insecure | Severe reduce of child food intake | Severe meal skip | Severe missing meal a whole day | Severe food deficit | Low Dietary Diversity Score |
|---|---|---|---|---|---|---|---|---|---|
| Boucle Mouhoun | 94.7 | 57.0 | 24.1 | 12.9 | 0.6 | 3.7 | 0.0 | 14.6 | 58.4 |
| Cascades | 95.6 | 28.8 | 5.0 | 47.5 | 0.1 | 0.0 | 0.0 | 3.8 | 32.7 |
| Centre | 92.9 | 40.7 | 9.2 | 31.5 | 0.0 | 2.5 | 0.6 | 8.9 | 59.6 |
| Centre Est | 94.9 | 47.8 | 16.1 | 21.2 | 0.4 | 1.6 | 1.1 | 2.9 | 61.8 |
| Centre Nord | 96.0 | 65.6 | 24.7 | 8.3 | 0.1 | 0.2 | 0.2 | 40.0 | 61.0 |
| Centre Ouest | 95.1 | 59.8 | 22.5 | 7.9 | 0.4 | 0.0 | 0.1 | 7.6 | 71.1 |
| Centre Sud | 93.6 | 38.3 | 12.2 | 30.6 | 0.0 | 1.6 | 0.8 | 0.6 | 44.5 |
| Est | 94.6 | 77.9 | 49.8 | 3.8 | 1.0 | 0.8 | 0.3 | 10.4 | 82.5 |
| Hauts Bassins | 90.5 | 40.8 | 15.0 | 30.7 | 0.1 | 0.3 | 0.0 | 6.8 | 42.0 |
| Nord | 94.9 | 28.3 | 5.0 | 44.1 | 1.3 | 0.7 | 0.2 | 44.4 | 40.5 |
| Plateau Central | 94.7 | 37.8 | 10.9 | 31.9 | 1.9 | 4.7 | 0.3 | 28.5 | 53.4 |
| Sahel | 94.9 | 76.0 | 40.9 | 3.1 | 6.6 | 6.1 | 2.5 | 18.9 | 70.2 |
| Sud Ouest | 94.8 | 28.1 | 2.5 | 39.4 | 2.5 | 8.0 | 2.6 | 13.6 | 78.8 |
| **Pooled sample** | **94.7** | **50.3** | **19.8** | **22.4** | **1.1** | **2.1** | **0.6** | **16.1** | **55.9** |

*Source: PNGT2 2004-2006, author's computations.*

Child nutrition status is better in food insecure households, compared to food secure households. These statistics are seemingly paradoxical as food security is expected to improve child nutrition (Table 8). They could be explained by potential positive deviance effects, reflecting children who grow well despite adversity (Lapping et al., 2002).

**Table 3 : Child nutrition statistics by household food security status (%)**

| | Stunted | Underweight | Wasted | Over-nutrition | Normal nutrition |
|---|---|---|---|---|---|
| Food insecure (FI) | 43.1 | 21.1 | 33.6 | 14.9 | 3.9 |
| Food secure (FS) | 42.5 | 19.7 | 30.5 | 17.1 | 5.0 |
| Mean equality t-test (FS - FI) | -0.6 | -1.4* | -3.1 | 2.2 | 1.1*** |
| **Pooled sample** | **42.8** | **20.4** | **32.1** | **16.0** | **4.4** |

*Source: PNGT2 2004-2006, author's computations.*

*Test of means equality : * Significant at 10%, ** Significant at 5%, *** Significant at 1%*

The distribution of household food security indicator, particularly for dietary diversity in graph 4, shows distinct subpopulations. Thus, it would call for use of quantile regression approach.

## 4.2. Variable description and summary statistics

In this section, we briefly describe the dependent and explanatory variables used for regressions in this paper, using a summary of related statistics. They include child, household, and village characteristics.

The household characteristics reflect its overall food security conditions. The women decision-making power, food security, dietary quality and diversity, asset and remittance variables, and gender equity are expected to have positive effects on household food security, while the household size would have negative the opposite effect. The women decision-making power is very low at less than 0.1. The average number of calories per capita and per day is 2,121, while most of children are in a household with less than required quantity of calories per capita (Table 6). The dietary quality is relatively weak as only 12% of calories come from fruits, vegetables and animals. Table 6 shows that household dietary is fairly diversify. About 31% of households have received some remittances, including 17% of households receiving remittances from abroad. The gender equity score at village level is very small (Table 10).

## Table 4 : Household and village characteristics

| | Pooled sample [N=4330] | | Has received remittances (R) [N=1562] | | Has received international remittances (Ri)[897] | | Mean differences and t-test | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Standard Deviation | Mean | Standard Deviation | Mean | Standard Deviation | R - Nr | Ri - Rn |
| **Socio-demographic variables** | | | | | | | | |
| Household size | 11.13 | 8.26 | 12.53 | 9.12 | 13.34 | 10.29 | 2.05*** | 1.77*** |
| Children under 5 years | 2.67 | 2.20 | 2.94 | 2.67 | 3.14 | 2.90 | 0.39*** | 0.45** |
| Dependency Ratio | 2.43 | 0.89 | 2.50 | 0.93 | 2.46 | 0.83 | 0.10** | -0.07 |
| Household education years | 6.10 | 9.56 | 7.61 | 10.51 | 7.04 | 10.53 | 2.24*** | -1.22 |
| Women decisionmaking power | 0.04 | 0.51 | 0.13 | 0.48 | 0.13 | 0.47 | 0.12*** | 0.00 |
| Number of income sources | 0.39 | 0.79 | 0.44 | 0.89 | 0.420 | 0.89 | 0.08 | -0.05 |
| Age of household head (years) | 47.24 | 14.46 | 51.83 | 14.92 | 52.90 | 15.25 | 6.74*** | 2.33** |
| Sex of household head (%) | 96.96 | 17.16 | 94.49 | 22.83 | 94.17 | 23.45 | -3.64*** | -0.70 |
| Polygamous head (%) | 48.7 | 50.0 | 43.6 | 49.6 | 39.5 | 48.9 | -7.7*** | -8.7 |
| Ethnic group of head (%) | | | | | | | | |
| *Mossi* | 43.23 | 49.55 | 62.11 | 48.53 | 68.54 | 46.46 | 27.69*** | 14.00*** |
| *Gourmantche* | 6.07 | 23.88 | 2.67 | 16.12 | 1.43 | 11.87 | -4.99*** | -2.70*** |
| *Peulh* | 7.34 | 26.08 | 6.00 | 23.76 | 4.11 | 19.87 | -1.97*** | -4.10* |
| *Gurunsi* | 1.56 | 12.38 | 1.60 | 12.55 | 1.99 | 13.99 | 0.06 | 0.86* |
| *Samo* | 3.79 | 19.09 | 6.27 | 24.25 | 5.17 | 22.15 | 3.64*** | -2.40* |
| *Bobo* | 4.17 | 20.00 | 2.29 | 14.97 | 2.06 | 14.22 | -2.76*** | -0.49 |
| *Other* | 33.84 | 47.32 | 19.06 | 39.29 | 16.69 | 37.31 | -21.68*** | -5.16 |
| **Asset and remittance variables** | | | | | | | | |
| Asset score | 0.49 | 2.03 | 0.65 | 1.98 | 0.52 | 1.69 | 0.24*** | -0.28 |
| Has received remittances (%) | 31.90 | 46.61 | . | . | . | . | . | . |
| *international (%)* | *17.33* | *37.86* | *54.33* | *49.83* | . | . | *54.33* | . |
| *internal (%)* | *14.57* | *35.28* | *45.67* | *49.83* | . | . | *45.67* | . |
| Remittances (CFA) | 15,972 | 77,933 | 50,068 | 131,676 | 52,431 | 95,213 | 50,068 | 5,174 |
| Cultivated land (hectares) | 5.92 | 7.78 | 5.84 | 9.36 | 6.23 | 11.81 | -0.12 | 0.83 |
| Village gender equity score | -0.06 | 0.998 | . | . | . | . | . | . |

*Source : PNGT2 2004-2006, author's computations.*

*Test of the equality of means: * Significant at 10%, ** Significant at 5%, *** Significant at 1%*

*Note : Nr and Rn are dummy variables representing respectively household without remittances, and household with internal remittances.*

## 5. Empirical results

The impacts of remittances on household food security are eclectic. We find positive effect on dietary quantity and cost, and negative effect on dietary quality and diversity. Our first hypothesis is partially confirmed by this result (Table 14). Hossain et al. (2013) lead to similar results in Bangladesh, particularly for remittances from rural-urban migration. Sharma also finds positive effect of remittances on household food security; however, he indicates that migration has negative effect on household food security, particularly for poor households (Sharma, 2012). The negative impact of remittances on household dietary quality is in line with the results from Kroeger and Anderson (2011), substitution of rich and expensive foods with poor and cheaper ones.

In addition, the effect of remittances on household food security is higher for lower quantiles than upper ones, though this effect is more significant for the middle quantiles. This result fits in our second expectation. In contrast, we find a quasi-increasing extent of remittances effects on household dietary quality and diversity from lower to upper quantiles. These impact differences in quantiles confirm the appropriateness of using a quantile regression approach in the current study (Table 15). We also note that estimates of remittance effect on household food security using Instrumental-Variable Generalized Method of Moments (IV/GMM) are not statistically significant (Table 14).

## Table 5 : Remittance effects on household food security using IV and quantile regressions

| | Log quantity of daily per capita calories | | Log share calories from fruits, vegetables and animals | | Log share number of consumed food groups | |
|---|---|---|---|---|---|---|
| | Coefficient | Standard D. | Coefficient | Standard D. | Coefficient | Standard D. |
| **Instrumental-Variable Generalized Method of Moments (IV/GMM)** | | | | | | |
| IV | 3.454 | 2.011 | -9.805 | 7.343 | -1.98 | 1.09 |
| N | 4,833 | | 3,860 | | 4,870 | |
| **Instrumental-Variable Quantile Treatment Effects** | | | | | | |
| Q10 | 0.942* | 0.378 | -0.646** | 0.197 | 0 | 0.045 |
| Q20 | 0.380* | 0.148 | -0.645*** | 0.171 | 0 | 0.073 |
| Q30 | 0.200** | 0.0757 | -0.753*** | 0.171 | -0.288*** | 0.081 |
| Q40 | 0.356*** | 0.069 | -0.777*** | 0.177 | -0.223*** | 0.053 |
| Q50 | 0.414*** | 0.069 | -0.800*** | 0.172 | -0.223*** | 0.059 |
| Q60 | 0.289*** | 0.080 | -0.730*** | 0.178 | -0.182*** | 0.047 |
| Q70 | 0.185** | 0.071 | -1.072*** | 0.163 | -0.182*** | 0.050 |
| Q80 | 0.124 | 0.076 | -0.590*** | 0.160 | -0.606*** | 0.048 |
| Q90 | 0.154 | 0.098 | -0.829*** | 0.160 | -0.452*** | 0.040 |
| N | 3,132 | | 2,426 | | 3,156 | |

*Source : PNGT2 2004-2006, author's computations.*

** Significant at 10%, ** Significant at 5%, *** Significant at 1%*

*Qi is the quantile i of corresponding z-score, and N is the number of observations.*

*Table 15 indicates that the effect of remittances on household food security is significantly different across quantiles, particularly for dietary diversity, and between lower and upper quantiles.This result is in line with using a quantile regression method.*

## Table 6 : Equality test of remittance coefficients between household food security quantiles

| | **Log quantity of daily per capita calories** [Chi-sq (.)] | **Log share calories from fruits, vegetables and animals** [Chi-sq (.)] | **Log share number of consumed food groups** [Chi-sq (.)] |
|---|---|---|---|
| [Q10=Q30] | 3.71* | 0.17 | 9.55*** |
| [Q10=Q40] | 2.33 | 0.24 | 10.28*** |
| [Q10=Q50] | 1.89 | 0.34 | 9.07*** |
| [Q10=Q70] | 3.88** | 2.77* | 7.31*** |
| [Q10=Q90] | 4.08** | 0.52 | 55.59*** |
| [Q20=Q60] | 0.29 | 0.12 | 4.44** |
| [Q20=Q70] | 1.41 | 3.25** | 4.26** |
| [Q20=Q80] | 2.36 | 0.06 | 48.18*** |
| [Q20=Q90] | 1.63 | 0.62 | 29.48*** |
| [Q50=Q70] | 5.33** | 1.31 | 0.28 |
| [Q50=Q90] | 4.72** | 0.02 | 10.31*** |
| [Q70=Q90] | 0.07 | 1.12 | 17.58*** |
| [Q10=Q20=Q30=Q40=Q50=Q60=Q70=Q80=Q90] | 17.01** | 5.82 | 126.06*** |

*Source : PNGT2 2004-2006, author's computations.*

** Significant at 10%, ** Significant at 5%, *** Significant at 1%*

*Qi is the quantile i of corresponding z-score.*

## Conclusion

This study analyzes the impact of remittances on household food security in rural Burkina Faso, and then contributes to related literature by using suitable methods for dealing with econometric biases. The rural Burkina Faso is characterized by endemic and chronic household food insecurity. Poor households are the most vulnerable to this problem. The prevalence of household food insecurity in rural Burkina Faso is 50%. Moreover, the household dietary is weakly diversified. We also find high regional differences in regional indicators of household food security. More remarkably, the rural Sahel region, with low natural resources, has the highest food security, while the rural South West, benefiting for high natural endowments, has the lowest food security. The core result from this study indicates that remittances improve food security, while decrease dietary quality and diversification. The main implications of this study are related to increasing the holistic advantage of remittances on household food security in rural Burkina Faso, including :

- *Promoting remittances as a strategy against household food insecurity, particularly the dietary quantity in rural Burkina Faso;*
- *Complementing promotion of remittances by strategies aiming to increase dietary quality, diversity, and food utilization in rural Burkina Faso.*
- *Cautiously accounting for regional specificities in developing food security programs.*

We lack including medium and long run effects of remittances on household food security. In addition, detailed analysis of effect channels on household dietary would be helpful for a comprehensive explanation of negative impact of remittances on household dietary quality and diversity. We also lead to some paradoxical result indicating that child nutrition status is better in food insecure households, compared to food secure households. Our future investigations will focus on these caveats.

## References

**Acosta, Pablo, César Calderón, Pablo Fajnzylber, and Humberto López, 2008.** "What is the Impact of International remittances on poverty and inequality in Latin America?". World Development 36(1) : 89-114.

**Acosta, Pablo, César Calderón, Pablo Fajnzylber, and Humberto López, 2007.** "The Impact of Remittances on Poverty and Human Capital: evidence from Latin American household surveys". World Bank Policy Research Working Paper, WPS4247.

**Antón, José Ignacio. 2010.** "The Impact of Remittances on Nutritional status of children in Ecuador." International Migration Review 44(2): 269-299.

**Bassolé, Léandre, 2007.** "Child malnutrition in Senegal: does access to public infrastructure really matter? A quantile regression analysis".

**Babatunde, Raphael and Martinetti, Enrica C. 2010.** "Impact of remittances on food security in rural Nigeria". Paper given at the Department of Public and Territorial Economics, University of Pavia, Italy.

**Carletto, C., K. Covarrubias, and J.A. Maluccio, 2011.** "Migration and child growth in rural Guatemala". Food Policy: 36: 16-27. Caulfield, L.E., M. de Onis, M. Blossner, and R.E. Black

**Chami, R., C. Fullenkamp, and S. Jahjah. 2003.** «Are Immigrant Remittance Flows a Source of Capital for Development?» IMF Working Papers

03/189, International Monetary Fund, Washington, D.C.

**Davis, Jason, 2013.** "Migration, Remittances and the Well-Being of Left-Behind Children: A National-level Quantitative Assessment of Guatemala." Population Association of America Annual Meeting, New Orleans, LA. April 11-13. (poster)

**Hamilton, E.R., A. Villareal, and R.A. Hummer, 2009**. "Mother's, household, and community U.S. migration experience and infant mortality in rural and urban Mexico".‖ Popul Res Policy Rev 28 123-142.

**Hossain, Zakir, Mohammad Mizanul Haque Kazal, Jasim Uddin Ahmed, 2013**, "Rural-urban migration and its implications for food security in Bangladesh". Shahjalal University of Science and Technology (SUST), Department of Statistics.

**International Organization for Migration, 2014,** website: http://www.iom.int/cms/en/sites/iom/home/where-we-work/africa-and-the-middle-east/central-and-west-africa/burkina-faso.html

**Isoto E. Rosemay and David S. Kraybill, 2014** "Do remittances alter household nutrition in rural Tanzania? Evidence from rural Kilimanjaro in Tanzania". University of Minnesota Libraries.

**Kanaiaupuni, S.M., and K.M. Donato, 1999.** "Migradollars and mortality: the effects of migration on infant survival in Mexico".‖ Demography 36(3): 339-353.

**Kroeger, Antje, and Kathryn Anderson, 2011.** "Remittances and children's capabilities; new evidence from Kyrgyzstan, 2005-2008". Deutsches Institut für Wirtschaftsforschung.

**Lu, Yao and Donald J. Treiman. 2007.** "The Effect of Labor Migration and Remittances on Children's Education Among Blacks in South Africa. " California Center for Population (CCPR) Research Working Paper 001-07. Los Angeles, CA: UCLA-CCPR.

**Mathys, Ellen and Alison Gardner, 2009,** "USAID Office of Food for Peace, Burkina Faso Food Security Country Framework FY 2010 – FY 2014". Food and Nutrition Technical Assistance II Project (FANTA-2), Academy for Edu-

cational Development (AED).

**McKenzie, D.J., 2005.** "Measuring inequity with asset indicators".‖ Journal of Population Economics 18(2): 229-260.

**Orozco, Manuel. 2009.** "Remittances and Social Development: The Latin American experience". McClanahan, editors, Financing Social Policy: Mobilizing Resources for Social Development, 319-52.

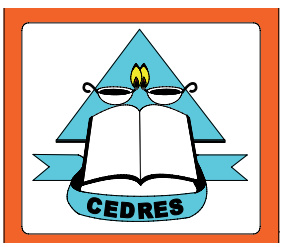
**Ezra Rosser, 2011.** "Children's Consumption of Migration: Remittances and Food Security". Journal of the Latino Research Center, Volume V.

**Rosen Stacey, and Shapouri Shahla, 2009.** "Global Economic Crisis threatens food security in lower income countries". Amber waves.

**Sharma, Hari Prasad, 2012,** "Migration, remittance and food security: a complex relationship". The Development Review – Beyond Research, Volume 1, Issue 1.

**World Bank. 2004.** "Enhancing the Developmental Effect of Workers' Remittances to Developing Countries," Global Development Finance Report 2004, World Bank, Washington, D.C.

**Yang, D. 2008.** «International Migration, Remittances and Household Investment: Evidence from Philippine Migrants' Exchange Rate Shocks.» Economic Journal, Royal Economic Society 118 (528):591-630.

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