

Shock and Poverty in Sub-Saharan Africa:

The Case of Burkina Faso (Report on Pre-Research in 2006)

Takeshi Sakurai (Policy Research Institute)

Introduction

Risk is the major cause of poverty in Sub-Saharan Africa (Dercon, 2005). It is well known that while rural households are relatively well insured against idiosyncratic shocks via various informal mechanisms, covariate shocks reduce consumption level significantly and its impact can be persistent (Hoddinott and Harrower, 2005 and Dercon, Hoddinott, and Woldehanna, 2005). Even in the case of covariate shocks, households could cope with them by receiving remittance from other regions that are not affected by the same shocks and/or out-migrating to such regions (e.g., forest zone in the case of drought). Most studies on covariate shocks deal with the case of drought, flood, earthquake, commodity price shocks, currency crisis, and so on. But it is not examined what rural households will behave, if transfer, one of the most important insurance against covariate shock, were widely suspended due to covariate shock. This paper focuses on this issue using rarely available panel data from Burkina Faso.

Burkina Faso, a landlocked country in West Africa, is located in the semi-arid zone on the southern edge of the Sahara desert, or in the Sahelian region (Figure 1). Most of the country's territory belongs to the Savanna zone whose annual precipitation varies from 400 mm in the north-east to 1200 mm in the south-west. Agriculture in this country is generally rain-fed, and frequent drought due to erratic rainfall keeps its productivity low and unstable. Since droughts are very frequent in Burkina Faso, rural households are known to be well prepared for them (e.g., Reardon, Matlon, and Delgado, 1988). But the country remains one of the poorest countries in the world: 53.1 percent of the country's rural population is below the poverty line in 2003 (Grimm and Günther, 2006). The poverty has made the rural population rely on external migration (mostly to neighboring Côte d'Ivoire) as well as

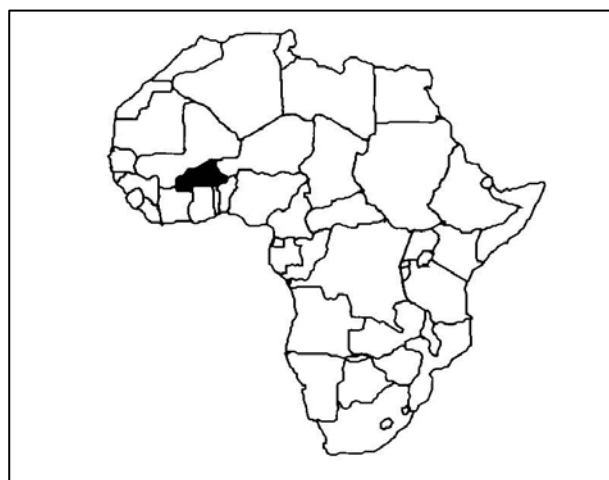


Figure 1 Location of Burkina Faso

remittance from the relatives living outside the country (also mostly in Côte d'Ivoire). It is estimated that such revenue constitutes 10 – 20 percent of their total income (Reardon, Matlon, and Delgado, 1988). In other words, rural households in Burkina Faso have diversified their income sources to zones (i.e., the forest zone) and sectors (i.e., non-agriculture) that are not subject to the erratic rainfall in the semi-arid zone. In addition, the regional migration has been contributing to the mitigation of population pressure on the land in Burkina Faso.

However, in September 2002, a military rebellion took place in Côte d'Ivoire. As a result, a considerable number of Burkinabés living in Côte d'Ivoire were obliged to return to

their home and the total number is officially estimated to be some 350,000 as of July 2003. That is, the crisis in the neighboring country has imposed unexpected income reduction because the sources of remittance and migration income have been lost. In addition, the returnees from Côte d'Ivoire have caused unexpected population pressure on rural Burkina Faso. This kind of covariate shock has been rarely investigated in the literature. Hence, this paper investigates empirically the effect of the covariate shocks due to the Ivorian crisis on the welfare of rural households in Burkina Faso.

Study Site and Data

The study site is eight villages shown in Figure 2, where Japan International Research Center for Agricultural Sciences (JIRCAS) and University of Ouagadougou (UO) have been conducting household survey since 1999.¹ They spread over the four major agro-ecological zones in Burkina Faso: the northern Sudanian zone, the southern Sudanian zone, the northern Guinean zone, and the southern Guinean zone. They differ significantly in the level of annual precipitation, and accordingly households' technological choice and risk management are different.

Thirty-two households were selected in each village in the following way. First, a village census was carried out in 1998, and village households were stratified based on the ownership/adoption of animal traction technology. Then, the number of sample households of each stratum is determined proportionally to the total number of households in each stratum so that the sample size of each village is fixed at thirty-two households. As a result, the number of sample households amount to 256 spread over the eight villages in the four agro-ecological zones.

Then, from 1999 they were surveyed repeatedly for five years so as to construct a panel dataset. The interview was conducted three times a year; after harvest in February, at the end of the dry season in May, and after planting in September. In the middle of the survey period, the civil war in Côte d'Ivoire took place unexpectedly in September 2002. Therefore, this paper uses the panel dataset to explore the impact of the crisis. However, this paper focuses on the case of two villages in the southern Sudanian zone (village 3 and village 4 on Figure 2) since they are known to have been relying on remittance significantly. Since these villages belong to the same agro-ecological zone and share the main market, influence of such factors need not be taken into account in the analyses.

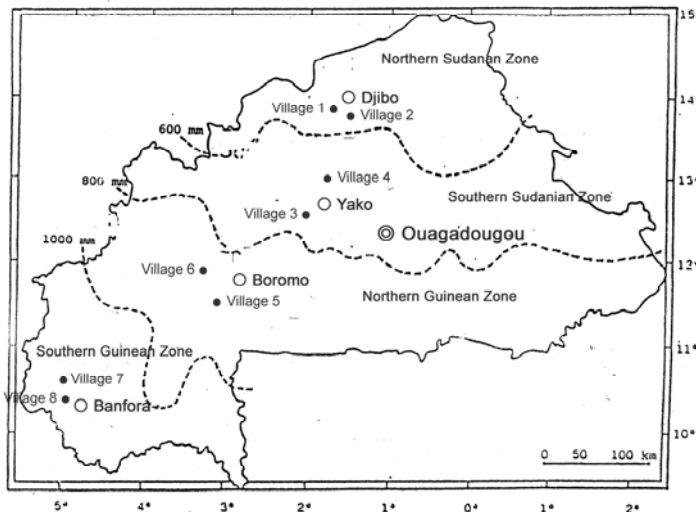


Figure 2 Study Site

and village 4 on Figure 2) since they are known to have been relying on remittance significantly. Since these villages belong to the same agro-ecological zone and share the main market, influence of such factors need not be taken into account in the analyses.

¹ Among these eight villages, six villages (villages 1 and 2 in the northern Sudanian zone, villages 3 and 4 in the southern Sudanian zone, and villages 5 and 6 in the northern Guinean zone) are those where ICRISAT (International Crop Research Institute for the Semi-Arid Tropics) conducted household survey from 1980 to 1985. JIRCAS/UO chose them as the study site to see how they have changed in twenty years.

Analytical Framework

Rural households in Burkina Faso are considered to have two kinds of covariate shock as a result of the Ivorian crisis. One is an increase in household size because of accepting returnees from Côte d'Ivoire. The other is a decrease in household income due to the suspension of remittance from Côte d'Ivoire. This paper assumes that these shocks are exogenous to the households as they are caused by the Ivorian crisis. As a result, household's income per capita should decline due to the increase of household size and the decrease of remittance and migration income. To cope with the shocks, rural households will increase non-agricultural income, sell livestock, increase remittance from other sources, and increase agricultural production in the short-run. If such efforts are successful, household consumption per capita will not be affected, i.e., consumption is smoothed. Therefore, the first objective of this paper is to examine if rural households in Burkina Faso are insured against this kind of covariate shocks.

The analytical framework presented above can be expressed in the following econometric model.

$$A_{iy} = A(R_{iy}, GI_{iy}, \mathbf{X}_{iy}, \mathbf{Y}_y) \quad (1)$$

$$N_{is} = N(R_{is}, GI_{sy}, \mathbf{X}_{is}, \mathbf{S}_s, \mathbf{Y}_y) \quad (2)$$

$$L_{is} = L(R_{is}, GI_{sy}, \mathbf{X}_{is}, \mathbf{S}_s, \mathbf{Y}_y) \quad (3)$$

$$GB_{is} = G(R_{is}, GI_{sy}, \mathbf{X}_{is}, \mathbf{S}_s, \mathbf{Y}_y) \quad (4)$$

The sub-script i stands for household i , y stands for harvest-year y , and s stands for season s . Harvest year starts from harvest season, then goes through dry season, and ends in planting season. Season in the model corresponds those three seasons. Dependent variables are: A is household's total cropped area, N is the value of net non-agricultural income per capita including both self-employment and non-agricultural employment, L is the value of net livestock sales per capita, and GB is the value of remittance from those who living in Burkina Faso. Since cropping is once a year, yearly data is used for equation (1), but otherwise seasonal data is used as seasonal variations are large. All the values are deflated by local food price index constructed by the survey data, and are in 2004 price. Among explanatory variables, household level exogenous shocks are captured by the following two variables. R : total number of returnees in a period (either a year or a season), and GI : the real value of remittance received from those who living in Côte d'Ivoire in a year (in current season and the previous two seasons). Explanatory variables include the vector of household's characteristics and assets (\mathbf{X}) and the vector of harvest-year and season dummies (\mathbf{S} and \mathbf{Y}).

Then, as for the consumption smoothing, two models are considered. One is a reduced form, which is the same as above:

$$E_{is} = E(R_{is}, GI_{sy}, \mathbf{X}_{is}, \mathbf{S}_s, \mathbf{Y}_y) \quad (5)$$

where E is the natural logarithm of real expenditure per capita divided by the poverty line.² The expenditure excludes durables, investment, and production inputs.

Table 1 Demographic Impact of the Ivorian Crisis

² This poverty line is not the official poverty line provided by Institut National de la Statistique et de la Démographie (INSD) nor rural poverty line given by Deuxieme Programme National de Gestion des Terroirs (PNGT 2), but rather is calculated following the method and data given in appendix of Savadogo et al (2006). Hence, the poverty line is 2832 FCFA per month per capita in 2004 price. This is based on the observed prices of a 2283 calorie food component and regional level estimate of the share of non-food expenditure. Savadogo et al (2006) estimates 3487 FCFA per month per capita in 2004 price for the national level rural poverty line.

Harvest Year	Number of Working-Age Returnees in a Year	Number of Working-Age Adults	Number of Household Members
2000/2001	0.49 (0.78)	4.24 (4.20)	11.6 (9.91)
2001/2002	0.67 (1.00)	4.53 (3.93)	12.0 (9.69)
2002/2003 (after the crisis)	1.27 (1.96)	5.66 (4.42)	13.6 (10.6)
2003/2004 (after the crisis)	1.40 (2.65)	6.01 (4.61)	14.2 (11.6)

The numbers are mean number of persons per household, and the standard deviations are in the parentheses.

Table 2 Impact of the Ivorian Crisis on Transfer

Harvest Year	From Non-Household Members Living in Côte d'Ivoire	From Non-Household Members Living in Burkina	From Household Members Living Away from Home ¹
2000/2001	254 (471)	89.7 (339)	-34.1 (126)
2001/2002	239 (312)	36.9 (279)	-38.2 (83.0)
2002/2003 (after the crisis)	208 (326)	64.7 (273)	-24.7 (79.0)
2003/2004 (after the crisis)	172 (346)	76.2 (220)	-16.3 (36.2)

The numbers are real value of net transfer per capita per month in FCFA, and the standard deviations are in the parentheses.

¹ They are living in Burkina Faso.

Results

Household Level Shocks and Poverty

First, the shocks are to be confirmed among sample households. Table 1 presents the demographic changes before and after the Ivorian crisis. It is clear that after crisis a household received more than one working-age (age between 16 and 60) adult on average every year, and it increased household size significantly. Note that the number of working-age returnees is used as an exogenous shock variable because the change of household size includes other cases: for example, returnees under the age of 16, new-born babies, marriages, deceased, etc. Table 2 summarized the changes of net transfer during the survey period. Net transfer from non-household members living in Côte d'Ivoire, which is another exogenous shock in this study, declined significantly after the crisis.

Figure 3 Poverty Over Time

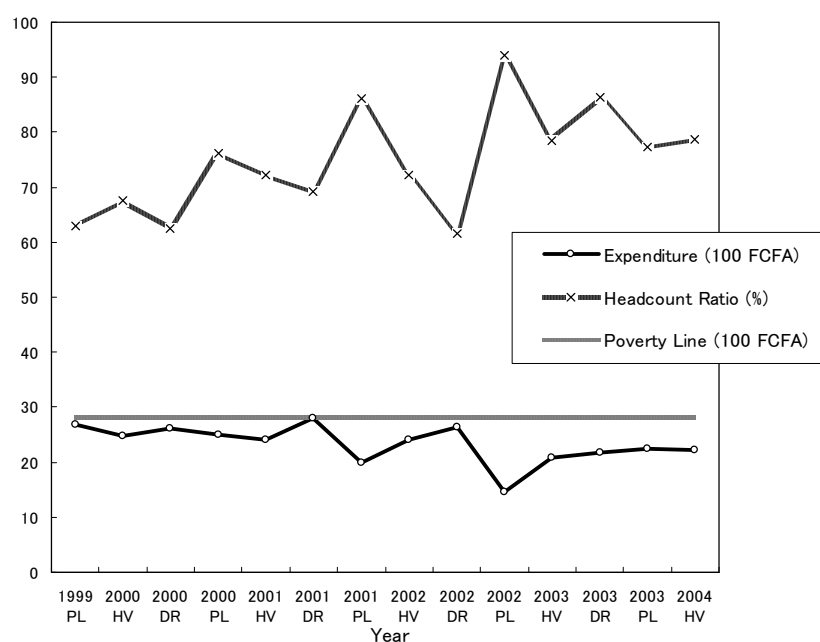


Table 3 Determinants of Household's Total Cropped Area

Explanatory Variables	Dependent Variable	Total Cropped Area (ha)	Cropped Area per Capita (10 ⁻¹ ha)
Exogenous Shocks			
Transfer from Côte d'Ivoire ¹		0.75 (3.50)	3.64 (2.55)
Number of Working-Age Returnees ²		0.70 (0.37) *	0.09 (0.12)
Household Assets			
Real Value of Livestock Holdings per Capita		6.06 (3.16) *	3.43 (2.16)
Household Demographics			
Household Size		0.23 (0.11) **	-0.03 (0.03)
Working-Age Male Rate (Number/HH size)		-5.57 (4.22)	-7.16 (3.03) **
Working-Age Female Rate (Number/HH size)		-1.47 (3.75)	0.72 (2.27)
Number of Working-Age Deceased ²		-0.73 (0.78)	0.78 (0.46) *
Household Head's Characteristics			
Change of the Sex during the Last 1 Year ³		1.16 (1.07)	-0.84 (1.11)
Household Head's Age (10)		-3.38 (2.95)	-0.72 (0.74)
Household Head's Age Squared (10 ²)		0.28 (0.32)	5.08 (5.40)
Household Human Capital			
Adult Male Total Education Score ⁴		-9.80 (8.50)	6.21 (5.17)
Adult Female Total Education Score ⁴		3.02 (5.03)	2.71 (1.48) *
Adult Male Highest Education			
Alphabetization of Local Language (dummy)		0.16 (0.98)	-0.18 (0.96)
Primary School (dummy)		-0.42 (1.51)	-1.06 (0.86)
Secondary School or Higher (dummy)		2.15 (2.47)	-2.36 (1.41) *
Adult Female Highest Education Level			
Alphabetization of Local Language (dummy)		2.65 (4.50)	-0.09 (1.63)
Primary School (dummy)		0.40 (1.50)	-0.08 (0.69)
Secondary School or Higher (dummy)		0.01 (2.25)	1.64 (2.11)
Harvest Year Dummies			
Year 2001/02		0.42 (0.65)	0.44 (0.48)
Year 2002/03		-0.48 (0.64)	-0.52 (0.42)
Year 2003/04		0.15 (0.61)	0.66 (0.50)
Constant		12.97 (7.07) *	7.80 (2.50) ***
Number of Observations		62 hhs * 4 years	62 hhs * 4 years
R ²		0.42	0.20
Hausman Test		30.1	0.0
Estimation Method		fixed effect	random effect

Standard errors are in parentheses. *, **, and *** indicate that the coefficient is estimated at significance level 10%, 5%, and 1% respectively.

¹ Real value in 2004 price per capita per year; ² Total number during the past 1 year; ³ Change from male to female takes 1, change from female to male takes -1, and no change takes 0, respectively; ⁴ If he/she completed alphabetization the score is 1, if he/she completed primary school the score is 2, and if his/her education level is higher than secondary school the score is 3. Then total score is divided by household size to obtain Total Education Score.

On the other hand, net transfer from non-household members living in Burkina Faso includes the cases within village, from near-by villages, and from cities in Burkina Faso, does not show a clear trend. It may be because households try to increase transfer from those people to cope with the reduction of transfer from Côte d'Ivoire. Almost all the cases of transfer from household members are within Burkina Faso, and as shown in the last column of Table 2, sample households are net givers on average. But the amount of net giving

declined after the crisis although it is much smaller than that received from non-household members. From Tables 1 and 2, it is clear that the Ivorian crisis has caused shocks to rural households in Burkina Faso.

Did the shock affect households' welfare? Figure 3 shows the trend of average real expenditure per capita per month in 2004 harvest season price. There are significant seasonal and annual fluctuations, but the expenditure seems to be declining after the crisis, namely since 2002 planting season.

As noted in footnote 2, poverty line estimated for the sample households is 2832 FCFA per month per capita in 2004 price, and the sample households on average were always below the poverty line. In fact, poverty headcount ratio is always quite high, ranging from 0.63 (in 2000 dry season) to 0.94 (2002 planting season), as shown in Figure 3. The headcount ratio also shows significant seasonal and annual fluctuations, but there seems to be an increasing trend over time. Hence, Figure 3 suggests that the Ivorian crisis have increased poverty among rural households in Burkina Faso.

In the next sections, the relationship between the shocks and the poverty will be formally investigated.

Household Coping with Shock

As shocks due to the Ivorian crisis are really observed, the next question is how rural households cope with them. To answer it, equations (1) – (4) are to be estimated. Table 3 is for household total cropped area. As expected, the number of working-age returnees has a positive impact on the household cropped area; one-adult returnees increases 0.7 hectare of area under cultivation. But the number of returnees does not change cropped area per capita. On the other hand, transfer from Côte d'Ivoire does not have any significant effect on either household total cropped area or cropped area per capita. It means that agricultural production does not substitute for the reduction of remittance.

Table 4 shows the regression results for other coping behaviors. First, the reduction of remittance from Côte d'Ivoire significantly increases non-agricultural income. Second, working-age returnees urge households to obtain transfer within Burkina Faso. That is, both non-agricultural income and domestic remittance are households' coping strategies in the case of the Ivorian crisis. But they work differently: while non-agricultural income is to compensate the loss of transfer income, domestic remittance is used in the case of demographic shock. On the other hand, livestock sales are not a response to such shocks, probably because livestock price declined after the crisis. Moreover, there is little role of human capital in those coping behavior, even in the case of non-agricultural income. It is because most of the non-agricultural income is from informal, small-scale self-employment like street vendors and vegetable production in the garden, which may not require a lot of education.

Table 4 Determinants of Household's Coping Behavior

Explanatory Variables	Dependent Variable	Non-agricultural Net Income ¹	Net Livestock Sales ¹	Transfer within Burkina Faso ¹
Exogenous Shocks				
Transfer from Côte d'Ivoire ²		-0.33 (0.20) *	0.25 (0.38)	-0.76 (0.79)
Working-Age Returnees Rate (Number/HH size)		0.46 (0.31)	-0.28 (0.65)	4.27 (2.34) *
Household Assets				
Real Value of Livestock Holdings per Capita		0.11 (0.13)	0.07 (0.42)	0.90 (0.75)
Crop Production in the Previous year ³		0.23 (0.12) **	0.15 (0.21)	-0.04 (0.48)
Household Demographics				
Household Size (10 ²)		-0.95 (0.68)	0.19 (1.14)	-3.94 (2.08) *
Working-Age Male Rate (Number/HH size)		-0.06 (0.30)	0.13 (0.62)	-0.55 (1.63)
Working-Age Female Rate (Number/HH size)		-0.06 (0.25)	-0.03 (0.50)	1.21 (1.20)
Working-Age Deceased Rate (Number/HH size)		-0.73 (0.40) *	0.98 (3.42)	6.04 (6.31)
Household Head's Characteristics				
Change of the Sex during the Last 1 Year ⁴		-0.44 (0.15) **	-0.25 (0.21)	2.09 (2.05)
Number of years of age gap, if it exists		-0.55 (0.29) *	0.28 (0.28)	0.66 (1.48)
Household Human Capital				
Adult Male Total Education Score ⁵		-0.09 (0.34)	1.65 (0.66) **	-0.04 (1.66)
Adult Female Total Education Score ⁵		0.06 (0.05)	-0.14 (0.18)	0.01 (0.64)
Adult Male Highest Education				
Alphabetization of Local Language (dummy)		0.00 (0.08)	0.33 (0.32)	0.13 (0.79)
Primary School (dummy)		-0.01 (0.07)	-0.20 (0.21)	0.28 (0.59)
Secondary School or Higher (dummy)		-0.19 (0.17)	-1.63 (1.00)	0.46 (0.88)
Adult Female Highest Education Level				
Alphabetization of Local Language (dummy)		-0.15 (0.14)	-0.48 (0.46)	-0.22 (1.08)
Primary School (dummy)		0.02 (0.05)	-0.04 (0.16)	0.45 (0.53)
Secondary School or Higher (dummy)		0.06 (0.09)	0.03 (0.19)	4.82 (2.21) **
Harvest Year /Season Dummies				
Year 2000/01		-0.23 (0.07) **	-0.02 (0.15)	0.77 (0.35) **
Year 2001/02		-0.13 (0.07) **	-0.12 (0.13)	1.21 (0.32) ***
Year 2002/03		-0.08 (0.06)	-0.18 (0.14)	0.90 (0.28) ***
Year 2003/04		-0.12 (0.07) *	-0.17 (0.14)	0.72 (0.27) ***
Planting Season		-0.06 (0.04) *	-0.04 (0.07)	-0.53 (0.25) **
Harvest Season		-0.21 (0.03) **	0.10 (0.08)	-0.42 (0.26) *
Constant		0.42 (0.17) **	0.33 (0.32)	1.17 (0.66) *
Number of Observations		62hhs * 12seasons	62hhs * 12seasons	62hhs * 12seasons
R ²		0.17	0.08	0.11
Hausman Test		45.2	67.7	15.1
Estimation Method		fixed effect	fixed effect	random effect

Standard errors are in parentheses. *, **, and *** indicate that the coefficient is estimated at significance level 10%, 5%, and 1% respectively.

¹ Real value in 2004 price per capita per month (10⁴ FCFA); ² Total amount of remittance received per capita in real value during the last one year (10⁴ FCFA); ³ The product of household's cropped area per capita in the previous year and annual rainfall in the previous year (10³ ha*mm); ⁴ See footnote 3 of Table 3; ⁵ See footnote 4 of Table 3.

Table 5 Determinants of Household Welfare (Reduced-form Models)

Explanatory Variables	Dependent Variable	Expenditure ¹		Expenditure ¹		Expenditure ¹	
		Full Sample		Asset-Poor ²		Asset-Rich ²	
Exogenous Shocks							
Transfer from Côte d'Ivoire ⁴		0.53 (0.23) **		1.11 (0.51) **		0.61 (0.26) **	
Working-Age Returnees Rate (Number/HH size)		0.07 (0.32)		0.09 (0.38)		0.32 (0.44)	
Household Assets							
Real Value of Livestock Holdings per Capita		0.20 (0.11) *		0.29 (0.56)		0.05 (0.14)	
Crop Production in the Previous Year ⁵		0.25 (0.08) ***		0.21 (0.13)		0.20 (0.10) *	
Household Demographics							
Household Size (10 ²)		0.06 (0.33)		-3.01 (0.92) ***		-0.20 (0.61)	
Working-Age Male Rate (Number/HH size)		0.41 (0.28)		0.16 (0.40)		-0.61 (0.40)	
Working-Age Female Rate (Number/HH size)		0.80 (0.24) ***		0.74 (0.36) **		0.50 (0.35)	
Working-Age Deceased Rate (Number/HH size)		1.30 (0.67) *		-0.25 (0.74)		1.86 (0.59) ***	
Household Head's Characteristics							
Male (dummy)		0.27 (0.13) **		0.20 (0.31)		1.24 (0.27) ***	
Age (10 ²)		-0.88 (0.53) **		-7.73 (4.44) *		8.55 (2.00) ***	
Age Squared (10 ⁴)		0.69 (0.42)		7.17 (4.34) *		-8.42 (1.87) ***	
Household Human Capital							
Adult Male Total Education Score ⁶		-0.19 (0.23)		-1.15 (2.04)		0.13 (0.23)	
Adult Female Total Education Score ⁶		0.22 (0.07) ***		0.15 (0.07) **		0.71 (0.38) *	
Adult Male Highest Education							
Alphabetization of Local Language (dummy)		0.11 (0.11)		(dropped)		0.16 (0.35)	
Primary School (dummy)		0.14 (0.08) *		0.18 (0.34)		-0.05 (0.12)	
Secondary School or Higher (dummy)		0.00 (0.12)		0.07 (0.57)		0.44 (0.13) ***	
Adult Female Highest Education Level							
Alphabetization of Local Language (dummy)		0.05 (0.12)		(dropped)		0.00 (0.16)	
Primary School (dummy)		-0.04 (0.06)		-0.06 (0.11)		0.12 (0.08)	
Secondary School or Higher (dummy)		-0.01 (0.15)		-0.02 (0.19)		(dropped)	
Rainfall (10 ³ mm) in the Previous Year		0.12 (0.03) ***		0.12 (0.05) **		0.11 (0.04) ***	
Harvest Year /Season Dummies							
Year 2000/01		0.17 (0.07) **		0.17 (0.13)		0.09 (0.09)	
Year 2001/02		-0.10 (0.05) **		-0.09 (0.07)		-0.13 (0.06) **	
Year 2002/03		0.16 (0.10)		0.23 (0.17)		0.10 (0.12)	
Year 2003/04		-0.34 (0.05) ***		-0.23 (0.08) ***		-0.33 (0.07) ***	
Planting Season		-0.24 (0.04) ***		-0.21 (0.06) ***		-0.24 (0.05) ***	
Harvest Season		-0.07 (0.03) **		-0.05 (0.05)		-0.05 (0.04)	
Constant		-1.44 (0.33) ***		0.61 (1.18)		-4.08 (0.73) ***	
Number of Observations		67hhs * 14seasons		30hhs * 14seasons		30hhs * 14seasons	
R ²		0.20		0.23		0.23	
Hausman Test		24.0		38.9		1240	
Estimation Method		random effect		fixed effect		fixed effect	

Standard errors are in parentheses. *, **, and *** indicate that the coefficient is estimated at significance level 10%, 5%, and 1% respectively.

¹ The dependent variable is natural logarithm of real per capita expenditure per month divided by the poverty line; ² Asset poor households are those whose real livestock value per capita was less than 1,290 FCFA as of the harvest season of 2000, and asset rich households owned more livestock than 1,290 FCFA; ³ Natural logarithm of household total real income per capita per month except for that from own agricultural production (10⁴ FCFA); ⁴ Total amount of remittance received per capita in real value during the current period (10⁴ FCFA); ⁵ See footnote 3 of Table 4; ⁶ See footnote 4 of Table 3.

Impact on Household Welfare

The important question is if the rural households smooth consumption by using the coping strategies as analyzed above. In order to see the impact of the exogenous shocks on household welfare, equation (5) is estimated. The results are presented in Table 5. The regression is done using full sample and sub-samples respectively. The sub-samples are asset-poor and asset-rich, which are obtained based on the initial livestock holdings (as of the harvest season in 2000) because livestock is known to be an important asset to cope with shocks in Burkina Faso. The Table clearly shows that the reduction of remittance from Côte d'Ivoire significantly decreased household expenditure per capita. The impact is much larger for the asset-poor households than the asset-rich household, as expected. However the number of working-age returnees does not have a significant impact on household expenditure. Moreover, both crop production and rainfall previous year significantly increase household expenditure regardless of asset level. This implies that sample households' welfare significantly depends on agricultural production, which is affected annual rainfall level. That is, they are subject to another covariate shock due to the rainfall.

Although education shows little role in coping behavior as discussed above, it has certain influences on the consumption level. First of all, adult female's total education score has a positive significant effect on household per capita expenditure. This is observed both in asset-poor households and in asset-rich households, but the impact is larger among asset-rich group. Second, a household has an adult male whose education level is secondary school or higher, welfare level of such a household is significantly higher. But it is only in the case of asset-rich households. That is, higher education level is more effective if assets are available.

Conclusions

The civil war in Côte d'Ivoire has caused an increase in household size due to returnees and a decrease in remittance received in rural Burkina Faso. The impact of the two kinds of shock on household's coping behavior is investigated first. The number of working-age returnees increases household cropped area and augments remittance received from those who living in Burkina Faso. But it does not have a significant impact on non-agricultural income. On the other hand, the reduction of transfer from Côte d'Ivoire significantly increases non-agricultural income, but has effect neither on household total cropped area nor on remittance within Burkina Faso. However, livestock sales are found not to be a response to such shocks. It means that agricultural production and remittance within Burkina Faso do not substitute for the reduction of remittance from Côte d'Ivoire, but rather are to cope with demographic shock. On the other hand, rural households in Burkina Faso compensate the loss of transfer income with non-agricultural income.

In spite of those coping behaviors, this study demonstrates that the households do not fully smooth consumption against the reduction of remittance form Côte d'Ivoire. The impact is much larger for the asset-poor households than the asset-rich household, as expected. And the significant fluctuation of household expenditure per capita due to the variability of annual rainfall is observed regardless of asset level. On the other hand the number of working-age returnees does not have a significant impact on household expenditure.

References

- Dercon, S. "Risk, Poverty and Vulnerability in Africa," *Journal of African Economies*, Vol. 14, No. 4, 2005, pp. 483-488.
- Dercon, S., J. Hoddinott, and T. Woldehanna, "Shocks and Consumption in 15 Ethiopian Villages, 1999-2004," *Journal of African Economies*, Vol. 14, No. 4, 2005, pp. 559-585.
- Hoddinott, J. and S. Harrower, "Consumption Smoothing in the Zone Lacustre, Mali," *Journal of African Economies*, Vol. 14, No. 4, 2005, pp. 489-519.
- Grimm, M. and I. Günther, "Growth and Poverty in Burkina Faso: A Reassessment of the Paradox," *Journal of African Economies*, Vol. X, No. Y, 2006, pp. xxx-xxx.
- Reardon, T., P. Matlon, and C. Delgado. "Coping with Household-level Food Insecurity in Drought-Affected Areas of Burkina Faso," *World Development*, Vol. 16, 1988, pp. 1065-1074.
- Savado, K., Y. Bambio, O. Combar, A. Ouédraogo, and A. Tiemtore. *Les Conditions de Vie, les Revenus et la Pauvreté des Ménages Ruraux au Burkina Faso en 2005: Resultats de l'Enquête Intermediaire 1 du PNGT 2, Deuxième Programme National de Gestion des Terroirs*, Ouagadougou, 2006.