Impact of remittances on poverty and inequality in rural Burkina Faso

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Abstract: This paper analyzes the impact of remittances on poverty and inequality in rural Burkina Faso. The study area is characterized by low-skilled worker emigration in Côte d'Ivoire, and rural-to-rural move from the North and Center to the West and South. We use a three year panel dataset, a counterfactual approach, and appropriate estimation methods for controlling selection bias, cross-sectional and temporal dependence, leading to robust results. We find that remittances decrease poverty and increase inequality in rural Burkina Faso in 2004-2006. International remittances have greater impact on poverty than internal ones, while internal remittances are source of higher inequality increase than international ones. Households who receive remittances have better living conditions. However, income growth resulting from remittances is not pro-poor.

Impact des transferts de fonds des migrants sur la pauvreté et l'inégalité en zone rurale au Burkina Faso

Résumé : Cet article analyse l'impact des transferts de fonds des migrants sur la pauvreté et l'inégalité en zone rurale du Burkina Faso. Cette zone se caractérise par une émigration de travailleurs peu qualifiés en Côte d'Ivoire, et une migration interne rurale du Nord et du Centre vers l'Ouest et le Sud. Nous utilisons des données panel sur trois ans, une approche contrefactuelle et des méthodes d'estimation appropriées pour contrôler les biais de sélection, la dépendance transversale et temporelle, et aboutir à des résultats robustes. Les transferts réduisent la pauvreté et augmentent les inégalités en zone rurale au Burkina Faso en 2004-2006. Les transferts internationaux ont plus d'impact sur la pauvreté que ceux internes, tandis que ces derniers augmentent plus l'inégalité que les transferts internationaux. Les ménages qui reçoivent des transferts ont de meilleures conditions de vie. Cependant, la croissance de revenus résultant de transferts ne favorise pas les pauvres.

1.   Introduction

Burkina Faso is essentially a low-skilled worker emigration country. In 2010, the Burkinabe emigrants were estimated to 9.7% of the country population (World Bank, 2011), compared to 2.9% on average for the South countries (International Organization for Migration, 2014a). The main international destination is historically Côte d'Ivoire. This corridor is the only one in Africa that is part of the top 20 corridors worldwide[1] (International Organization for Migration, 2014a). The internal migration is principally from rural to urban areas, and from North to West and South rural regions. The rural-to-rural move is usually motivated by better land opportunity. The first migration reason is job search. Net inflow remittances in Burkina Faso were estimated to US $ 133 million in 2013 (International Organization for Migration, 2014b), and 0.1% of the Gross Domestic Product in 2006 (Ratha and Xu, 2008). These inflows are increasing mostly because of growth in migrant number, while money transfer costs are still high (Mohapatra and Ratha, 2011). The importance of remittances involves the understanding of its impact on household welfare for more efficient policy-making. Poverty and inequality are both viewed as components of welfare. Inequality usually matters when it contributes to impede the economy functioning, the political system, or the social welfare (World Bank, 2006). However, the literature offers a few insights into the effects of migrant remittances on poverty and inequality in Burkina Faso.

Migration is "a move from one geographical area to another" (Borjas, 2000). The literature points out that migration and remittances to relatives and friends in original country or area are ancient. The pioneer in classical migration research is Ernest Georg Ravenstein (1885) who has formulated six "laws of migration" based on survey data from Kingdom. Since this time, many explanations have been tried to understand migration and remittances. This interest has shapely grown since a few decades of years. The main common idea is related to pull-push reasons of migration and welfare improvement as migration major purpose (Hoddinott, 1994). Need of non-farm labor in urban zone, surplus of labor and agricultural constraints, as shortage of arable land, in rural area create a great incentive for peasants to migrate for job opportunities (Zhu and Luo, 2008). Moreover, considerable literature on migration tends to be redirected on international migration and the impact of the subsequent remittances on development of developing countries (Lucas, 2007). Richer households are usually considered to have more chance to participate in international migration (Wouterse, 2008; Adams and Page, 2003), and consequently to increase inequality through related remittances, and to have limited impact on social welfare. But, remittances seem to be more equalizing when migrants are the poorer. The remittance impact can be analyzed at macroeconomic and microeconomic levels.

The macroeconomic effects of remittances are related to balance of payment, exchange rate and domestic interest rate. Important remittance flows could lead to exchange rate appreciation and subsequent loss of competitiveness. This phenomenon is called "Dutch disease". Too huge remittances relative to the receiving country GDP could be

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[1] The corridor here is considered on the basis of the number of migrants moving between two countries.

coupled with labor supply decrease. In addition, if these remittances are principally spent on non-tradable goods/services, the price of these goods would increase, leading to real exchange rate appreciation. Furthermore, it could cause a contraction of the tradable sector due to labor reallocation needed for non-tradable sector expansion (Acosta et al., 2009; Lopez et al., 2008; Bourdet and Falck, 2006). However, many authors have not found Dutch disease as remittance consequences (Rajan and Subramanian, 2005). They explain this result by the endogeneity of remittances which tend to stop in case of exchange rate overvaluation.

The microeconomic impacts of remittances are more perceptible than macroeconomic ones in most of developing countries, as these transfer flows are relatively small. Remittances impact on household income, consumption and investment. Subsequently, they might have direct effects on inequality and poverty at household level. Wouterse and Taylor (2008) have found that remittances from inter-continental migrants contribute to household income diversification by stimulating livestock production. Remittances can help households overcoming credit constraints due to market imperfections in developing countries (Azam and Gubert, 2005; Wodon et al., 2003). The insurance against shocks is another positive effect of remittances (Yang, 2006; Clarke and Wallsten, 2004). This insurance effect could increase the probability for receiving households to gamble or invest in riskier activities. In addition, insurance through remittances could create moral hazard so that household active members would be less incentive to work, leading to a trade-off between insurance and labor efficiency (Miller and Paulson, 2000; Azam and Gubert, 2005).

Frequent questions in the migration analysis are whether remittances alleviate poverty or increase inequality across households; various results are found. Most of research works on migration have concluded to a poverty reducing effect of remittances (Adams, 1991, 2004, 2006, 2008; Adams and Page, 2003; Cordova, 2006; Taylor et al., 2005; Hoti, 2009). Wouterse (2008) found a much lower poverty mitigating effect of international migration than internal one in Burkina Faso. Portes (2009) showed that remittance impact on income is non-monotone and strongest for low income countries. Using a panel data of 46 countries on 1970-2000, he found positive remittance effect on income with a decreasing trend for the bottom 7 deciles, and negative and increasing trend for the top 2 deciles. Gupta et al. (2009) argue that remittances do not only have poverty mitigate effect; they also promote financial development. Nevertheless, some studies did not find significant poverty moderating effect of remittances (Campbell, 2008). Remittance impact on inequality seems to be unclear in the literature, depending mainly on the geographic and community area studied (World Bank, 2006). Adams (1991, 2008) found that remittances contribute to increase inequality in Egypt and Ghana. Barham and Boucher (1998) showed similar results using data from Nicaragua. Wouterse (2008) argued that international remittances are associated with greater inequality, whereas internal remittances and inequality are negatively correlated in Burkina Faso. However, Taylor et al. (2005) showed that remittances from international migrants decrease inequality in rural Mexico. Mckenzie and Rapoport (2004) found an inverse U-shaped relationship between emigration and

inequality in rural Mexico, suggesting that remittances increase inequality in migration short term and decrease it in the long term.

This paper arms to shed some light on the impact of remittances on poverty and inequality in rural Burkina Faso. Remittances are expected to reduce poverty while increasing inequality. In addition, international migration would have greater effect on household welfare and income inequality. Section 2 briefly describes migration and remittance theory, while section 3 sets the econometric model we use. Section 4 presents the dataset and key descriptive statistics on remittances in rural Burkina Faso. Section 5 analyses the estimation results and the last section concludes the paper.

2.   Theoretical background

Migration and remittances have been explained under various theory frameworks with different assumptions and concepts, likely leading to different consequences on remittance behaviors and sets of policy recommendations. Many factors impact on both decisions to migrate and to remit. In this paper, we consider the *New Economics of Labor Migration* as basic theoretical framework. This theory uses microeconomic analysis in arguing that migration is initiated by individual/household's rationale choice. Our empirical model will control for other theories as *Migration Network Theory*. This theory explains that social capital decreases migration costs and risks, and thus creates an increasing likelihood and a self-sustainability of migration.

Migration: The New Economics of Migration remains in the pull-push framework but includes, in addition, other markets as capital, insurance or future markets, given many failures in these markets. Migration decision is made at household/family level as a strategy for maximizing family income, minimizing income risk of the family, and overcoming capital constraints of this family. In contrast of neoclassical economics, income source matters in the new economics of migration since income is not a homogenous good, and even if diversifying income source does not necessary increase total income. In addition, the New Economics of Migration argues that the household decision of migration seeks to improve both its absolute and relative income, and subsequently to reduce their relative deprivation regarding some categories of households or communities. This theory implies that the household absolute or relative income has negative impact on the likelihood of sending migrant and subsequently receiving remittances. It expresses the closed link between migration and remittances. Indeed, it is realistic that individual decides to migrate considering his income maximization in household that intends to diversify its income risks through labor allocation.

Remittances: The individual remits after migrating, depending on many factors. The main remittance behaviors in the literature are altruism and cooperative contract. The altruistic factor implies that migrant remits to improve the other household member's welfare that he includes in his utility function. Thus, this behavior tends to smooth the respective welfares of the migrant and the household. The altruism behavior supposes a positive effect of the risks to a household income or its relative deprivation on the likelihood of receiving remittances from the migrant.

The contractual behavior is considered as an agreement between the migrant and the household to maximize the household utility, including the migrant. Many hypotheses can be derived from this behavior. Remittances can serve as a risk sharing mechanism. Thus, it can be used as a future insurance against unemployment or low wage for the migrant, or an insurance against income shocks for the household in origin place. Intra-household exchanges of favors may include remittances. A migrant can remit in exchange for his child-care in the receiving household. This bargaining hypothesis states that the number of migrant's dependents in the origin household has a positive impact on remitting to this household.

The migrant inheritance behavior is a potential motive for remitting, as a form of investment for future inheritance. Thus, the child-to-parent remittances may be positively linked to the origin household inheritable assets, or negatively linked to the number of brothers/sisters to share the inheritance with. It implies that the migrant prospects for future inheritance from origin household may have a positive effect on his remittances to this household. In addition, the investment conditions as infrastructure availability, interest rate, inflation, access to land, may influence the willingness of a migrant to remit. Thus, it is expected that favorable investing conditions in the origin area has a positive effect on remittances from migrants. Moreover, remittances can be explained by a repayment behavior of past investment in migrants. This investment may include migrant education and migration cost from the origin household. So, the probability to remit is higher as the investment of the household in the migrant is higher.

Illustration of the theoretical model: We follow Hoddinott (1994) to illustrate the theoretical model. To simplify, consider two agents: a prospective migrant and his parents. Suppose that they agree to maximize a joint utility function under a "migration contract" specifying share conditions of the migration benefits. This long-term agreement for joint utility maximization is realistic in the context of rural Burkina Faso. Both migrant and parent gain in this agreement and likely lose in disagreement situation. Indeed, the parents expect remittances to improve their income, to overcome capital and insurance market failings, and to reduce their social deprivation. The migrant benefits from his parent social and financial support for migration costs, unemployment and old age insurance, if he returns after failing to work in receiving area. He also gains from the safeguard of his eventual assets and children at home when migrating. However, a disagreement as a situation where the son runs away when the parents do not agree with his migration, could lead to a socio-economic banishment from his parents. Likewise, parents do not gain from this disagreement as they lose both labor and some expected remittances from their son. In addition, information asymmetry problem seems to be less serious as family members may be well informed about each other. This socio-economic contract is similar to a cooperative game where both players know the gains and strategies of each other.

Suppose the following son (s) and parent (p) joint utility functions, strictly quasi-concave and defined over two goods, a composite commodity (z) and leisure (l), and two states, the migration (m) and staying home (h) of the son.

$$U_i^j = U_i^j(z_i^j, l_i^j) \tag{1}$$

where i represents m and h, while j represents s and p.

Suppose that the parents and their son agree to maximize a utility function as follows:

$$V = (U_m^s - U_h^s)^{\beta s}(U_m^p - U_h^p)^{\beta p} \tag{2}$$

with β the weight attached to utility, and $\beta s + \beta p = 1$.

This utility maximization is subjected to the following budget constraints:

$$\begin{cases} w_i^s T^s + R_i^{ps} = w_i^s l_i^s + Pz_i^s + R_i^{sp} + r_i(R_i^{sp} - R_i^{sp*}) \\ w^p T^p + R_i^{sp} + G = w^p l_i^p + Pz_i^p + R_i^{ps} + r_i(R_i^{sp} - R_i^{sp*}) \end{cases} \tag{3}$$

where w is the wage or return; T is the total time available; R is the value of remittances, e.g. R_i^{sp} is the value of remittances made by the son to his parents at state i; P is a price index of goods consumed; r is the reward function, the reward is the difference between current (R_i^{sp}) and benchmark (R_i^{sp*}); G is the net value of transfers received from other household members. w is assumed to be endogenous: w_h^s and w^p depend on agricultural factors as land, while w_m^s is a function of migrant educational and socio-demographic characteristics.

The household full income constraint is needed for the joint utility maximization: we obtain it by combining the individual income constraints from equations 3. This process drops out all the transfer elements in equations 3. Since $T^s = L^s + l^s$, with L the labor supply, equations 3 can be rewritten as:

$$\begin{cases} w_m^s(L_m^s + l_m^s) + w_h^s(L_h^s + l_h^s) = w_m^s l_m^s + w_h^s l_h^s + Pz^s \\ w^p T^p + G = w^p l^p + Pz^p \end{cases} \tag{4}$$

with $z^j = z_m^j + z_h^j$ the consumption of a composite commodity; $l^p = l_h^p + l_m^p$ is the parent consumption of leisure. By rearranging (4), we obtain the household full income constraint:

$$w_m^s l_m^s + w_h^s l_h^s + Pz^s + w^p l^p + Pz^p = w_m^s(L_m^s + l_m^s) + w_h^s(L_h^s + l_h^s) + w^p T^p + G \tag{5}$$

Demand functions of goods and leisure can be derived from the maximization of (2) subject to (5). Noting that $L_h^s + L_m^s = T^s - l_h^s - l_m^s$, we write son's supply of labor as:

$$L_i^s = L(w_h^s, w_m^s, w^p, P, G) \tag{6}$$

Assuming that P is the same in both states, the migration equation can be written as:

$$M = m(w_h^s, w_m^s, w^p, P, G), \tag{7}$$

where M represents the migration status.

Data are not available on L_i^s, while the decision to migrate is observed. So, we impose the following restrictions:

$$L_m^s = \begin{cases} 1 \ \ if \ the \ individual \ migrates \\ 0 \ \ otherwise; \end{cases}$$

$$L_h^s = \begin{cases} 1 \ \ if \ the \ individual \ stays \ home \\ 0 \ \ otherwise; \end{cases}$$

and $L_m^s + L_h^s = 1$

Then, migration status can be defined as: $M = \begin{cases} 1 \ \ if \ L_m^s = 1 \\ 0 \ \ if \ L_h^s = 1 \end{cases}$

Data on w_h^s, w_m^s and w^p are not observed in the dataset used for this paper. As w_m^s is function of migrant educational and demographic characteristics, w_h^s and w^p depend

on factors as land, and G can be explained by household characteristics, then the migration model can be estimated using the following equation:

$$M = m(age, education, L^p, L^{ps}, HDC),$$ (7')

where *age* is the age of the prospective migrant, *education* is his education level, L^{ps} the quantity of land he received from his parents, L^p the quantity of land of his parents and *HDC* the household demographic characteristics.

3.   Econometric specification

In the literature, the effects of migration and remittances are determined considering mainly remittances as exogenous or substitute for receiving household income. The first option analyses remittances from migrant as an additional exogenous income for individual or household receiving these transfers. It supposes a null opportunity cost of migration and no relation between remittances and other income sources of the household. The second option treats remittances as a substitute for domestic income. The present paper follows this process and uses the counterfactual income method. The idea is to compare the actual interest outcomes of remittance receiving households with what these outcomes would be without remittances. Unfortunately, the outcomes of remittance household "without" remittances are not observable. They are usually estimated using the parameter estimates from non-remittance household data. One approach in the literature (Adams, 1989) considers the non- remittance households as a random draw from the population, and hence remittance households are uniformly and randomly distributed among the population. The main issue of this approach is the selection bias. There are strong evidences that this random assumption is not realistic. Remittance and non-remittance households can differ systematically from their income or consumption patterns. If migrants come from more (less) productive households, the selectivity problems could underestimate (overestimates) the counterfactual and hence overestimate (underestimates) the effects of remittances.

The selection model is used to estimate the counterfactual ($\hat{y}_0$). Consider two income (*y*) regimes, household with remittances (1) and household without remittances (0).

$$R_i^* = \beta Z_i + \mu_i$$
$$R_i = \begin{cases} 1 \ if \ R_i^* > 0 \\ 0 \ if \ R_i^* \leq 0 \end{cases}$$ (8)
$$\ln y_{0i} = \alpha_0 X_i + \varepsilon_{0i}$$

where R_i^* is an unobserved continued latent variable that represents the propensity to not receive remittances; its sign is known. *R* is an observed binary variable (1 for non-remittance households and 0 otherwise). X_i and Z_i are vectors of independent variables of respectively income and remittance participation. (μ_i, ε_{0i}) are error terms supposed to follow a bivariate normal distribution. Then, the expected incomes conditional on remittances participation are: $E(\ln y_{0i}|R_i) = \alpha_0 X_i + \delta_0 \lambda_i$ (9)

where $\lambda_i = E(\mu_i|R_i) = \begin{cases} \phi(\beta Z_i)/\Phi(\beta Z_i) & if \ R_i = 1 \\ -\phi(\beta Z\_i)/((1 - \Phi(\beta Z\_i))) & if \ R_i = 0 \end{cases}$

λ_i is the Inverse Mills Ratio measuring the expected value of the contribution of latent intrinsic characteristics to the status of receiving remittances. This contribution will be taken into account in the income estimation.

We use a two-step stage Heckman approach to estimate the model. It consists of, firstly, estimating the probit equation to obtain $\hat{\beta}_i$ (estimated value of β). Estimated value $\hat{\lambda}_i$ of λ_i is computed using $\hat{\beta}_i$. Secondly, we estimate the log-income for non-remittance households ($R_i = 1$) in regime 0: $\ln y_{0i} = \alpha_0 X_i + \delta_0 \hat{\lambda}_i + v_{0i}$ (10)
where v_{0i} is an error term with $E(v_{0i}|R_i) = 0$ and $var(v_{0i}|R) = \sigma_0^2$.

The estimated parameters from equation 10 for sub-sample of non-remittance households are used to predict the log-income in regime 0 ($\widehat{\ln y_{0i}}$) for each household i in the sample, leading to $\hat{\alpha}_0 X_i + \widehat{\delta_0}\hat{\lambda}_i$. Indeed, equation 10 is composed of a conditional expected element ($E\ln y_{0i} = \alpha_0 X_i + \delta_0 \hat{\lambda}_i$) and a non-observed error term (v_{0i}). Excluding this error term in the income predicting would underestimate the variance in income, and could then lead to a false inequality increasing effect of remittances. We use the "observed" residual ($\widehat{v_{0i}}$) for non-remittance households. We also generate an error term ($\widehat{v_{0i}}$) for remittance households as: $\widehat{v_{0i}} = \widehat{\sigma_0}\Phi^{-1}(r)$, where $\widehat{\sigma_0}$ is the estimated standard error using the non-remittance household sub-sample ($R_i = 1$), Φ is the cumulative probability function, r is a random number between 0 and 1. The predicted log-income in regime 0 for household i is:

$$\widehat{\ln y_{0i}} = \begin{cases} \widehat{E\ln y_{0i}} + \widehat{v_{0i}} = \widehat{\alpha_0}X_i + \widehat{\delta_0}\hat{\lambda}_i + \widehat{v_{0i}} & R_i = 0 \\ \widehat{\ln y_i} = \widehat{\alpha_0}X_i + \widehat{\delta_0}\hat{\lambda}_i + \widehat{v_{0i}} & R_i = 1 \end{cases} \quad (11)$$

The predicted income in regime 0 for household i is $\widehat{y_{0i}} = \exp(\widehat{\ln y_{0i}})$, representing the counterfactual, i.e., a full distribution of income if a household did not receive remittances.

We analyze the remittance impact on poverty and inequality by comparing the observed and simulated distribution of income[2]. The FGT poverty indices (P_α), Gini index ($G(.)$), and Growth Incidence Curve (*GIC*) are used for this analysis. The GIC shows per capita income growth per segment of the population on the concerned period (Ravallion and Chen, 2003; Kakwani and Pernia, 2000; Kakwani et al., 2004).

The pro-poorness concept is helpful in this paper for understanding the interrelation between remittance-induced growth, poverty and inequality. Different approaches of pro-poor growth are available in the literature (Kakwani and Pernia, 2000; Ravallion and Chen, 2003, Kakwani and Son, 2008; Duclos, 2009). One of them considers growth pro-poorness in terms of absolute or relative concepts. A growth is considered as absolutely pro-poor when the absolute benefits for the poor are greater than the absolute benefits for the non-poor. It implies decrease in inequality, and is qualified as stronger concept than relative one. Indeed, a growth is relatively pro-poor if the poor benefit for it proportionally more than the non-poor. So, it reduces relative inequality (Kakwani et al., 2004). These absolute and relative pro-poor concepts can be analyzed using curves, and taking account for ethical order of pro-poorness. The growth rate for quantile p on two time-points is calculated accordingly. Absolute and relative pro-poor curves are based on respective equations below:

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[2] "Income" and "Consumption" terms will be used interchangeably in what follows.

$$g_t(p) = (q_t(p)/q_{t-1}(p)) - 1$$
$$f_t(p) = (q_t(p)/q_{t-1}(p)) - (\bar{y}_t/\bar{y}_{t-1}), \tag{12}$$

with $q(p)$ the quantile and generalized Lorenz at percentile p, respectively for first and second orders of pro-poorness. $\bar{y}$ is average income.

Similarly, we used these curves to analyze the growth at each percentile of the distribution, comparing observed (y) and simulated ($\widehat{y_0}$) distributions. The growth incidence curve is obtained by plotting growth rates versus percentiles.
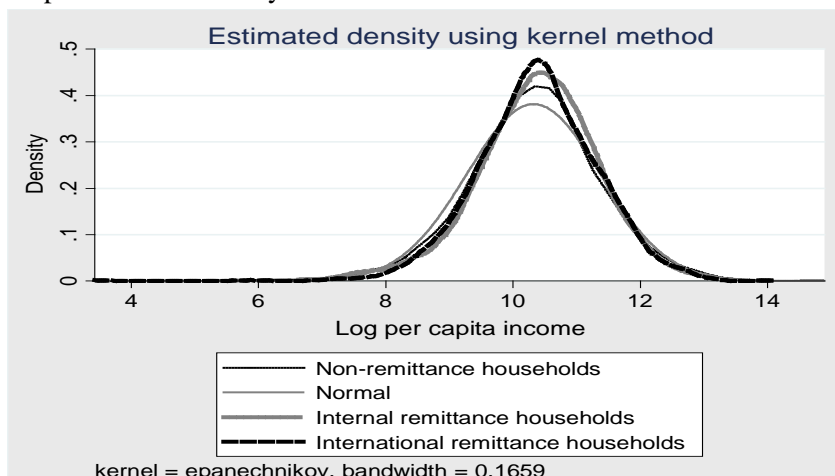
4.   Data and descriptive statistics

We use panel data from a household survey conducted by the *Programme National de Gestion des Terroirs – deuxième phase* (*PNGT2*), a national program for rural development in Burkina Faso. This survey is rural representative and has included 60 villages with 33 households per village. They contain detailed information on demographic characteristics, income including transfers and remittances, consumption, health, education, credit, food security, assets, and prices from 2004 to 2006. Most of data are available at household member level.

4.1.   Remittances in rural Burkina Faso

The following descriptive analysis is based on statistics, comparing remittance receiving households to non-remittance households. This analysis includes income and inequality, consumption and poverty, demographic characteristics, and education.

Graph 1 shows similar density distribution of per capita income for non-remittance households, internal remittance households, and international remittance households. However, remittance households seem to be denser around their respective mean.
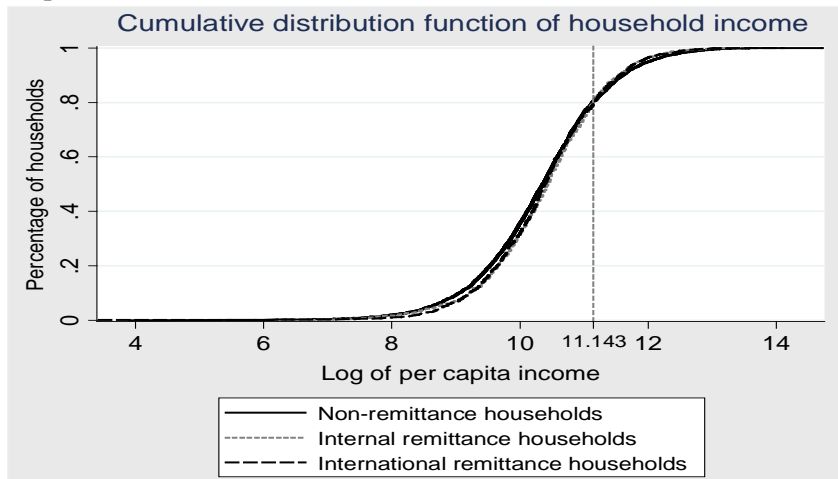
Graph 1: Kernel density estimates of household income

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

There is a stochastic dominance of remittance households on non-remittance households for quintiles 1 to 4, while the reverse trend holds for the upper quintile (Graph 2). Internal and international remittance households have similar income cumulative distribution functions. However, a slight stochastic dominance of international remittance households on internal ones is observed for middle quintiles.

Graph 2: Cumulative distribution of household income

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

The average remittance per capita is CFA 4460 for the subsample of remittance-receiving households (Table 1). About 68% of these remittances come from abroad Burkina Faso. At regional level, the *Nord*, *Boucle du Mouhoun* and *Centre Ouest* regions are the most remittance beneficiaries with more than half of the total declared remittances received during the 2004-2006 period (Graph 3). The received remittances per capita remain higher for these regions (Table 1).

Graph 3: Distribution of received remittances, by region

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

About one household out of three has received internal or international remittances over 2004-2006 (Table 1). There are high regional differences. For example, 13% and 61% of households have received remittances respectively in the *Cascades* and *Centre Ouest* Regions. About 15% and 18% of households have received respectively internal and international remittances. In the *Centre Ouest* Region, more than half of the households have received remittances from abroad, mainly from Côte d'Ivoire which is the first destination for Burkinabe international migration. The higher internal remittance receiving is found in *Plateau Central* Region. Indeed, many people move from this Region to the south and west of the country, looking for agricultural better quality soil, and other income source opportunities; agricultural land pressure and, then, land quality are poor in this region. Remittances, as share of consumption, account for about 8% for recipient subsample. The higher percentage of this share is noted in *Centre Ouest* Region (11%).

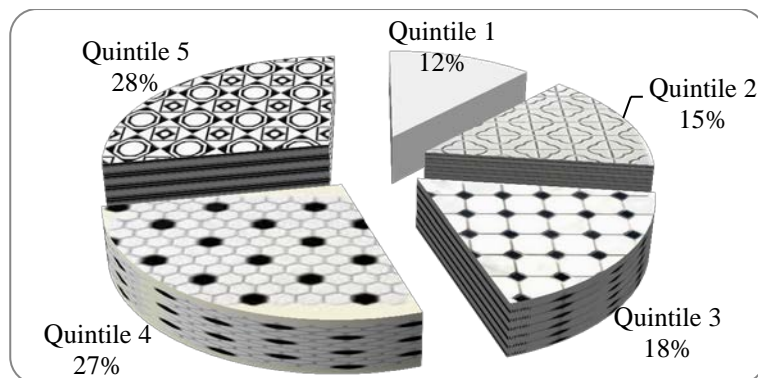Table 1: Remittance recipient households and amount of remittances, by region

Regions	Remittance receiving households (%)		Remittances/ consumption (%)	Remittances per capita (CFA)
	Internal	**International**		
Boucle du Mouhoun	16.0	13.6	10.5	6,111
Cascades	10.0	2.8	6.3	1,915
Centre	23.9	17.3	4.6	2,371
Centre Est	5.7	11.1	10.0	6,338
Centre Nord	16.6	29.8	5.3	2,329
Centre Ouest	9.2	51.4	11.4	7,097
Centre Sud	23.9	32.4	8.4	5,534
Est	10.6	4.8	8.7	6,059
Hauts Bassins	13.6	2.0	2.9	1,998
Nord	24.2	33.8	8.6	4,234
Plateau Central	29.7	21.6	4.7	3,168
Sahel	15.6	15.6	6.5	5,185
Sud Ouest	10.4	11.7	8.9	5,524
Rural Burkina Faso	**15.3**	**18.2**	**8.0**	**4,460**

Source: PNGT2 2004-2006, author's computations.
Note: Computation of statistics in this table is based on remittance recipient sub-sample.

Income and remittance distributions seem to be positively correlated as the upper quintiles have received more remittances than the lower ones (Graph 4). These quintile shares increase from 12% (quintile 1) to 28% (quintile 5). Moreover, the remittances per capita have an uprising trend from quintile 1 to quintile 5 (Graph 5).
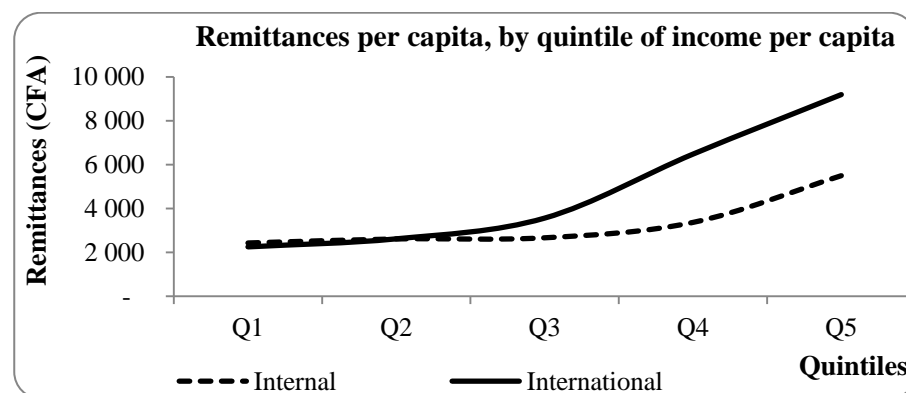
Graph 4: Share of remittances, by quintile of per capita income

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

Similarly, the inequality in remittance distribution within the quintile increases from the lower to the upper quintiles (Table 2).

Graph 5: Remittances per capita, by quintile of income per capita

Source: PNGT2 2004-2006, author's computations.
NB: Only sub-sample of households with remittances is considered in this graph.

The share of remittances in total consumption is greater for lower quintiles (Table 2). Then, poor potential discrimination in remittance distribution would not be evident.

Table 2: Inequality in remittance distribution, and share of remittances in consumption

Quintile	Q1	Q2	Q3	Q4	Q5	Total
Remittance distribution (Gini index)						
Per capita remittances	0.54	0.54	0.60	0.71	0.68	**0.67**
Per household remittances	0.50	0.57	0.62	0.69	0.68	**0.66**
Share of remittances in total consumption (%)						
Remittance recipient subsample	10.8	8.8	7.4	8.2	7.0	**8.0**
All sample	4.5	3.5	3.0	3.2	2.6	**3.3**

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

4.2.   Variable description and summary statistics

This section describes the variables used in the regression process of the present paper. These variables are composed of household characteristics and production factors. The asset score is computed using the principal component analysis and some asset and living condition variables, including radio, TV, phone, electricity, improved cooker, house materials, water sources, and bicycle, motorcycle and car values.

Most of demographic and educational characteristics are significantly higher for remittance recipient households (RH), particularly for international remittance households (InRH) (Table 1). InRH have more actives, more old persons, older heads and more female heads. In general, RHs are better educated. Per capita income is lower for RH, particularly for internal remittance recipient households (IRH), but this difference is not statistically significant (Table 3). Owned cultivated land is significantly smaller for the group of RH, particularly for IRH, than other types of households. Own land is an agricultural production capital of the household; intensive and efficient agricultural investment can be done on this land. Its lack is likely to increase the probability of migrating or remitting. Indeed, many internal migrants come from the *Plateau Central* in Burkina Faso – one of the poorest Regions at the center of the country – looking for better quality land at the South and the West parts of the country. The asset score is higher for *RH*, implying better living conditions.

5.   Results

We first present the estimation results of participation for analyzing determinants of receiving remittances. Secondly, we use these results to estimate the counterfactual income, e.g. a scenario without remittances. Finally, we analyze the impact of remittances on inequality and poverty, including Gini index, FGT indexes and growth incidence curves.

5.1.   Determinants of remittances

We follow Heckman two-steps approach, using the Probit model, to estimate the participation equation. The results are presented in Table 4. Most of coefficient signs are expected. For example, female headed households are more likely to receive remittances. Indeed, many migrants live their wife and children at origin household, then remit to them for their needs. Having more old persons in the household has a positive effect on receiving remittances. This result is particularly realistic in the African context where taking care of old relatives is part of ancestral culture. The coefficient of the household head age is negative; however, this relation is not linear as the coefficient of the square of this variable is significantly positive. The effect of the religion of household head on receiving remittances is not statistically significant. However, the effects of some interactive variables from religion and ethnic group of the household head are significant (Table 4). Owned cultivated land is negatively linked to receiving remittances, confirming corresponding statistics in Table 3; but this link is not statistically significant.

Table 3: Summary statistics

	Type of household								Differences and t-test	
	No Remittances (NRH)		Internal Remittances (IRH)		International Remittances (InRH)		All sample		(IRH/ NRH)-1 (%)	(InRH/ NRH)-1 (%)
	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.		
Income per capita	58.8	85.7	49.8	54.4	51.0	76.0	56.0	80.1	-15.3	-13.3
Household income	540.3	803.4	493.6	674.9	555.5	1146.8	535.9	856.6	-8.6*	2.8***
Consumption per capita	65.6	49.4	61.0	38.6	54.9	37.0	62.9	46.0	-7.0	-16.3***
Household consumption	621.8	709.0	656.5	851.4	650.1	651.1	632.0	722.9	5.6*	4.6***
Asset score	0.2	1.9	0.5	2.1	0.3	1.6	0.3	1.9	150.0***	50.0***
Owned cultivated land (ha)	5.0	6.5	4.4	5.4	5.2	10.1	4.9	7.1	-12.0	4.0*
Household size	9.5	7.4	10.2	7.1	11.6	9.9	10.0	7.9	7.4***	22.1***
Children under 5 age	2.1	2.0	2.2	2.4	2.6	2.9	2.2	2.3	4.8	23.8***
Aged 5-15 years old	3.0	2.8	3.3	2.7	3.7	3.2	3.1	2.9	10.0***	23.3***
Aged 16-40 years old	3.4	2.9	3.6	3.1	4.0	4.0	3.5	3.2	5.9*	17.6***
Aged 40-60 years old	1.0	1.1	1.2	1.1	1.3	1.1	1.1	1.1	20.0***	30.0***
Aged 60 years old or more	0.4	0.6	0.6	0.8	0.7	0.8	0.5	0.7	50.0***	75.0***
Age of household head	46.5	14.3	51.8	15.5	54.0	15.4	48.6	15.0	11.4***	16.1***
Male household head(%)	94.5	22.9	90.1	29.9	89.5	30.6	92.9	25.6	-4.7***	-5.3***
Total years of education	5.7	10.2	8.3	10.4	7.0	10.5	6.3	10.3	45.6***	22.8***
Religion of household head (%)										
Muslim	62.5	48.4	64.5	47.9	54.5	49.8	61.4	48.7	3.2**	-12.8
Traditionalist	21.2	40.9	20.2	40.2	31.7	46.5	22.9	42.0	-4.7***	49.5
Christian	15.5	36.2	15.1	35.9	13.6	34.3	15.1	35.8	-2.6	-12.3
Other	0.9	9.2	0.1	3.6	0.3	5.1	0.6	8.0	-88.9	-66.7
Number of observations	3,409		833		1,114		5,356		.	.

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

∗ Significant at 10%,   ∗∗ Significant at 5%,   ∗∗∗ Significant at 1%

Note: Income and consumption are in CFA 1,000. Approximate exchange rate: 1 CFA ≈ 0.002 USD.

Table 4: Probit estimation of participation equation
Dependent variable: 1 if household receives remittances

Variables	Coefficients	t-statistics
Age of household head	-0.0135	-1.73*
Age square of household head	0.0002	2.2**
Male household head (1 = yes)	-0.3865	-4.82***
Asset score	0.0580	3.94***
Owned cultivated land (log)	-0.0038	-1.06
Number of years of education (log)	0.0232	6.91***
Children under 5 age	0.0235	1.88*
Aged 5-15 years old	-0.0050	-0.52
Aged 15-40 years old	-0.0231	-2.17**
Aged 40-60 years old	0.1019	4.51***
Aged 60 years old or more	0.1483	4.42***
Ethnic group, religion, and interaction variables		
Muslim	0.4753	1.35
Traditionalist	0.3889	1.1
Christian	0.2993	0.84
Mossi	1.6929	2.1**
Samo	-3.3699	-8.19***
Muslim & Mossi	-1.2337	-1.53
Muslim & Samo	4.3241	10.13***
Traditionalist & Mossi	-1.0121	-1.25
Traditionalist & Samo	4.3141	9.38***
Christian & Mossi	-0.9845	-1.21
Christian & Samo	4.5500	9.62***
Intercept	-0.5999	-1.5
Log-likelihood	-3,123.19	
Pseudo- R^2	0.0882	
Number of observations	5,242	

Source: PNGT2 2004-2006, author's computations.
∗ Significant at 10%,   ∗∗ Significant at 5%,   ∗∗∗ Significant at 1%

5.2.   Estimation of income counterfactual

Residuals from equation 10 are likely correlated over time and would include cross-sectional dependence. Ignoring this issue in estimating panel model is source of high statistical biases. As recommended by Hoechle (2007), we follow Driscoll and Kraay (1998) dealing with these biases. Indeed, the Driscoll-Kraay standard errors are robust to general forms of temporal and spatial dependence. Table 5 includes estimation results of the income equation for non-recipient households, using estimates from the selection equation. The household dependence ratio has negative and significant impact on the household income as expected. In addition, asset score has a positive and significant effect on per capita income. Better living conditions are expected to

improve human capital, and then productivity. Compared to the *Region du Centre[3]*, most of the effects of regional characteristics on household income are significant and positive, because of differences in agricultural potentialities and risks. Time variable negatively impacts per capita income, particularly for 2005. Indeed, 2005 was an agro-climatic shock year in Burkina Faso. Most of interactive effects of region and time variables on household income are positive (not reported in the paper for lack of space). The coefficient of the inverse Mill's ratio is significant, implying evidence of a selection on non-observables among non-remittance recipient households. The respective errors of the selection and income equations are positively correlated.

Table 5: Pooled OLS estimation of income, and comparison of standard error estimates
Dependent variable: Logarithm of per capita income.
Sample: Non-remittance households

Variables	Coefficients	t-Statistics				
		OLS	White	Rogers	Newey-West	Driscoll-Kraay
Age of head	-0.0378	-5.75***	-3.62***	-3.04***	-3.22***	-13.67***
Age square of head	0.0003	4.91***	3.30***	2.77***	2.95***	18.98***
Male head	0.1305	1.55	0.92	0.83	0.86	1.20
Asset score	0.1162	10.76**	5.55***	6.25***	6.00***	8.51**
Dependence ratio	-0.1542	-8.03***	-4.44***	-4.05***	-4.21***	-11.29***
Fertilizer costs per hectare	0.0069	2.97	2.16**	1.94*	2.03**	2.89
Lambda	0.3376	4.39*	2.55**	2.26**	2.37**	4.20*
Region and year interaction variables						
2004	-0.6857	-2.35***	-3.37***	-3.28***	-3.34***	-72.3***
2005	-0.9980	-3.07***	-4.77***	-5.08***	-4.97***	-173***
Boucle Mouhoun	-0.5855	-2.61***	-2.89***	-2.86***	-2.87***	-42.1***
Cascades	0.3926	1.47**	1.40	1.40	1.39	8.61**
Centre Est	0.0716	0.32*	0.45	0.45	0.45	3.3*
Centre Nord	0.1623	0.7***	1.02	1.02	1.02	13.14***
Centre Ouest	-0.0708	-0.26**	-0.43	-0.43	-0.43	-9.28**
Centre Sud	0.1885	0.79***	0.81	0.81	0.81	16.36***
Est	0.3150	1.31**	1.96**	1.92*	1.94*	7.57**
Hauts Bassins	0.1016	0.43*	0.48	0.47	0.47	3.19*
Nord	-0.2649	-1.08***	-1.16	-1.15	-1.15	-10.98***
Plateau Central	-0.9658	-3.43***	-5.23***	-5.21***	-5.22***	-77.1***
Sahel	0.3309	1.44***	1.98**	1.95*	1.96**	14.39***
Sud Ouest	-0.2135	-0.84**	-1.19	-1.17	-1.17	-5.74**
Intercept	11.5244	39.59**	31.52**	27.62**	28.84***	41.08***
R^2		0.3429	0.3429	0.3429	.	0.9575
N. observations	3.207	3.207	3.207	3.207	3.207	3.207
N. of clusters	.	.	.	1,615	.	1,615

Source: PNGT2 2004-2006, author's computations.
* Significant at 10%,   ** Significant at 5%,   *** Significant at 1%
The t-statistics are based on standard error estimates obtained from the covariance matrix.

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[3] The *Region du Centre* and 2006 are references for respectively regional and time variables.

Results from Driscoll-Kraay estimation are compared with other standard error estimates to seek for presumption of cross-sectional dependence. The t-statistic of the Driscoll-Kraay estimator is lower for some variables. It could be an indication of presence of cross-sectional dependence. Calibration of Driscoll-Kraay standard errors is appropriate when cross-sectional dependence is present; however, it is not recommended when subjects are spatially uncorrelated. An explicit test for cross-sectional dependence has confirmed the appropriateness of the Driscoll-Kraay estimates. By following Wooldridge (2002) and Hoechle (2007), we use a robust Hausman test that fully accounts for cross-sectional and temporal dependence to test for fixed effect (FE). The null hypothesis of no FE is not rejected. The results of this test imply consistent coefficient estimates from Driscoll-Kraay pooled OLS estimation.

5.3.   Remittance impact on inequality and poverty

The income counterfactual has been estimated using the Driscoll-Kraay estimates in Table 5. It is a simulation of the household income in the absence of remittances. Without remittances, household income and Gini index would have decrease. Remittances have increase rural household income and inequality by about 10% and 24% respectively (Table 6). In addition, remittances have decreased poverty incidence by about 3%, while the poverty depth and severity have moved up significantly by 29% and 81% respectively (Table 6). Some non-poor would have been out of poverty probably because of receiving remittances while being nearby the poverty line. On the other hand, some of the poorest households do not receive remittances (Graph 6). Some authors as Adams et al. (2008), Zhu and Luo (2008, or Gubert et al. (2010) have found similar coefficient signs about impact of remittances on inequality and poverty.
Table 6 shows higher poverty incidence decreasing and less poverty severity increasing impacts of international remittances than internal ones. International remittances have decreased poverty depth, while internal remittances have increased it. In addition, inequality has increased more among international remittance households than internal ones.

Table 6: Poverty and inequality impacts of remittances, by remittance recipient status

	Counterfactual income	Observed income	Variation: Observed/ Counterfactual -1 (%)
Mean per capita income (CFA 1,000)	51.0 [47.7]	56.0 [80.1]	9.8***
All sample			
Poverty incidence (P_0)	62.6	61.0	-2.6
Poverty depth (P_1)	26.8	34.7	29.5
Poverty severity (P_2)	15.2	27.5	80.9
Gini index	0.413	0.514	24.5
Internal remittance sub-sample			
Poverty incidence (P_0)	67.1	61.7	-8.1
Poverty depth (P_1)	30.8	33.4	8.4
Poverty severity (P_2)	18.3	26.4	44.1
Gini index	0.372	0.459	23.4
International remittance sub-sample			
Poverty incidence (P_0)	72.2	59.7	-17.3
Poverty depth (P_1)	33.7	32.0	-5.0
Poverty severity (P_2)	19.7	21.3	7.9
Gini index	0.465	0.473	1.7
Number of observations[4]	5,154	5,356	.

Source: PNGT2 2004-2006, author's computations.
Notes: ******* Significant at 1%. In brackets are standard deviations. P_0, P_1, and P_2 are FGT indexes (%). Approximate exchange rate: 1 CFA ≈ 0.002 USD.

Reasons of positive impact of remittances on inequality may include the disproportionate distribution of these remittances by quintile (Graph 5). Graph 6 shows that lower percentile households have benefit for remittances less than upper ones. This result confirms statistics from Table 2. However, inequality has decreased within all quintiles of income, particularly for quintiles 3 and 4 (Table 7).

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[4] There are 202 more observations for the observed income per capita. However, for these additional observations, there is no significant difference in mean income per capita by household remittance status.

Table 7: Inequality impact of remittances, by quintile of per capita income

	Income per capita (CFA 1000)		Gini Index		
	Counter-factual	Observed	Counter-factual	Observed	(Observed/counterfactual)-1 (%)
All sample	51.0	56.0	0.413	0.514	24.5
Quintile 1	26.7	6.6	0.288	0.241	-16.3
Quintile 2	38.0	15.7	0.332	0.211	-36.4
Quintile 3	41.0	33.8	0.332	0.161	-51.5
Quintile 4	67.9	56.1	0.428	0.167	-61.0
Quintile 5	70.8	145.7	0.393	0.353	-10.2

Source: PNGT2 2004-2006, author's computations.
Note: Approximate exchange rate: 1 CFA ≈ 0.002 USD.

Annual remittance impact is not quite similar on the period considered in this study (Table 8). Based on the counterfactual, the poverty rate has decreased in 2004 and 2005 by 15% and 10% respectively, while increasing by 17% in 2006. The shock on agricultural production in 2005 could have contributed to changing income distribution, including sending, receiving and use of remittances.

Table 8: Poverty impact of remittances, by year

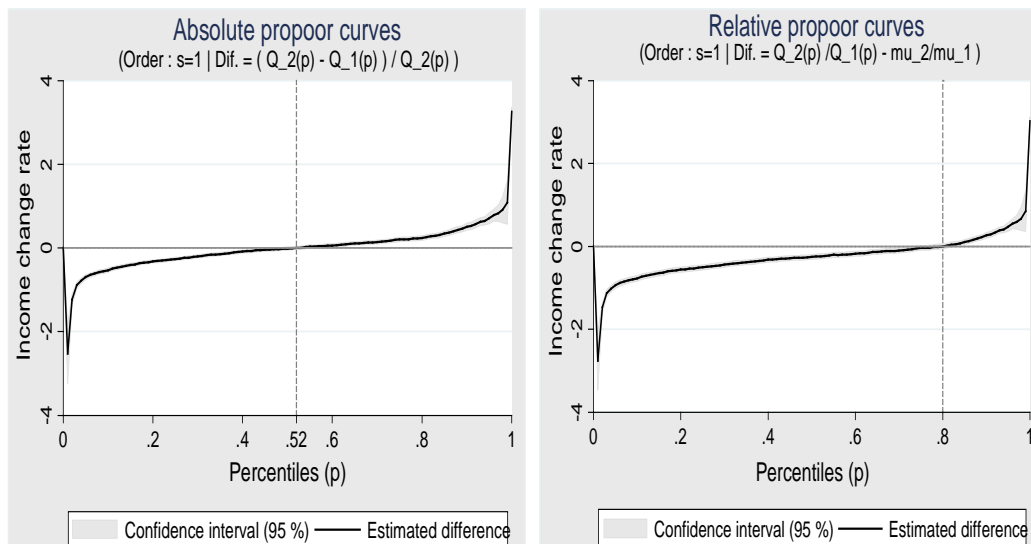| Year	Poverty headcount (%)			Poverty share (%)		
	Counterfactual	Observed	Variation(%)	Counterfactual	Observed	Variation(%)
2004	51.4	44.1	-14.3	29.2	26.1	-10.6
2005	87.4	86.0	-1.6	48.9	49.8	1.8
2006	46.5	51.5	10.6	21.9	24.1	10.2

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

We use difference between counterfactual and observed household incomes to compute the growth incidence curves in Graph 6. The income growth attributable to remittances is negative for percentile 52 and less (Graph 6). This growth is not absolutely pro-poor, as most of the poor households do not benefit for the change.

The relative pro-poor curve tests the relatively pro-poorness of the distributive change of the household income as resulting from remittances. It indicates whether remittances have increased the incomes of the poor faster than the rate of the remained population. The income change is normalized for each percentile by the population mean income. This income change is negative up to percentile 80 (Graph 6). Then, the income change from remittances is not relatively pro-poor. The main beneficiaries are the top quartile

population. Moreover, the negative impact of this growth is more important on some of the poorest population. This negative effect has contributed to increase the poverty depth and severity as confirmed in Table 6.

Graph 6: Testing pro-poorness of income growth from remittances

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

6.   **Conclusion**

This paper contributes to the existing literature of impact of remittances on poverty and inequality in Burkina Faso, by using reliable panel data and robust econometric approach, though it does not include medium and long run effects of remittances. Our results show that remittances have decreased poverty; however, they have increased income inequality, and poverty depth and severity in rural Burkina Faso on 2004-2006. International remittances impact on poverty reduction is greater than internal ones. They have also decreased poverty depth, while internal remittances increase it. In addition, internal remittances cause higher inequality increase than international ones.
Asset score is greater for households who receive remittances, implying better living conditions. However, remittance growth-induced is not pro-poor in rural Burkina Faso, as results indicate a disproportionate distribution of income growth from remittances, in favor of the richest households. Most of poor households have less benefit for this growth. The shock characteristics of the study period may have an important effect on this impact of remittances, including complex remittance behavior and strategies in shock periods.

Policy implications from these results involve increasing remittances, improving remittance effects, and accounting for these effects in development projects. Specific recommendations include:

- Lower costs of secure money transfer from migrants, and improve money transfer instruments;
- Incite Burkinabe migrants to transfer savings to bank accounts in Burkina Faso, including attractive savings and investment products from banks in Burkina Faso;
- Take account for emigration and remittance prevalence in targeting social transfers and development projects. However, its implementation calls for further research.

7.   References

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