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# Household's Income Inequality in Burkina Faso: Analysis by the Multi-Decomposition of Gini Index

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**Abstract**
The objective of this study is to make contribution on the knowledge of sources of inequality in the formation of farm households' income. The multi-decomposition of the Gini index is used to calculate the contributions of each source of income, each sub-group and each pair (source/sub-group) to the formation of total inequality of income. This type of decomposition allows knowing income inequalities progress in different regions and among socio-economic groups due to policy changes. Data used in this study come from the Permanent Agricultural Surveys 2006/2007 and 2007/2008, in Burkina Faso. The results show the influence of geographic and socio-economic sources of inequality in the formation of farm households' income.
**Keywords :** Burkina Faso; household income; Inequality; Gini index; multi-decomposition.

## 1. Introduction

### 1.1 Background and justification

Burkina Faso is a landlocked country whose population is 80% rural. Agriculture contributes 40% of GDP formation and is the main source of household income. It provides 80% of total exports and employs 90% of the active population.

Like most of farm in West Africa, Burkina Faso agriculture is mainly family-type. This form of agriculture is facing issues and challenges due to the combination of climatic, physical, socioeconomic and political factors. Indeed, agricultural production is dependent on weather conditions, material and technical capacities of farmers but also on the political choices of the State. Farming is practiced as rainfed cultivation where changes in precipitation often get catastrophic effect on production and hence on farm household income and living conditions.

Despite this vulnerability, agriculture has recorded remarkable growth in these recent years. This growth is due to the increase in area planted and to the improvement of yields. Agricultural statistics show that the rate of increase in cereal production was 14.38% during the crop year 2003/2004 compared to 2002/2003 and 26% in (the crop year of) 2005/2006 compared to that of 2004/2005. During the same period, the production of cash crops and other food crops has also made significant progress (5.29% for cotton and 10.65% for peanuts).

Paradoxically, results of the survey on households' living conditions (INSD, 2005) indicate that 46.5% of Burkinabe still live below the poverty line (threshold), the vast majority of which lives in rural areas.

For this reason, further analysis would be needed to better understand who benefits from the agricultural growth observed in these recent years. And as Kidane *et al* (2006) stated: "agricultural growth induces growth of rural non-farm activities able to mitigate poverty if we ensure that not only the wealthiest collect the profits".

The objective of this study is to contribute to the knowledge of inequality sources of in the formation of farm household income. To do this, we use the multi-decomposition of the Gini index technique to analyze inequalities using data from the permanent agricultural surveys of 2006/2007 and 2007/2008 in Burkina Faso.

### 1.2 Literature review

In recent years, great interest has developed for the assessment of inequality in income distribution between different groups of society. Since the pioneering work of Kuznets (1955) on the relationship between economic development and income inequality, attention has focused on the sources of income inequality in developing countries. Thus, new decomposition methodologies of income inequality sources have grown with more insight.
Two indices of inequality are generally used, the Theil index and the Gini index. The Theil index is based on the theory of information developed from the second law of thermodynamics, the law of Entropy by Shannon (1948), which measures the disorder of a thermodynamic system, offering opportunity to evaluate the contribution of intergroup and within-group inequalities to total inequality. Entropy is the expected information in a distribution which is associated with a probability. Theil (1967) performs a transposition replacing the idea of probability by the income shares of each sub-population calculated from the total income of the original population. The Gini index in turn measures the average difference between two values, randomly selected from the distribution. Its

 

use allows appraising disparities among populations within groups and between groups.

Most empirical studies of developing countries highlighted the contribution of different sources of income or different socio-economic groups to total inequality of income. These studies have decomposed income inequality by income sources or by sub-groups of population.

In the area of decomposition into sub-groups, include studies of Zhu (2002) and Yitzhaki (2002). The first uses the Gini coefficient to calculate the contribution of each source of income inequality and the sensitivity of the inequality to a marginal change in rural livelihoods in China. The second, in the assessment of impacts on the margin of social programs and public policies on the distribution of income and consumption in Mexico. Fambon *et al* (2005) are very interested in inequality in household groups in Cameroon. These sub-groups are defined on the basis of differentiation criteria which may be geographic (regions or ecological areas) or socioeconomic (education level of the household head, age of the household head, gender of the household head, size of household). Using inequality indices, they decomposed by sub-groups the inequality of spending per adult-equivalent. In the same, Lachaud (1999) estimated the marginal effects of remittances on households' well-being in Burkina Faso. He shows, from the decomposition of Gini index, that it is possible to examine the relative role, in terms of inequality and welfare, of the various sources of income, especially transfers. Finally, acknowledging the great difficulty of analyzing the determinants of inequality which is to find a good indicator of inequality that can help measure both the inequalities in the population and among groups, Gaye and Mbaye (2001) use a decomposition of the Gini index in three indices to characterize the determinants of income inequality in Senegal.

More recently, many other studies have been devoted to the decomposition of the Gini index. These studies propose a new decomposition method: the multi-decomposition. The multi-decomposition of the Gini indicator combines the decomposition into sub-groups and sources of income. It can detect the role of each determinant, its influence on within-group inequality and between-group inequality. This detection is then used to calculate contributions "source / within-group" and "source / between-group." The series of studies by Mussard *et al* (2002, 2003, 2004, 2006, and 2009) provides theoretical developments and practical applications of this new decomposition of the Gini index. These theoretical developments show that the multidimensional indicator of Gini is more comprehensive than the one-dimensional form in measuring the contribution of each group to total inequality.

Our methodology in this study is based on these new theoretical developments and their application to the case of Burkina Faso.

## 2. Methodology: the decomposition of Gini index

The methodology of this study is based on the research of Mussard (2006) which aims to explain income inequality by the degree of involvement of the various groups composing the original population. Does one group contribute more than another one to the explanation of inequalities? Does inequality come from income differences within groups or from income differences between groups? As for decomposing in income sources, it helps identify sources of earnings that explain the overall income inequality.

### 2.1 Gini index

According to Mussard (2006), let $Q$ be a population with n individuals whose incomes are represented by $x_{Q,i}(i = 1, \cdots, n)$, composed of $k$ sub-groups $Q_j(j, h = 1, \cdots, k)$; each sub-group is composed of $n_j$ individuals $(i, r = 1, \cdots, n_j)$. Let's denote by $\mu$ the arithmetic mean of incomes of $Q$ and by $\mu_j$ the one of $Q_j$. The associated Gini coefficient is measured by (Mussard 2006):

$$G = \frac{\sum_{i=1}^{n} \sum_{r=1}^{n} |x_{Q,i} - x_{Q,r}|}{2n^2\mu} \qquad (1)$$

Equation (1) gives the average income gap (as a percentage of the mean) between two individuals randomly drawn in $Q$. This average difference in income is given by $2\mu G$. The higher the index G is close to 1, the more the income distribution is unequal. Conversely, it approaches zero when the distribution is egalitarian. However, this global approach is insufficient to analyze the fine structure of inequality and complex evolution, especially when multiple groups are identified within $Q$.

### 2.2 Decomposition into sub-groups

To highlight the intergroup and within-group gross inequalities, the Gini index was rewritten as following:

$$G = \frac{\sum_{j=1}^{k} \sum_{i=1}^{n_i} \sum_{r=1}^{n_i} |x_{j,i} - x_{j,r}|}{2n^2\mu} + \frac{2\sum_{j=2}^{k} \sum_{h=1}^{j-1} \sum_{i=1}^{n_i} \sum_{r=1}^{n_h} |x_{j,i} - x_{h,r}|}{2n^2\mu} = G_\omega + G_{gb} \quad (2)$$

The term $x_{j,i}$ is the income level of individual i belonging to group $Q_j$. $G_\omega$ is the Gini within-group index of inequality and represents the contribution of inequalities from each group to the overall inequality while $G_{gb}$ is the gross contribution of Gini between-group index that allow to gauge the income gaps between each peer

 

group of sub-groups. The Gini coefficients associated with the sub-population $Q_j(G_{jj})$ and the Gini indicator for sub-populations $Q_j$ and $Q_h(Q_{jh})$ are respectively given by:

$$G_{jj} = \frac{\sum_{i=1}^{n_i} \sum_{r=1}^{n_i} |x_{Q,i} - x_{Q,r}|}{2n_j^2 \mu_j} \quad (3)$$

$$G_{jh} = \frac{\sum_{i=1}^{n_i} \sum_{r=1}^{n_h} |x_{Q,i} - x_{Q,r}|}{2n_j n_h (\mu_j + \mu_h)} \quad (4)$$

When $G_{jh}$tends towards the value 1, the distribution of income between groups $Q_j$ and $Q_h$ is uneven; its zero value corresponds to the even distribution.

The between-group index of inequality can also be broken down into two parts: the first is the net intergroup Gini index of inequality $G_{nb}$ which measures income differences in mean between groups. The second measures the transvariation intensity between groups $(G_t)$, that is, inequalities originated from overlapping between income distributions. This decomposition uses $D_{jh}$called the economic distance. It is null when means of groups $Q_j$ and $Q_h$ are equal. It measures the magnitude of overlapping between two distributions:

$$D_{jh} = \frac{\sum_{x_{i,j}<x_{h,r}} (x_{h,r} - x_{i,j}) - \sum_{x_{i,j}>x_{h,r}} (x_{i,j} - x_{h,r})}{\sum_{i=1}^{n_i} \sum_{r=1}^{n_h} |x_{j,i} - x_{h,r}|}, \quad (5)$$
$$\forall \mu_j < \mu_h$$

The decomposition of Gini index can then be rewritten as:

$$G = G_\omega + G_{nb} + G_t \quad (6)$$

With
$$G_{nb} = \sum_{j=2}^{k} \sum_{h=1}^{j-1} G_{jh} D_{jh} (P_j S_h + P_h S_j) \quad (7)$$

and
$$G_t = \sum_{j=2}^{k} \sum_{h=1}^{j-1} G_{jh} (1 - D_{jh}) (P_j S_h + P_h S_j) \quad (8)$$

where $P_j = \frac{n_j}{n}$ (9)

and $S_j = \frac{n_j \mu_j}{n\mu}$ (10)

### 2.3 Decomposition in income sources

Using the formula:

$$|x_{Q,i} - x_{Q,r}| = x_{Q,i} + x_{Q,r} - 2min\{x_{Q,i}, x_{Q,r}\} \quad (11)$$

The overall Gini index, measured on population $Q$, is such that:

$$G = \frac{\sum_{i=1}^{n} \sum_{r=1}^{n} (x_{Q,i} + x_{Q,r} - 2 \min\{x_{Q,i}, x_{Q,r}\})}{2n^2 \mu} \quad (12)$$

Assuming that incomes of each individual are divided into q sources $x^m (m = 1, \cdots, q)$, the i-th individual's income from population $Q$ is then separated additively:

$$x_{Q,i} = \sum_{m=1}^{q} x_{Q,i}^m \quad (13)$$

We can write the Gini index in the form:

$$G = \sum_{m=1}^{q} \frac{\sum_{i=1}^{n} \sum_{r=1}^{n} (x_{Q,i} + x_{Q,r} - 2x_{Q,ir}^{*m})}{2n^2 \mu} = \sum_{m=1}^{q} S^m \quad (14)$$

Where $S^m$ can be likened to the contribution of factor m to the overall Gini and,

$$\sum_{m=1}^{q} 2x_{Q,ir}^{*m} = 2min\{x_{Q,i}, x_{Q,r}\} \quad (15)$$

### 2.4 Multi-decomposition

From decompositions in sources and sub-groups, the multi-decomposition of the Gini index is written as following (Mussard, 2006):

$$G = G_\omega + G_{nb} + G_t \quad (16)$$

With

$$G_\omega = \sum_{m=1}^{q} \frac{\sum_{j=1}^{k} \sum_{i=1}^{n_j} \sum_{r=1}^{n_j} (x_{j,i}^m + x_{j,r}^m - 2x_{j,ir}^{*m})}{2n^2 \mu} \quad (17)$$

 

$$G_{nb} = \sum_{m=1}^{q} \frac{2\sum_{j=2}^{k}\sum_{i=1}^{j-1}\left(\sum_{x_{j,i}>x_{h,r}}\sum_{i=1}^{n_j}\sum_{r=1}^{n_h}\left(x_{j,i}^{m} - x_{h,r}{}^{m}\right)\right)}{2n^2\mu}$$
$$- \sum_{m=1}^{q} \frac{2\sum_{j=2}^{k}\sum_{i=1}^{j-1}\left(\sum_{x_{j,i}<x_{h,r}}\sum_{i=1}^{n_j}\sum_{r=1}^{n_h}\left(x_{h,r}^{m} - x_{j,i}{}^{m}\right)\right)}{2n^2\mu} \quad (18)$$

$$G_t = \sum_{m=1}^{q} \frac{4\sum_{j=2}^{k}\sum_{i=1}^{j-1}\left(\sum_{x_{j,i}<x_{h,r}}\sum_{i=1}^{n_j}\sum_{r=1}^{n_h}\left(x_{h,r}^{m} - x_{j,i}{}^{m}\right)\right)}{2n^2\mu} \quad (19)$$

Equations have a Gini index with a natural structure of multi-decomposition. They indicate that this natural decomposition allows computing all possible contributions (sources, sub-groups, sources and sub-groups).

## 3. Data and limitations

The data used in this study come from the Permanent Agricultural Surveys and they where collected over the 2006/2007 and 2007/2008 agricultural campaign in Burkina Faso. To measure inequality, we had firstly partitioned the different income sources of farm households into six groups that are livestock (A), the non-agricultural activity (B), cereal crops (C), cash crops (D), other food crops (E), and vegetable crops (F). Afterward, we defined a grouping structure of households using synthetic variables which are:

• the household size: the size of farm households has an influence in the formation of their income. Three terms (or slices) were used: 1-6 people 7-8 people and more than 9 persons;

• the household head's region of residence: five agro-ecological regions were selected to capture the differences in income between regions: these are the Regions of the East, the West, the North, the Northwest and the Centre.

• the household head's level of education: It is expected that the level of education plays an important role in determining farm households' income. Four conditions were defined: "non-literate" if the household head is not literate, "literate" if the household head attended rural schools, *madrasas* or Koranic school, "Education 1" if the household head attended primary school and finally "Education 2" if the household head attended secondary/high school and above.

• the age of household head : the age of the household head could relate his/her experience in cultivation practices. Four modalities (or age groups) were selected: less than 35 years old, from 35 to 45 years old, from 45 to 60 years old and, 60 years old and above.

• type of farm: two modalities: large farms (area> 5 ha) and small farms (area <5 ha).

Data Limitations: one of the main limitations of this work comes from the estimate of income. It was made from the sale of agricultural products, livestock and others of the previous year. The time interval in which the information is collected is sufficiently long and poses a problem of reliability. In effect, the incomes may be understated, reason for why, many researchers use expenditure to appraise the level of household income.

## 4. Results

For different decompositions of the Gini index, a computer program was developed in MATLAB (MATrix LABoratory) taking into account the different variables and sources of income. We present below the results for the contribution of each source of inequality and group to the overall inequality.

### 4.1 Sources of income inequality at the national level

Nationwide, the Gini index of income *per capita* is 0.4042. This index indicates that farm households' income in Burkina Faso is less unequal compared to that of all households estimated at 0.482 (UN, 2005). The source of income analysis reveals that 33.97% of the observed income inequality is explained by the revenue of the non-agricultural activity. The inequalities of cereals cultivation income come second with a contribution of 25.24%, followed by cash crops, 19.86%, other food crops, 8.20%, livestock, 7%, and vegetables, 5.73%.

### 4.2 Sources of income inequality across regions

The calculation of the Gini coefficient by region gives 0.3341 for the Sahel, 0.3902 for the Centre, 0.4383 for the East, 0.3876 for the West and 0.3579 for the Northwest Region.

Income inequality is greater in the East Region and is higher than the national ratio (0.4042). In this region, the climate is quite favorable to agricultural activities leading to a wide variety of household income sources. This diversity of income sources induces levels of income inequality. The decomposition of the Gini index in within-region and between-region component (Table 1) reveals that it undoubtedly explains the level of total inequality (76.49%). Indeed, regions do not have the same potential. For example, inequality between the West Region which is the most agricultural region and other regions accounts for 44.21% in explaining total inequality. Within-region inequalities explain 23.51% of total inequality.

 

The analysis by sources shows that the differences in non-agricultural income between different regions account for 25.36% in the formation of total inequality.

Table 1: Within and between regions contribution (%) of income sources inequalities to national income inequality (G = 0.4042)

| | Source A | Source B | Source C | Source D | Source E | Source F | Total |
|---|---|---|---|---|---|---|---|
| **$G_w$** | **1.7** | **8.17** | **5.68** | **4.64** | **2.02** | **1.32** | **23.51** |
| Sahel | 0.06 | 0.19 | 0.12 | 0.00 | 0.05 | 0.01 | 0.43 |
| Centre | 0.65 | 3.93 | 1.71 | 0.62 | 0.87 | 0.49 | 8.25 |
| East | 0.41 | 1.37 | 0.75 | 0.35 | 0.23 | 0.29 | 3.40 |
| West | 0.46 | 2.08 | 2.65 | 3.65 | 0.63 | 0.39 | 9.86 |
| North-West | 0.12 | 0.60 | 0.45 | 0.02 | 0.24 | 0.14 | 1.57 |
| **$G_b$** | **-0.99** | **0.44** | **9.43** | **14.05** | **0.3** | **0.38** | **23.62** |
| Sahel / Centre | 0.47 | 0.13 | 0.52 | -0.44 | -0.14 | -0.11 | 0.43 |
| Sahel / East | 0.18 | 0.22 | 0.45 | -0.31 | 0.07 | -0.05 | 0.56 |
| Sahel / West | -0.46 | -0.34 | 0.30 | 1.82 | 0.06 | 0.14 | 1.53 |
| Sahel / North-West | 0.22 | 0.21 | 0.21 | -0.06 | -0.16 | -0.06 | 0.36 |
| Centre / East | -0.48 | 0.57 | 0.53 | -0.13 | 0.66 | 0.06 | 1.22 |
| Centre / West | -0.11 | -0.92 | 3.26 | 5.95 | -0.30 | 0.18 | 8.05 |
| Centre / North-West | -0.01 | 0.62 | -0.15 | 0.63 | -0.37 | -0.05 | 0.66 |
| East / West | -0.52 | -0.06 | 2.56 | 3.66 | 0.42 | 0.17 | 6.24 |
| East / North-West | -0.22 | -0.12 | 0.35 | -0.46 | 0.55 | 0.06 | 0.16 |
| West/North-West | -0.06 | 0.13 | 1.40 | 3.39 | -0.49 | 0.04 | 4.41 |
| **Gt** | **6.29** | **25.36** | **10.12** | **1.16** | **5.89** | **4.03** | **52.87** |
| Sahel / Centre | 0.02 | 1.65 | 0.48 | 0.51 | 0.52 | 0.26 | 3.44 |
| Sahel / East | 0.17 | 0.86 | 0.25 | 0.36 | 0.15 | 0.20 | 2.00 |
| Sahel / West | 0.73 | 1.53 | 0.86 | -0.61 | 0.28 | 0.02 | 2.81 |
| Sahel / North-West | 0.00 | 0.50 | 0.30 | 0.06 | 0.34 | 0.14 | 1.34 |
| Centre / East | 1.47 | 4.10 | 1.78 | 1.07 | 0.31 | 0.74 | 9.48 |
| Centre / West | 1.07 | 6.66 | 1.70 | -0.21 | 1.60 | 0.71 | 11.52 |
| Centre / North-West | 0.58 | 2.52 | 1.91 | -0.27 | 1.27 | 0.57 | 6.58 |
| East / West | 1.12 | 3.50 | 0.93 | 0.18 | 0.40 | 0.63 | 6.77 |
| East / North-West | 0.67 | 1.96 | 0.84 | 0.72 | -0.01 | 0.35 | 4.53 |
| West / North-West | 0.46 | 2.08 | 1.07 | -0.65 | 1.03 | 0.41 | 4.40 |

### 4.3 Sources of income inequality with respect to the level of education of the household head

The Gini coefficient calculated according to the [household head's] level of education is 0.3910 for non-literate households, 0.4236 for those who are literate, 0.4156 for those who attended primary school and 0.5350 for those who attended the secondary school and above.

Income inequalities are much more pronounced for household heads that have high school level and above. The Gini index in this group of household is 0.5350 and is greater than the national Gini. However, inequality is less pronounced among households whose head is not literate, with a Gini index of 0.3910.

According to Gondard Delcroix[1], several studies have shown that a high level of education favored participation in non-agricultural activities. This participation in a variety of non-farm activities helps diversify income sources for households with a high level of education; what explains income inequalities between households with higher level of education as shown by the foregoing results.

The National Gini index, in terms of education level, is mostly determined by within-groups inequalities 59.43% against 40.57% between groups (Table 2). The analysis of the decomposition also shows that in terms of contribution, income inequality in the group of households whose head is not literate participate

[1] Gondard Delcroix, « Diversification des activités et dynamiques de pauvreté en milieu rural malgache, entre gestion des risques et barrières à l'entrée ».

 

at 56.73% in the formation of overall inequality. This contribution is attributable to the non-agricultural activity, cereal crops and cash crops. Indeed, the contributions are much characterized by non-literate/non-agricultural activity, non-literate/cereal crop and non-literate/cash crop couples.

Income differences are particularly generated by the income discrepancies between households whose head is not literate and those whose head is literate. In fact, the intensity of transvariation between these two groups is 17.15% of total inequality. The causes of this transvariation reside in non-agricultural activity and cereal crops which account respectively for 30.25% and 27.37% of this transvariation.

Table 2: Contribution (%) of income sources inequalities according to educational level and between levels of education to national income inequality (G = 0.4042)

| | Source A | Source B | Source C | Source D | Source E | Source F | Total |
|---|---|---|---|---|---|---|---|
| **$G_w$** | **4.8** | **18.55** | **15.99** | **11.35** | **5.26** | **3.48** | **59.42** |
| Illiterate | 4.66 | 17.53 | 15.41 | 10.72 | 5.08 | 3.33 | 56.73 |
| Literate | 0.11 | 0.79 | 0.46 | 0.50 | 0.11 | 0.11 | 2.08 |
| Education 1 | 0.03 | 0.20 | 0.12 | 0.13 | 0.07 | 0.04 | 0.58 |
| Education 2 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 |
| **Gb** | **-0.64** | **6.44** | **1.46** | **3.29** | **0.18** | **0.6** | **11.32** |
| Illiterate / Literate | -0.29 | 2.57 | 0.64 | 1.99 | -0.19 | 0.24 | 4.95 |
| Illiterate / Education 1 | -0.25 | 1.56 | 0.55 | 1.08 | 0.37 | 0.23 | 3.54 |
| Illiterate / Education 2 | -0.07 | 1.86 | 0.20 | 0.21 | -0.06 | 0.10 | 2.23 |
| Literate / Education 1 | -0.02 | 0.04 | 0.04 | 0.01 | 0.08 | 0.02 | 0.16 |
| Literate / Education 2 | -0.01 | 0.27 | 0.02 | 0.00 | -0.01 | 0.01 | 0.30 |
| Education 1 / Education 2 | 0.00 | 0.14 | 0.01 | 0.00 | -0.01 | 0.00 | 0.14 |
| **Gt** | **2.84** | **8.99** | **7.77** | **5.23** | **2.75** | **1.65** | **29.26** |
| Iilliterate / Literate | 1.68 | 5.19 | 4.69 | 2.92 | 1.65 | 1.02 | 17.15 |
| Illiterate / Education 1 | 0.87 | 2.45 | 2.27 | 1.46 | 0.85 | 0.51 | 8.42 |
| Illiterate / Education 2 | 0.14 | 0.40 | 0.27 | 0.23 | 0.11 | 0.01 | 1.17 |
| Literate / Education 1 | 0.12 | 0.77 | 0.45 | 0.50 | 0.11 | 0.11 | 2.05 |
| Literate / Education 2 | 0.02 | 0.12 | 0.06 | 0.08 | 0.01 | 0.00 | 0.30 |
| Education 1 / Education 2 | 0.01 | 0.06 | 0.03 | 0.04 | 0.02 | 0.00 | 0.17 |

### 4.4 Income inequality sources according to the household head's age

The Gini coefficient value for heads of household under 35, between 35 and 45, between 45 and 60, and above 60 year-old is respectively 0.4299, 0.4206, 0.4017 and 0.3652. Therefore, income inequality decrease when the age of the household heads. There is this decrease in income inequality because holder head of household are less engage in non-agricultural activities (Barrett *et al*[1]).

The inequality in income distribution affects all the groups of age of household head. However, the between-group inequalities explain 73.40% of the global inequality. Therefore, inequality in total income is related to the differences between households headed by less younger people and households headed by older people on the one hand, and on the other hand, households headed by older people and those headed by elderly (much older people) (Table 3). Analysis per income sources shows that crop production and off-farm activities revenue importantly contribute to income inequalities. The within-group income inequalities contributions remain relatively low in all groups except the 45-60 age group, which explains 12.35% of total inequality.

[1] Barret, C. B., Bezuneh, M. and Aboud, A. (2001) 'Income diversification, poverty traps and policy shocks in Côte d'Ivoire and Kenya', *Food Policy*, 26(4), pp 367-384.

 

Table 3: Contribution (%) of income sources inequalities by age of household head and between the ages to national income inequality (G = 0.4042)

| | Source A | Source B | Source C | Source D | Source E | Source F | Total |
|---|---|---|---|---|---|---|---|
| $G_w$ | **1.89** | **8.89** | **6.94** | **5.25** | **2.2** | **1.44** | **26.6** |
| Less than 35 years | 0.13 | 0.95 | 0.62 | 0.59 | 0.19 | 0.27 | 2.74 |
| 35 to 45 years | 0.45 | 2.73 | 1.17 | 1.23 | 0.50 | 0.24 | 6.31 |
| 45 to 60 years | 0.76 | 3.93 | 3.52 | 2.53 | 0.96 | 0.65 | 12.35 |
| more than 60 years | 0.55 | 1.28 | 1.63 | 0.90 | 0.55 | 0.28 | 5.20 |
| $G_b$ | **-0.02** | **6.69** | **-0.31** | **3.21** | **-0.24** | **1.55** | **10.9** |
| Less than 35 years / 35 to 45 years | -0.15 | -0.28 | 0.22 | 0.22 | 0.01 | 0.36 | 0.40 |
| Less than 35 years / 45 to 60 years | -0.10 | 0.75 | -0.05 | 0.56 | 0.07 | 0.51 | 1.75 |
| Less than 35 years / more than 60 years | -0.08 | 1.06 | 0.08 | 0.69 | -0.05 | 0.45 | 2.15 |
| 35 to 45 years / 45 to 60 years | 0.20 | 1.82 | -0.59 | 0.36 | 0.08 | -0.05 | 1.81 |
| 35 to 45 years / more than 60 years | 0.13 | 2.12 | -0.24 | 0.71 | -0.11 | 0.09 | 2.70 |
| 45 to 60 years / more than 60 years | -0.02 | 1.22 | 0.27 | 0.67 | -0.24 | 0.19 | 2.09 |
| $G_t$ | **5.14** | **18.39** | **18.6** | **11.4** | **6.22** | **2.75** | **62,5** |
| Less than 35 years / 35 to 45 years | 0.63 | 3.50 | 1.50 | 1.49 | 0.60 | 0.21 | 7.93 |
| Less than 35 years / 45 to 60 years | 0.71 | 3.17 | 2.99 | 1.93 | 0.78 | 0.41 | 9.99 |
| Less than 35 years / more than 60 years | 0.61 | 1.34 | 1.92 | 0.89 | 0.69 | 0.19 | 5.63 |
| 35 to 45 years / 45 to 60 years | 0.98 | 4.91 | 4.68 | 3.18 | 1.31 | 0.84 | 15.91 |
| 35 to 45 years / more than 60 years | 0.87 | 2.06 | 2.99 | 1.49 | 1.15 | 0.43 | 8.99 |
| 45 to 60 years / more than 60 years | 1.34 | 3.41 | 4.52 | 2.42 | 1.69 | 0.67 | 14.05 |

### 4.5 Sources of income inequality according to household size

The Gini index among households groups of 1 to 6 people, 7 to 8 people and 9 people or more are respectively 0.4274, 0.3775 and 0.3903. The Gini index is higher for small households. These households generally get lower farm incomes and rely on off-farm activities to earn the appropriate income level. Despite this, average incomes are lower in large households. The structure of decomposition by (income) source and class indicates that 60.37% of income inequality is explained by income differences between the clusters (Table 4). The differences to consider are the income discrepancies between household size between 1 to 6 people and households of size greater than 9 people. In effect, it is the high incomes of large households that create gaps with low income of households of small size. The intensity of transvariation between these two groups explains 24.36% of the total inequality. The differences between the medium sized households and larger ones are not negligible. Indeed, they contribute to explaining 15.73% of total inequality.

 

Table 4: Contribution (%) of income sources inequalities by household size and between household size to the national income inequality (G = 0.4042)

| | Source A | Source B | Source C | Source D | Source E | Source F | Total |
|---|---|---|---|---|---|---|---|
| $G_w$ | **2.81** | **13.16** | **9.97** | **8.45** | **3.16** | **2.06** | **39.62** |
| less than 7 people | 0,59 | 3,92 | 2,57 | 1,69 | 0,80 | 0,56 | 10,13 |
| 7 to 8 people | 0,22 | 0,76 | 0,51 | 0,45 | 0,20 | 0,22 | 2,35 |
| 9 people and more | 2,00 | 8,48 | 6,89 | 6,31 | 2,16 | 1,28 | 27,14 |
| $G_b$ | **0.04** | **5.25** | **5.23** | **-0.52** | **1.68** | **1.34** | **13.03** |
| less than 7 people/ 7 to 8 people | -0,08 | 1,12 | 1,22 | 0,21 | 0,38 | -0,04 | 2,82 |
| less than 7 people / 9 people and more | -0,02 | 4,00 | 4,05 | -0,20 | 1,29 | 0,83 | 9,94 |
| 7 to 8 people/ 9 people and more | 0,14 | 0,13 | -0,04 | -0,53 | 0,01 | 0,55 | 0,27 |
| $G_t$ | **4.14** | **15.57** | **10.05** | **11.92** | **3.36** | **2.32** | **47.34** |
| less than 7 people/ 7 to 8 people | 0,78 | 2,48 | 1,25 | 1,52 | 0,47 | 0,75 | 7,25 |
| less than 7 people / 9 people and more | 2,17 | 8,13 | 5,00 | 6,49 | 1,59 | 1,00 | 24,36 |
| 7 to 8 people/ 9 people and more | 1,19 | 4,96 | 3,80 | 3,91 | 1,30 | 0,57 | 15,73 |

### 4.6 Sources of income inequality according to the type of farm

Two types of farms were selected, large farms and small farms. The distribution of income in the class of small farms is less unequal than that in the class of large farms. Gini indices in these classes are 0.3876 and 0.4127, respectively. Small farms occupy less the household, giving him time to engage in non-agricultural activities unlike large farms. Analysis of the decomposition shows that inequalities are observed in both within and between groups. Indeed, within-group inequalities contributions are equal to 53.18% while between-group inequalities contributions account for 46.81% (Table 5). Within-group inequalities contributions are due to inequalities in the group of large farms while between-group one's are due to the unequal transvariation that explains 40.71% of total inequality. This is explained by the income gap between the high-income level within the class of small farms and the low income level of the class of large farms. However, the income gap is less observable. Its contribution to total inequality remains low, 6.10%. Analysis per source shows that livestock and cash crops reduce the income gap between these classes.

Table 5: Contribution (%) of income sources inequalities by type of farm and between types to national income inequality (G = 0.4042)

| | Source A | Source B | Source C | Source D | Source E | Source F | Total |
|---|---|---|---|---|---|---|---|
| $G_w$ | **3.5** | **18.4** | **13.32** | **10.29** | **4.56** | **3.1** | **53.19** |
| Large Farms | 2.01 | 14.36 | 9.84 | 6.96 | 3.89 | 2.44 | 39.52 |
| Small Farms | 1.49 | 4.04 | 3.48 | 3.33 | 0.67 | 0.66 | 13.67 |
| Gb | **-2.12** | **3.45** | **2.78** | **-1.07** | **2.03** | **1.04** | **6.10** |
| Large Farms/Small Farms | -2.12 | 3.45 | 2.78 | -1.07 | 2.03 | 1.04 | 6.10 |
| Gt | **5.61** | **12.12** | **9.14** | **10.63** | **1.61** | **1.60** | **40.71** |
| Large Farms/Small Farms | 5.61 | 12.12 | 9.14 | 10.63 | 1.61 | 1.60 | 40.71 |

## 5. Conclusion

This study aims to contribute to the knowledge of inequality sources in the formation of household income. To do this, we used a numerical approach by the Gini index which is decomposable in income sources and subgroup of population. This type of decomposition allows knowing income inequalities progress in different regions and among socio-economic groups due to policy changes. Results show that:

The synthetic variables studied in this paper are all major determinants of agricultural household income. Their degrees of participation in the total inequality remain different.

Regional potential is a key determinant of the overall inequality nationwide; it contributes to explaining 76.49% of income total inequality. Nonetheless, within-region components account for only 23.51%

 

of total inequality.

Education is a determinant of farm income. Even though within-group components are much more likely to explain inequality level nationwide (59.43%), between-group's share remains quite high (40.57%). The average income of the class of household heads with primary level of education and above represents 58.16% of the average income of the class of household heads who are not literate; or even a difference of 8.16 percentage points.

As education level, age of the household head is a determinant of farm income. The study shows that the income difference between age groups is significant and explains the total inequality. Indeed, within-group inequalities explain 73.40% of total inequality.

Looking at the household size, it is clear from the study that between-groups inequalities represent 60.37% of total inequality. However, the within-group inequalities account for only 39.62%. Household size therefore plays an important role in the formation of farm household income.

This decomposition provides explanations about income inequalities that exist within groups, between groups and farm households' income sources level in Burkina Faso. As can be seen, the determinants of inequalities are many and the role and influence of each are measurable. This makes, it possible to simulate the effects of socio-economic policies aiming to change the structure of farm income.

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