GENDERED SENSITIVITY OF THE CAMEROONIAN SOCIAL PLANNER TOWARDS HOUSEHOLDS INEQUALITY: AN (A, B) – DECOMPOSITION

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ABSTRACT

This paper aims at highlighting the inequality aversion of the Cameroonian social planner. This is allowed by the multilevel (α , β) - decomposition of the α - Gini which integrate in its functional form a parameter of inequality aversion of the decision maker being related either to within-group inequality (α) or between-group inequality (β). Analysis are carried out by sex groups on data from the third and the fourth Cameroonian Survey on households. It's appear that the overall inequality index decrease between 2001 and 2007. The Cameroonian social planner appears sensitive to both within group and between group households' inequalities following decomposition by sex.

Keywords: Multilevel (α , β)-decomposition, inequality aversion, decomposition by population sub-groups, between and within groups inequalities, Cameroon.

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1. INTRODUCTION

The property of the decomposition into population's sub-group of inequalities indicators is essential. This concept developed by Bourguignon in 1979 allows determining the amount of the disparities of income without knowing the exact characteristics of the distributions of the sub-groups. He shows that the total inequality within a population divided into several groups

is consisted (divided) by the inequalities present inside each group – within group's inequalities – and the inequalities which exist between the groups – between group's inequalities.

The concept of decomposability is reinforced thereafter by that of additivity which expresses the component of intra-group inequality in the form of a weighted average of the inequalities measured in each group. Although any measurement of inequality additively decomposable is also aggregative, the reciprocal is not true. Thus, only the measurement of Theil was additively decomposable until work of Shorrocks (1980, 1984) which supplement these first definition by weakening the axiom of additive decomposability in order to extend its application to the whole class of measurements of the family of the generalized entropy. These indicators are recognized by Cowell (1980) as being good measurements of inequality, contrary to the Gini's index. But, this last is not less decomposable in sub-groups as shown by Soltow (1960) or Bhattacharya and Mahalanobis (1967), which are the first to formulate methods of its decomposition in sub-groups. In 1988, Ebert states a theorem which confers on the index of Gini the property of the additive decomposability when the distributions to which it refers does not overlap. Various approaches of the decomposition of the index of Gini in sub-groups will be presented throughout the fifty last years. Although each one of them is based on different concepts, the sum of their respective components always makes it possible to find the indicator of total Gini.

The indicator of Gini arouses the interest of the researchers thus and all the more takes importance that the property of additive decomposability of Shorrocks (1980) appears unsatisfactory. The fact that the intra-group component is formulated as a weighted average of the inequalities resulting from each group poses in particular problems on the level of the installation of redistributive measurements, which cannot be applied any more correctly, without speaking about the dependence that generates with the term of inequality joint committee.

Recent researches [Ebert (2010), Chameni (2006 and 2011) and Mornet et al. (2013)] on the subject are focused on taking into account a parameter corresponding to the degree of aversion to the inequality of a decision maker. This parameter appears in the form of a power applied only to the absolute binary differences and under the terms of arithmetic mean inherent in the basic structure of Gini. The general formulation of the index of inequality is intrinsically related to the degree of aversion to the inequality of the decision maker. When this one takes a unit value, the structure of the index of Gini remains unchanged, in contrary, if the degree of aversion to the inequality reaches a value of 2, the indicator thus formed corresponds to the coefficient of variation squared.

For any value alpha higher than 2 the indicator appears under the general denomination of "Gini-alpha", the alpha term which can be replaced by rising the manpower of the degree of aversion to the inequality of the decision maker. This new configuration is introduced by Chameni (2011) which shows that the coefficient of variation squared can be broken up into sub-group according to the method of Dagum (1997a, 1997b), hitherto reserved for the index of Gini. It is then generalized with the indexes of inequality per pairs by Mussard and Terraza (2009). In 2010, Ebert provides the axiomatic necessary one to Gini alpha and states a new property of decomposability in sub-groups: weak decomposability. This new method is appropriate perfectly for the index of Gini like to certain measurements of the entropy generalized and the coefficient of variation squared.

Mornet and al. (2013) proposed a generalization of the decomposition by population subgroups of the Gini index, named (α, β) -multi-level α -Gini decomposition multi-level subgroup decomposition. They take recourse to weakly decomposable inequality measures that characterize the α -Gini index (Chameni, 2011), which include a parameter of inequality aversion, and they establish that all components issued from the decomposition, namely within-

group and between-group inequalities, can integrate in their functional form a parameter of inequality aversion being either related to within-group inequalities (α) or between-group inequalities (β). After checking the axiomatic foundation of the new family of indices they prove that the decision maker that behaves in accordance with the α -Gini index is also sensitive to the inequalities between the groups, this sensitivity may differ for each partition of groups.

It's on the basis of this new approach that we are to analyse the inequality aversion of the social planner. This article is organized according to three following sections. The section 2 presents the methodology. In the section 3 we implement the methodology on Cameroonian household's consumption expenditures of 2001 and 2007. In Section 4 we conclude.

2. THE (A, B)-MULTILEVEL A-GINI DECOMPOSITION

In this paper, $P = \{1, 2, \dots, i, \dots, n\}$ is a population of n members. X is a positive variable representing the income or expenditure of individual in P . Let's note $X = \{x_1, x_2, \dots, x_i, \dots, x_n\}$ where $X = (x_i)_{i=1, \dots, n}$ the distribution of income; x_i is the income of individual i in the global population P . We assume that the population has K sub-populations $P_1, P_2, \dots, P_h, \dots, P_K$ of $n_1, n_2, \dots, n_h, \dots, n_K$ individuals, then: $\sum_{h=1}^K n_h = n$.

The income of individual i of the sub-population h is noted x_{hi} . The restriction of X in the sub-population P_h is X_h , μ and μ_h represent respectively the mean of income in the global population and in the sub-population h . Chameni (2011) prove that the initial index of Carrodo Gini can integrate in its functional form a parameter (α) of the decision maker aversion to inequality. The global α -Gini index is given by:

$$G^\alpha(\mathbf{x}, n) = \sum_{i=1}^n \sum_{r=1}^n \frac{|x_i - x_r|^\alpha}{2n^2 \mu^\alpha(x)}, \forall \mathbf{x} \in R_+ \text{ and } \alpha \in R_+ \quad (1)$$

with $\mu^\alpha(\mathbf{x}) = \left(\frac{1}{n} \sum_{i=1}^n x_i\right)^\alpha$ the mean income of all the population power α .

The subgroup decomposition into two components is given by Chameni (2011):

$$G^\alpha(\mathbf{x}, n) = G_{kk}^\alpha(\mathbf{x}, n) + G_{kh}^\alpha(\mathbf{x}, n) \quad (2)$$

Where the within-group index:

$$G_{kk}^\alpha(\mathbf{x}, n) = \sum_{i=1}^{n_k} \sum_{r=1}^{n_k} \frac{|x_{ik} - x_{rk}|^\alpha}{2n_k^\alpha \mu_k^\alpha(\mathbf{x})} \quad (3)$$

The weighted within and between-group components:

$$G_w^\alpha(\mathbf{x}, n) = \sum_{i=1}^n G_{kk}^\alpha p_k s_k^\alpha \quad (4)$$

The gross between-group index:

$$G_{kh}^\alpha(\mathbf{x}, n) = \sum_{i=1}^{n_k} \sum_{r=1}^{n_h} \frac{|x_{ik} - x_{rh}|^\alpha}{n_k n_h (\mu_k^\alpha + \mu_h^\alpha)} \quad (5)$$

The weighted gross between group components:

$$\begin{aligned} & G_{gb}^\alpha(\mathbf{x}, n) \\ &= \sum_{j=2}^k \sum_{h=1}^{j-1} G_{kh}^\alpha (p_h s_h^\alpha + p_k s_k^\alpha) \end{aligned} \quad (6)$$

In order to derive the subgroup decomposition into three components, Chameni (2011) uses the traditional distance of Dagum to break down the gross between group component into the net and the transvariation components.

Moreover, the $(\alpha; \beta)$ -decomposition developed by Mornet & al. (2013), to decompose into subgroup the α -Gini substitute the β -directional distance ($D_{kh}(\beta)$) to the Dagum bidirectional economic distance.

$$D_{kh}(\beta) = \frac{d_{kh}^{\beta} - p_{kh}^{\beta}}{d_{kh}^{\beta} + p_{kh}^{\beta}} \quad (7)$$

$$\text{With } d_{kh}^{\beta} = \frac{1}{n_k n_h} \left(\sum_{i=1}^{n_k} \sum_{x_{ij} \geq x_{rh}} (x_{ij} - x_{rh}) \right)^{\beta} \text{ and } p_{kh}^{\beta} = \frac{1}{n_k n_h} \left(\sum_{i=1}^{n_k} \sum_{x_{rh} > x_{ij}} (x_{ij} - x_{rh}) \right)^{\beta}$$

Therefore, the components of this new approach called (α, β) -decomposition differ from Chameni's decomposition while breaking down the gross between-group index into the net between group and the tranvariation components.

The gross between group component is to be decompose into two components as follow:

$$G_{gb}^{\alpha}(\mathbf{x}, n) = \underbrace{\sum_{j=2}^k \sum_{h=1}^{j-1} G_{kh}^{\alpha} D_{kh}(\beta) (p_h s_k^{\alpha} + p_k s_h^{\alpha})}_{G_{nb}^{\alpha; \beta}(\mathbf{x}, n)} + \underbrace{\sum_{j=2}^k \sum_{h=1}^{j-1} G_{kh}^{\alpha} [1 - D_{kh}(\beta)] (p_h s_k^{\alpha} + p_k s_h^{\alpha})}_{G_t^{\alpha; \beta}(\mathbf{x}, n)} \quad (8)$$

$G_{nb}^{\alpha}(\mathbf{x}, n)$ is the net between-group component, and

$G_t^{\alpha}(\mathbf{x}, n)$ is the between-group component of transvariation.

According to Mornet et al. (2013):

- It is interesting to note that the (1, 1)-decomposition strictly corresponds to Dagum's Gini decomposition in subgroup.
- Imposing $\alpha=2$ and $\beta=1$ permits to retrieve Chameni's decomposition in subgroup of the coefficient of variation squared.
- The various components must be carefully manipulated. Only the standard Gini index is included in $[0; 1]$, since $\alpha > 1$ implies that $G^{\alpha}(\mathbf{x}, n) \in [0; \infty[$. However the β -directional distances may be compared for all real positive value of β .

The β parameter represents the between-group social planner's aversion degree towards inequality (Mornet et al, 2013). The measure $[1 - D_{kh}(\beta)]$ yields the intensity of overlapping i.e. the intensity of trasvariation in the Gini's sense (1916). In order to model a decision maker with an aversion degree towards between-group inequality being the same compared with the within-group one, one has to impose $\alpha = \beta$. On the contrary, if the decision maker judges between-group inequalities more (less) important (because there are some [non-]needs of between-group inequalities distribution), then $\beta \geq (\leq) \alpha$. Consequently, if the decision maker weighted differently the various partition, hence, we would have as many parameters as partitions.

3. A CASE STUDY: MEASURING CAMEROONIAN HOUSEHOLD'S INEQUALITY, 2001-2007

3.1. Taking into account within-group inequality aversion of the social planer

In this section we illustrate the property of the β -economic distance with Cameroonian household's consumption expenditure data of 2001-2007 by sex group. The analysis under the (α, β) - decomposition requires that parameters α and β should be defined or calibrated. We agree to calibrate our analysis under the neutral decision maker.

We have to determine the appropriate α and β parameters that characterize the neutral decision maker. Graph 1 shows that the α -Gini explodes from $\alpha = 2$ in 2001 (resp. 2007). Indeed, when the degree of aversion to inequality increased from 2 to 3 in 2001 (resp. In 2007), the overall amount of inequality is multiplied by about 10 and ranging from 2.22 to 25.92 (resp. from 1.55 to 15.38). Therefore, we set the neutral decision maker's parameter at $\alpha = 2$.

This choice matches that of Chameni (2011) who believes that the analysis of Cameroonian households inequality is appropriate when the decision maker sensitivity is rated at $\alpha_0 = 2$. At this level of aversion to inequality, the α -Gini yields the squared coefficient of variation which belongs to the family of generalized entropy. It remains to consider the economic β -distance. The estimated 2-Gini in 2001 and 2007 shows very pronounced inequalities in 2001, which are reduced in 2007. Indeed the 2-Gini rated at 2.22 and 1.55 shows that inequalities of Cameroonian household consumption expenditures dropped at a rate of about -30.24% between 2001 and 2007.

Graph 1 Calibrating of the α -Gini, 2001-2007.

Source: ECAM 2 α 3, following our calculations.

3.2. Taking into account between-group inequality aversion of the social planer

Unlike Mornet and al (2013) operating an arbitrary choice of the sensitivity of the decision maker to transvariation, here we implement the rule of the choice of parameter β . This choice is to stand on the neutral decision maker to transvariation.

Graph 2: Sensitivity toward intra-group inequality of the Cameroonian social planer, 2001 - 2007.

Source: ECAM 2 α 3.

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The growth of β -directional economic distance shown above is illustrated on Cameroonian household's expenditure 2001 and 2007. Indeed, the economic β -distance increases gradually as we increments β from one to 4. For example ranging from 0.30 to 0.84 in 2001 and 0.25 to 0.77 in 2007.

Illustration of the decision maker sensitivity towards transvariation and net inequality appears paradoxical in 2001 and 2007. In 2001, when β increases from 1 to 2, the net inequality component increase from 0.2121 (9.55%) [1] to 0.3899 (17.57%) while the transvariation component decrease from 0.5040 (22.70%) to 0.3261 (14.69%). When $\beta = 4$, the net inequality increases to 0.6015 (27.10%) while the transvariation component falls to 0.1146 (5.16%).

In 2007, when β increases from 1 to 2, the net between group inequality components increases from 0.1398 (9.03%) to 0.2630 (6.98%) while the transvariation inequality index decrease from 0.4170 (26.93%) to 0.2938 (18.97%). When $\beta = 4$, the net between group inequality increases to 0.4300 (27.77%) while inequality transvariation decrease at 0.1267 (8.18%).

For $\beta=2$, the decision maker condemns the net between group inequality component [Gnb (β)] and transvariation [Gt (β)] between sex group. Then for all β value higher than 2 it severely condemns the net inequality in favor of the transvariation component. This contrast is explained by the increasing property growth of the β -directional economic distance.

Graph 3: Sensitivity toward transvariation and net inequality of the Cameroonian social planer, 2001 - 2007.

Source: ECAM 2 & 3.

To sum up, the (α, β) -decomposition of the α -Gini is provided in 2001 and 2007 by the following two equations:

$$G_{2001}^{2, \text{Sex}} = G_w^2 + G_{nb}^2 + G_t^2 = 1,5036 + 0,2121 + 0,5040 = 2,2197 \quad (9)$$

[67,74%] [09,55%] [22,70%]

$$G_{2007}^{2, \text{Sex}} = G_w^2 + G_{nb}^2 + G_t^2 = 0,9916 + 0,1398 + 0,4170 = 1,5483 \quad (10)$$

[64,04%] [09,03%] [26,93%]

Looking into the within group inequality components, it appears that men contribute the most both in 2001 and 2007. to the overall.

Table 1: Within group inequality, 2001 - 2007

Year	Men	Women	G_w^2
2001	1,4264	0,0773	1,5036
2007	0,9141	0,0775	0,9916

4. CONCLUSIONS

Present research illustrated how the Cameroonian social planer behaves according to the (α, β) -multilevel α -Gini decomposition (Mornet et al., 2013). We observed that the overall inequality index decrease between 2001 and 2007 and the Cameroonian social planer appears sensitive to both within group and between group households' inequalities following decomposition by sex. In fact, our estimates shown that as α increase, the social planer penalize very severely the overall inequality measure. The β - economic distance is an increasing function of β starting from the Dagum's bidirectional economic distance. Then the social planer is sensitive to consumption inequality between household headed by men and women.

KEYNOTE

[1] Percentage of the total inequality

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