Economics Bulletin

Volume 37, Issue 4

The change in monetary inequality among households in Togo over 2011-2015: an illustration based on the decomposition of the Gini coefficient using the Shapley value approach

Yawo A. Noglo
Paris West University Nanterre La Défense -Mozaïques-LAVUE 92000 Nanterre, France

Komivi Afawubo
CEREFIGE –Univ. of Lorraine and CRESE EA3190-Univ. of Bourgogne Franche-Comté

Abstract

This paper aims at measuring and analyzing for the first time the evolution of inequality in the distribution of expenditures among households in Togo over 2011-2015 and according to the characteristics of household heads. The study is based on the two most recent surveys (QUIBB 2011 and QUIBB 2015) and the monetary well-being indicator used is total expenditure per adult equivalent. With regard to the decomposition of the Gini index through Shapley's approach, within-groups inequality is greater than between-groups inequality for both years with an increase of total within-areas and within-age inequalities. The decomposition of overall within-groups component shows that urban areas, male-headed families and the 31-50 age group are more contributory. The increase of this contribution is observed for urban areas, the 31-50 age group while we have a slight decrease concerning gender. These findings witness that in Togo, policy actions to reduce inequalities should first target the within-groups expenditure disparities by focusing on the most contributory groups, and also without neglecting the between-strata effects.

The authors would like to thank the two anonymous reviewers for their comments and suggestions.
Citation: Yawo A. Noglo and Komivi Afawubo, (2017) "The change in monetary inequality among households in Togo over 2011-2015: an illustration based on the decomposition of the Gini coefficient using the Shapley value approach", *Economics Bulletin*, Volume 37, Issue 4, pages 2602-2615
Contact: Yawo A. Noglo - noglohonore@gmail.com, Komivi Afawubo - komivi.afawubo@univ-lorraine.fr.
Submitted: June 06, 2017. **Published:** November 19, 2017.

1 Introduction

Togo is one of the least developed countries (LDCs). According to AfDB et al. (2012), Togo grew by 3.9 per cent in 2011 due to better agricultural production and continued industrial activity. The situation improved with 5.9 per cent in 2012, but a slight drop (5.6 per cent) in 2013 (AfDB et al., 2014). The growth rate of 5.6 per cent in 2013 is explained by the performance of primary (cotton, food crops) and tertiary (trade, transport, warehousing) sectors. Due to lower government investment and less port activity, Togo's economy slowed from 5.3 per cent growth in 2015 to 5 per cent in 2016 (AfDB et al., 2017). Despite this good economic performance, the per capita growth rate is still low ranging between 1.8 per cent and 3.3 per cent over the 2011-2015 period according to previous sources. Thus, Togo remains a very poor country with serious problems of poverty and inequality. According to the United Nations Development Programme (UNDP) Report 2016, with a human development index (HDI) of 0.487, Togo is ranked 166th out of 188 countries in the world in 2015.

In recent years, many empirical studies, such as Piketty (1994), Kanbur and Lustig (1999), Bourguignon and Morrison (2002), Milanovic (2002), Charpentier and Mussard (2011), and Chantreuil and Trannoy (2013), have addressed inequality issues. This research indicates a considerable interest in the measurement of inequality and its decomposition.

Decomposition analysis may be divided into two categories. The first category is concerned with the decomposition of the well-being indicator (income or expenditure) of individuals or households into different components, which are the socio-economic sources of inequality. It allows us to look at the contributions of these components to overall inequality and helps in the design of effective socio-economic policies to reduce poverty and inequality.

The second category of decomposition consists of dividing the sample into discrete categories (rural or urban residents, gender of individual, and so on) and calculating the level of inequality in the distribution of income or expenditure in each sub-sample, and between the means of sub-samples. Thus, total inequality is the sum of within- and between-groups iequalities(Bourguignon, 1979; Cowell,1980; Shorrocks,1980,1984).

Some of the research carried out regarding monetary inequalities has revealed interesting results. Fambon (2010), studying inequality in the distribution of household expenditure in Cameroun through the Shapley value, showed evidence that, between 1984 and 1996, inequality defined by the Gini index decreases with the age of household head and the within-groups effect is more predominant in total inequality. As for Araar (2006), he demonstrated using the Gini index that, in 2001, the distribution of Cameroonian household expenditures decreased when moving from urban to rural areas. Using Shapley's value, he noted that the within-groups inequality is larger and represents approximately 69.25 per cent of total inequality. Sastre and Trannoy (2002), applying Shapley decomposition by factor to UK and US income find answers to some dilemmas faced by applied economists when implementing Shapley's decomposition technique.

Some researches exist for Togo concerning inequality. Lawson Body et al. (2007) carried out a comparative analysis of the multidimensional approach of poverty and inequality in Togo between 1988 and 1998. After decomposing the Gini index by source of well-being according to the Shapley approach, they found that the households' highest contributions to non-monetary wealth were housing, and means of communication. Agbodji et al. (2013) analysed gender inequality in multidimensional welfare in Burkina Faso and Togo. According to their

results, three dimensions (assets, access to credit, and employment) account together for most of the total contribution to gender inequality in Togo. Noglo (2014) applying Shapley's value in the non monetary concept evidenced that the highest and the lowest contribution to within-group inequality is found in the Plateaux (15.19%) and Lomé (3.57%) regions, respectively. Noglo (2016) studying gender inequality in Togo through the (alpha, beta)-multi-level alpha-Gini decomposition in gender inequality show that on the first and second level of partitions, the results with the scale using the Engel approach show similarities compared to those from the Oxford scale. Moreover, Ametoglo and Ping (2016) using the Theil index show that in Togo, more than 18 per cent of the overall inequality in 2006 was attributable to the inequality across urban-rural divide subgroups and this percentage rose to 20 per cent in 2011.

The purpose of this article is the measurement and analysis of inequality in the distribution of household expenditure in Togo between 2011 and 2015, relying on the second category of decomposition and using the Gini index and its components as derived from the Shapley value decomposition approach. This latter allows us to identify the link between the characteristics of household heads and inequality over the studied period, and how inequalities have evolved. This work is interesting because no study has yet been done on monetary inequality depending on the characteristics of household heads in Togo based on Shapley's approach.

To fill this void, and based on the most recent data from the Core Welfare Indicators Questionnaire survey (QUIBB) for 2011 and 2015 which have not yet been used for this case, we will try to understand what relationship may exist between the characteristics of household heads and the distribution of expenditure, and then propose some socio-economic policies. We intend through this study to enrich the literature on inequalities in Togo.

In the following sections, after presenting the methodological framework, we will then outline the empirical results. This is followed by a conclusion and recommendations.

2 Methodological framework

2.1 Well-being indicator

Our baseline indicator of well-being is total expenditures for the following reasons: First, expenditure flows are more regular and more easily identifiable than income (Friedman, 1957). Second, households more easily remember their spending than their income from informal sector activities. Moreover, the expenditure indicator takes into account people said to be without income. Once the measure of welfare is specified, we determine expenditures per adult equivalent. This requires the implementation of an equivalent scale which takes into account the lesser cost of children and economies of scale. The former is important because there is a difference between the consumption of children and adults, as their needs are not the same, while economies of scale are significant because overcrowded households have the benefit of such economies on joint purchasing or joint use of property.

According to Cutler and Katz (1992), the equivalence scale may be expressed by the following equation:

$$n_e = (n_a + \gamma m_c)^{\theta} \qquad (1)$$

with n_e the number of persons in adult equivalents, n_a the number of adults and n_c the number of children aged less than 18 years. γ means the relative cost of a child compared to an adult and θ the equivalence elasticity. We implement the FAO/WHO[1] scale which represents the size of family in adult equivalents and it is expressed as follows:

$$m_{FAO/WHO} = A_{Men} + 0.8A_{Women} + 0.5E_{0-14} \quad (2)$$

The weighting applies 1 unit to adult men (A_{Men}) of at least 15 years of age and 0.8 to adult women (A_{Women}) in the same age group. For children under the age of 15 (E_{0-14}), the weight is 0.5. This scale is partly based on nutritional, food and health needs. Thus, we have determined the level of expenditure of a household to have the same standard of living as that of a representative.

2.2 The Gini index and the Lorenz curve

Several inequality measures can be found in the literature, notably in Jenkins (1995) and Sen (1997). However, the Gini index is the most interesting inequality index because it is easier to interpret in terms of a Lorenz curve. The Gini coefficient is defined as being equal to one minus twice the area under the Lorenz curve (Gastwirth, 1971). However, the simplest and most popular formalization is based on the covariance between the well-being indicator of an individual or household and the rank which it occupies in the distribution of this indicator. According to Duclos and Araar (2006), the class of Gini indices is expressed as follows:

$$I(\rho) = \frac{-\mathrm{cov}[Q(p), \rho(1-p)^{(\rho-1)}]}{\mu} \quad (3)$$

where ρ is the parameter of aversion to inequality. The more the value of ρ increases, the more emphasis is put on the lower tail of the income distribution, and hence on the position of the poorest individuals in a population. $Q(p)$ is the living standard of the individual according to his rank, p; and p is ranked from 0 (poorest individuals) to 1 (richest individuals). μ is the mean of the distribution of living standards. If $\rho = 2$, the standard Gini index is calculated as follows:

$$I(\rho = 2) = \frac{2\mathrm{cov}(Q(p), p)}{\mu} \quad (4)$$

The Gini index varies from 0 (total equality) to 1 (total inequality).

The Lorenz curve is the most popular graphical tool used to make inequality comparisons in terms of living standards. The reason for the use of Lorenz curves in order to compare inequality between several distributions is that they give more robust results than the Gini index. The Lorenz curve relates cumulative population to income (or expenditure). For a proportion p of the population, Duclos and Araar (2006) express the Lorenz curve $L(p)$ as follows:

---

[1] FAO/WHO : Food and Agriculture Organization/World Health Organization

$$L(p) = \frac{1}{\mu}\int_0^p Q(q)dq \qquad (5)$$

p is the rank of household or individual going from 0 (the poorest) to 1 (the richest). $Q(p)$, the individual standard of living according to its rank and μ the mean of the living standard distribution. $L(p)$ is the cumulative proportion of living standards held by a cumulative proportion of households or individuals p, knowing that they are ranked in ascending order according to their own standards of living. The more the Lorenz curve diverges from the 45° line (first bisector), the greater the inequality in the distribution of wealth. The distribution is perfectly equal if the Lorenz curve is represented by the 45° line.

2.3 Decomposition of the Gini index by household groups according to Shapley's approach

The developments of this method follow Fambon (2010). This decomposition is carried out in two steps (Duclos and Araar, 2006). In the first step, total inequality is broken down into total between-groups and total within-groups contributions. The second step consists of expressing the total within-groups contribution as a sum of the within-groups contributions of each group.

The two Shapley factors in the first step are between-groups (C_{inter}) and within-groups (C_{intra}) inequalities. Hence, the total inequality is expressed as follows:

$$Overall \quad inequality(I) = C_{inter} + C_{intra} \qquad (6)$$

The rules for computing the contribution of each of the two factors are:

-to eliminate within-groups inequality and calculate between-groups inequality $(I(\mu_{1,\ldots,}\mu_G))$ we will use a vector of income in which each household has its group's average income given by μ_g;

-to eliminate between-groups inequality and calculate within-groups inequality $(I(y_i(\mu/\mu_g)))$, we will use a vector of income in which each household has its income multiplied by μ/μ_g. So the mean income of each group is equal to μ.

-to highlight the between-groups and within-groups inequalities simultaneously, we will use simply a vector of incomes where each household has the average of incomes.

The order followed to eliminate factors is arbitrary. To remove this arbitrariness, Araar (2006) follows Shapley's approach, which consists in eliminating either of the two factors. By taking into account this method, the decomposition gives us:

$$C_{inter} = 0.5[I - I(y_i(\mu/\mu_g)) + I(\mu_{1,\ldots,}\mu_G)] \qquad (7)$$

$$C_{intra} = 0.5[I - I(\mu_{1,\ldots,}\mu_G) + I(y_i(\mu/\mu_g))] \qquad (8)$$

Starting from this decomposition, one can proceed to the second stage of decomposition, consisting of breaking down within-groups inequality into specific group components. Regarding equation (8), which defines the contribution of within-groups inequality, this contribution is based on three inequality indices.

In order to avoid arbitrariness in the sequence of eliminations of the marginal contribution of groups to total within-groups inequality, the Shapley approach is used for the three terms. We assume that there are only two groups, A and B. The decomposition gives:

$$C_{intra} = 0.5[\underbrace{I}_{terme1} - \underbrace{I(\mu_A, \mu_B)}_{terme2} + \underbrace{I(y_i^A(\mu/\mu_A), y_i^B(\mu/\mu_B))}_{terme3}] \quad (9)$$

Within-groups inequality is eliminated when the income of each household is equal to the average income of its group. In this way, we apply the same rule to the three terms as follows:

$$CA = \sum_{i=1}^{3} 0.25 C_{A:terme(i)} \quad (10)$$

$$\begin{aligned} C_{A:terme(1)} &= [I - I(\mu_{A,} y_B) + I(y_{A,} \mu_B) - I(\mu_{A,} \mu_B)] \\ C_{A:terme(2)} &= [I(\mu_{A,} \mu_B) - I(\mu_{A,} \mu_B) + I(\mu_{A,} \mu_B) - I(\mu_{A,} \mu_B)] = 0 \\ C_{A:terme(3)} &= [I(y_i^A(\mu/\mu_A), y_i^B(\mu/\mu_B)) - I(\mu, y_i^B(\mu/\mu_B)) + I(y_i^A(\mu/\mu_A), \mu) - I(\mu, \mu)] \end{aligned} \quad (11)$$

Let CA_g be the absolute contribution of each group g to the Gini inequality index. This value gives the magnitude, in absolute value, of the contribution of group g. The coefficient of relative contribution is defined as follows:

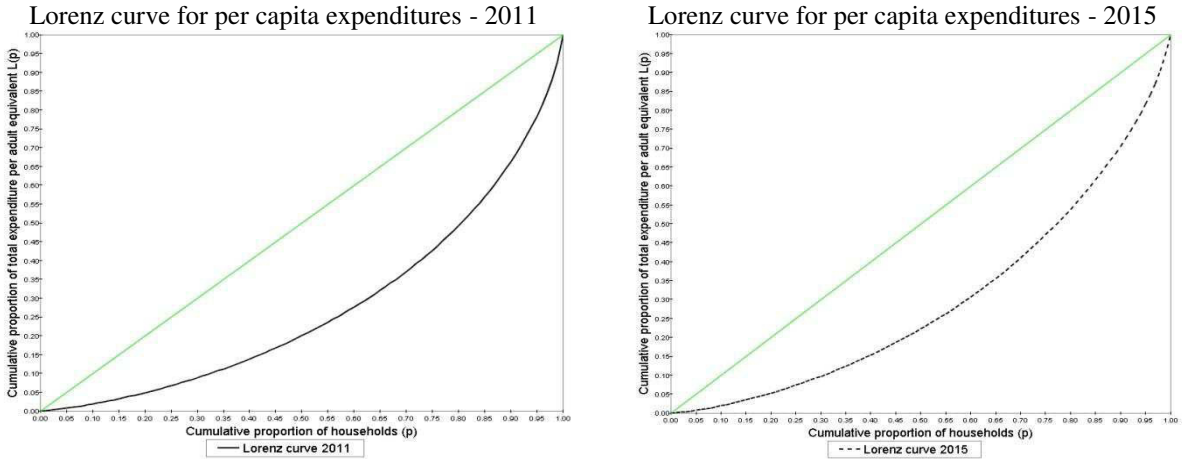
$$CR_g = \frac{CA_g}{I} \quad (12)$$

Finally, note that the Gini index and its decomposition are computed by DAD software developed by Duclos et al. (1999).

3 Data

The data are from the most recent surveys (QUIBB 2011 and QUIBB 2015) on the issue of poverty in Togo. The surveys were carried out by the the National Institute of Statistics and Economic and Demographic Studies (INSEED) in cooperation with the World Bank, the United Nations Development Programme (UNDP), the European Union (EU) and the United Nations Children's Fund (UNICEF). QUIBB 2011 took place from 25 July to 31 August 2011. It is an areolar survey stratified into two stages. At the first stage, 336 Zones of Counting (ZC) were drawn with probability proportional to their size of ZC. The second stage has allowed to have 5491 households from the ZC with 2,439 and 3,052 in urban and rural areas respectively. QUIBB 2015 took place from 15 August to 5 September 2015. It has the same objective as QUIBB 2011 to provide information such as: food and non-food expenditure, sociodemographic information, characteristics of housing, access to basic infrastructure. The sample size is 2,335 households representative of the Togolese population at national level. The QUIBB 2015 survey has not provided the sampling design.

Figure 1: The Lorenz curves



Source: Authors' calculation and graphic with DAD 4.6 using data from QUIBB 2011 and QUIBB 2015.

4 Empirical results of the Gini index and its decomposition based on the Shapley value

The Gini coefficient (see Tables 2, 4, and 6) indicates that the overall inequality in the distribution of expenditures among Togolese households is equal to 45.18 per cent in 2011 and 40.80 per cent in 2015, corresponding to a decrease of 4.38 per cent. However, the level of inequality remains high. This slight decrease is due to the improvement of economic situation declining the poverty rate from 58.7 per cent (2011) to 55.1 per cent (2015) (INSEED, 2016). The comparison of Lorenz curves (Figure 1) based on the distribution of total expenditure per adult equivalent for the two years supports the results of the Gini coefficient. Indeed, the curve of 2011 is a bit more remote from the first bisector. Disparities also exist according to the areas, and the gender and age of household head.

4.1 Decomposition by area

According to the results in Table 1, the average expenditure per adult equivalent in urban areas not only increases but is more than twice that in rural areas for both years. Thus urban households have a better standard of living than those in rural areas, even if the monetary situation of rural areas has also improved during the studied period.

Table 1: Mean household expenditure by area

Characteristics of household head	Mean expenditure of households in CFA	Number of households	Share of households
	2011		
Areas			
Urban	463,181.013	2,439	0.4442
Rural	194,227.255	3,052	0.5558
	2015		
Areas			
Urban	470,643.879	1,536	0.6601
Rural	234,483.35	791	0.3399
Variation 2011-2015			
Urban	7,462.866	-	-
Rural	40,256.095	-	-

Source: Authors' own calculation based on data from QUIBB 2011 and QUIBB 2015.

Observing the Gini inequality in Table 2, we note that in 2011, the distribution of expenditures is more uneven in urban areas (41.31 per cent) than in rural areas (36.71 per cent). These results are not surprising, since generally the variation of income in urban areas is higher than the national average, which affects expenditure. The fact that rural areas are less inegalitarian than urban areas reflects how widespread a low standard of living is in rural areas. This situation evidences the extent of rural poverty. However, urban and rural inequalities are extremely close in 2015 due to a decline of 4.01 per cent (urban) and a negligible increase of 1.26 per cent (rural).

With regard to the Shapley approach (Araar, 2006) in Table 2, we can see that the within-areas inequality component of total expenditure is greater than the between-areas component in 2011 and 2015. The contribution of within-areas inequalities to overall inequalities increases by 9.86 per cent while, the between-areas effect drops from 30.49 per cent in 2011 to 20.63 per cent in 2015 or a significant decrease about 9.86 per cent. If the decomposition of the within-areas inequality component is considered, we note that urban areas contribute more to the within-areas component (37.07 per cent in 2011 and 57.16 per cent in 2015) and this contribution increases by 20.09 per cent. However, the contribution of rural areas to within-areas component drops by 10.23 per cent in rural areas.

Table 2: Inequality decomposition by area

	2011		**2015**		**Variation 2011-2015**	
Gini						
Overall	0.4518		0.4080		-0.0438	
Urban	0.4131		0.3730		-0.0401	
Rural	0.3671		0.3797		0.0126	
	Shapley's approach					
	Contribution					
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Between-groups	0.1378	0.3049	0.0842	0.2063	-0.0536	-0.0986
Within-groups	0.3141	0.6951	0.3238	0.7937	0.0097	0.0986
Decomposition of within-groups component						
Urban	0.1675	0.3707	0.2332	0.5716	0.0657	0.2009
Rural	0.1466	0.3244	0.0906	0.2221	-0.056	-0.1023

Source: Calculation by the authors using data from QUIBB 2011 and QUIBB 2015.

Policies likely to achieve a significant reduction in total expenditure inequalities in Togo should centre first on the within-areas disparities, with a special emphasis on urban areas, while not losing sight rural areas where poverty remains widespread. However, although inequalities between the areas fall, they should not totally be neglected.

4.2 Decomposition by gender of household head

Regarding Table 3, on average in 2011, female-headed families have a higher standard of living than male-headed families. This finding is in part due to the higher participation of Togolese women in informal sector activities. A proportion of women with informal employment in urban and rural areas are 91.7 per cent and 95.4 per cent respectively (Atake et al., 2017). The income from these activities, although modest, helps to raise the standard of living of households compared to families managed by males. It should also be noted that when Togolese women manage a family, they are engaged exclusively in the restricted family unit (themselves with their children). Contrary to women, men are often polygamous, with a large family already and they also carry the burden of supporting close and distant cousins, which results in the impoverishment of households. This result is in accordance with some

studies. Indeed, Liu et al. (2017) find that in El Salvador and Peru, male-headed households are less wealthier than female-headed ones. Milazzo and Van de Walle (2017) studying 24 African countries show that households managed by women contribute appreciably to the overall decline of poverty. Finally, Oginni et al. (2013) find female-headed households less likely to be poor in Nigeria. However, between 2011 and 2015, the increase in expenditure is higher among male-headed families (81,752.738 CFA) than female-headed families (60,520.338 CFA). The fact that male-headed families become wealthier in 2015 reveals sometimes the complexity of the situation although the situation described for 2011 is also a reality. This finding is in line with Liu et al. (2017) who reveal in 8 countries in Latin America (Argentina, Brazil, Chile, Columbia, Costa Rica, Panama, Uruguay, and Venezuela) that female-headed households are overall poorer.

Table 3: Mean household expenditure by gender

Characteristics of household head	Mean expenditure of households in CFA	Number of households	Share of households
	2011		
Gender			
Male	311,874.238	4,312	0.7853
Female	320,337.875	1,179	0.2147
	2015		
Gender			
Male	393,626.976	1,733	0.7447
Female	380,858.213	594	0.2553
Variation 2011-2015			
Male	81,752.738	-	-
Female	60,520.338	-	-

Source: Calculation by the authors using data from QUIBB 2011 and QUIBB 2015.

The design of gender-sensitive policies requires the breakdown of inequality according to the gender of the household head. Although the living standards of the two groups are different, referring to Table 4, we see that inequality in the distribution of consumption expenditures among households headed by men is almost equal to expenditure inequality in families managed by women for 2011 and 2015. If both indices are substantially equal, there is still a slight superiority of monetary inequality in male-headed households for the two years and also a mild decrease about 4 per cent for both groups.

Decomposition results of Gini using Shapley's value approach (Table 4) shows in 2011 and 2015, the overwhelming contribution of within-gender groups inequalities (around 99 per cent) to the explanation of total inequalities with a non-significant decline of 0.27 per cent. A decomposition of the within-gender component indicates that households managed by men contribute more to within-gender inequalities (79.05 per cent in 2011 and 75.03 per cent in 2015) with a small decline of 4.02 per cent. As regards households managed by women, this contribution to within-gender disparities amounts to 20.44 per cent in 2011 and 24.20 per cent in 2015 reflecting an increase of 3.76 per cent.

Table 4 : Inequality decomposition by gender of household head

	2011		2015		Variation 2011-2015	
Gini						
Overall	0.4518		0.4080		-0.0438	
Male	0.4554		0.4106		-0.0448	
Female	0.4378		0.3996		-0.0382	
Shapley's approach						
	Contribution					
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Between-groups	0.0023	0.0051	0.0032	0.0078	0.0009	0.0027
Within-groups	0.4495	0.9949	0.4048	0.9922	-0.0447	-0.0027
Decomposition of within-groups component						
Male	0.3572	0.7905	0.3061	0.7503	-0.0511	-0.0402
Female	0.0923	0.2044	0.0987	0.2420	0.0064	0.0376

Source: Authors calculation based on data from QUIBB 2011 and QUIBB 2015.

Policies that aim to reduce total expenditure inequalities should focus more on within-strata disparities. Although there is a decrease of 4.02 per cent in the contribution of households headed by men to the within-gender component, a particular attention should be paid to this group. However, between-strata inequalities should not be shelved.

4.3 Decomposition by age of household head

The average household expenditure decreases when the age of the household head increases in 2011 (Table 5). Indeed, poverty increases in families as the age of the household head increases. In fact, the young household heads, aged between 15 and 30, do not have much in the way of a family burden. In the 31-50 age group, many household heads are active and carry the burden of the family, leading to a reduction of expenditure per adult equivalent compared to the 15-30 age group. As for the over-50 age group, the average expenditure of these households is the lowest. In effect, the majority of household heads includes elderly retired people. The latter have lost in part or totally their workforce and have therefore joined the ranks of the poor. Although the monetary situation is better in 2015 for the three age groups, the 51-99 age group remains the poorest for both years and the 31-50 age range becomes the wealthiest in 2015.

Table 5: Mean household expenditure by age of household

Characteristics of household head	Mean expenditure of households in CFA	Number of households	Share of households
2011			
Age group			
15-30	366,837.036	1,117	0.2034
31-50	317,941.246	2,805	0.5108
51-99	268,258.704	1,569	0.2857
2015			
Age group			
15-30	390,815.676	449	0.1930
31-50	396,546.739	1,195	0.5135
51-99	379,261.695	683	0.2935
Variation 2011-2015			
15-30	23,978.64	-	-
31-50	78,605.493	-	-
51-99	111,002.991	-	-

Source: Authors' own calculation from QUIBB 2011 and QUIBB 2015.

According to Table 6, the decrease of inequality between 2011 and 2015 in the three age groups is 5.81 per cent (15-30), 3.36 per cent (31-50) and 3.97 per cent (51-99). This confirms as mentioned above, the improvement of the living standards of these groups.

Considering the Shapley value principle (Table 6), total within-age-groups inequality (93.21 per cent in 2011 and 98.79 per cent in 2015) is much greater than between-age-groups inequality (6.79 per cent in 2011 and 1.21 per cent in 2015). In addition, we note an increase of 5.58 per cent in overall within-age-groups inequality. For the two years, the 31-50 age group is the main contributor to total inequality within-age-groups (49.12 per cent in 2011 and 52.13 per cent in 2015), followed successively by the over 50 and the 15-30 age groups. We can also observe that the contribution of the 31-50 age group to total inequality within-age-groups increases by 3.01 per cent and that of 51-99 age group is 3.01 per cent. Hence, an increase in the number of active population and elderly would cause the distribution of expenditures to become less equal in Togo. Given that these two ranges of the population will increase in the years to come, the rise in inequality should be a concern. In order to effectively reduce monetary inequality, policy makers should target first the within-age disparities, with a particular emphasis on households with heads aged between 31 and 50, because this group of individuals is the most active and especially carry family responsibilities. Then safety nets can be implemented to help seniors. However, between-groups inequality must not be neglected even if a drop of 5.58 per cent is recorded.

Table 6: Inequality decomposition by age of household head

	2011		**2015**		**Variation 2011-2015**	
Gini						
Overall	0.4518		0.4080		-0.0438	
15-30	0.4486		0.3905		-0.0581	
31-50	0.4490		0.4154		-0.0336	
51-99	0.4452		0.4055		-0.0397	
Shapley's approach						
	Contribution					
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Between-groups	0.0307	0.0679	0.0049	0.0121	-0.0258	-0.0558
Within-groups	0.4211	0.9321	0.4030	0.9879	-0.0181	0.0558
Decomposition of within-groups component						
15-30	0.0866	0.1917	0.0747	0.1830	-0.0119	-0.0087
31-50	0.2219	0.4912	0.2127	0.5213	-0.0092	0.0301
51-99	0.1126	0.2491	0.1157	0.2836	0.0031	0.0345

Source: Authors own calculation from QUIBB 2011 and QUIBB 2015.

The empirical findings show that the decomposition leads to lower between-group inequalities for all population subgroups distinguished. Araar (2006) and Fambon (2010) found the same results. Deutsch and Silber (2008) give an explanation for this situation. According to these authors, for given average expenditures of population subgroups, the between-group inequality will be maximal when the population subgroups are of equal size and will be smaller when their sizes are more different. This is consistent with the results we obtained through all the decompositions.

5 Conclusion and implications of socio-economic policies

As already mentioned, the purpose of this study is to measure and analyze inequality in the distribution of household expenditure in Togo over 2011 and 2015, and its decomposition into within- and between-groups components through Shapley's approach. The data used come from the QUIBB 2011 and QUIBB 2015 surveys, which provide the monetary variable (household expenditure) that we have transformed into expenditure per adult equivalent by using the FAO/WHO equivalence scale. The Gini results indicate that the level of inequality in the country decreases by 4.38 per cent due to the improved economic situation. Considering the decomposition of inequality according to Shapley's approach, total within-groups inequality is greater than the between-groups effect in 2011 and 2015 with an increase of overall within-areas and within-age disparities. The breakdown of the within-areas component shows that for both years, households living in urban areas contribute more to within-groups inequality. Over the period, this contribution increases for urban areas but drops for rural areas which are very poor. The decomposition of within-gender inequalities indicates that male-headed families are more contributory but with a slight decline. As regards the decomposition of the within-age component, the 31-50 age group is the main contributor for the two years with an increase over the period. Thus, strategies to reduce inequalities should be a priority in the within-groups component, while putting a strong emphasis on the strata that contribute most to inequality. However, the between-groups effect should not be underestimated.

State and Microfinance institutions (MFIs) should focus policies on urban and rural areas by strengthening micro-finance programmes, for example. As the economic activity is more developed in urban areas, entrepreneurship generated by microfinance will lift people out of poverty and reduce inequalities. Working on Addis Ababa, Gumbo (2010) demonstrated that microfinance alleviates urban poverty and leads to economic growth. Rural areas are predominantly agricultural in Togo and micro-finance can help farm households to develop extensive agriculture, part of which will be destined for the market. This could help to lift households out of subsistence agriculture and consequently of poverty. With a view to making their business profitable, rural household heads should also be trained in modern agricultural techniques and business management. To this end, education is necessary. Imai et al. (2010) proved that in rural India significant poverty reducing effects are observed when access to microfinance loans are granted for productive purposes. Our recommendation also reflects the results of Berhane and Gardebroek (2011) who studied the link between microfinance and rural poverty in rural northern Ethiopia. As for education, Bachewe et al. (2017) noticed in Ethiopia that improved access to education is a driver for the increasing adoption of modern inputs generating consequently higher expenditure in the agricultural sector. Moreover, awareness campaigns with a view to changing attitudes must always be directed to male household heads since many among them are polygamists with large families, which leads to the impoverishment of households. Considering that the 31-50 age class is the most active and carries the family burden (including close and distant cousins), the struggle against disparities of wealth must focus on unemployment. The government is planning to set up a youth entrepreneurship fund (AfDB et al., 2017). If this program is adopted, it can help considerably this age group. Another measure is to set up safety nets to help the elderly and retired people. This means creating social security for this population. Fiszbein et al. (2014) working on 59 developing countries proved that social protection programs have resulted significantly in reductions in poverty. All of these poverty reduction measures depend on a serious economic growth policy and the willingness of policymakers to improve the social welfare of populations.

The data from QUIBB 2011 and QUIBB 2015 do not necessarily reflect the current situation and those of subsequent years. Indeed, the government is raising money for a 2016-18 industrial programme to boost agroindustry and set up an entrepreneur fund (AfDB et al., 2017). These policies will probably reduce poverty and inequality. Also, Togo's economy slowed to 5 per cent growth in 2016 from 5.3 per cent in 2015 with a slight increase (5.1 per cent) in 2017 and a forecast of 5.3 per cent in 2018 (AfDB et al., 2017). These different situations could affect households' standard of living. So even though this paper provides an additional contribution to the issue of inequality, the extrapolation of the findings to 2017 and subsequent years in order to formulate policies for socio-economic development must be done with great caution.

References

AfDB (African Development Bank), OECD (Organisation for Economic Co-operation and Development, UNDP (United Nations Development Programme) and ECA (Economic Commission for Africa (2012) "Togo 2012, perspectives économiques en Afrique 2012.

AfDB (African Development Bank), OECD (Organisation for Economic Co-operation and Development, UNDP (United Nations Development Programme) (2014) "Perspectives économiques en Afrique.

AfDB (African Development Bank), OECD (Organisation for Economic Co-operation and Development, UNDP (United Nations Development Programme) (2017) "Togo 2017, perspectives économiques en Afrique".

Agbodji, A.E., Y.M. Batana and D. Ouedraogo (2013) "Gender Inequality in Multidimensional Welfare Deprivation in West Africa" Policy Research Working Paper N°6522, The World Bank, Washington, DC.

Ametoglo, M. and G. Ping (2016) "Inequality, Poverty and Inclusive Growth in TOGO: An Assessment of the Survey Data" *Journal of Poverty, Investment and Development* **29**, 42-51.

Araar, A. (2006) "On the Decomposition of the Gini Coefficient: An Exact Approach, with an Illustration Using Cameroonian Data" Tech. Rep, CIRPEE-WP: 06-02, Université Laval, Quebec.

Atake, E-H., E.A., Agbodji, M.A.N., Yagninim, A.M., Tameko, L.A.T., Fotue, Y. Dandonougbu, A-F, Fofana (2017) " Togolese Informal Sector Workers' Willingness to Pay for Access to the Social Protection: the case study of CNSS" Working paper CBMS-2016-05.

Bachewe, F.N., G. Berhane, B. Minten and A.S. Taffesse (2017) "Agricultural Transformation in Africa? Assessing the Evidence in Ethiopia" *World Development*, doi.org/10.1016/j.worlddev.2017.05.041.

Berhane, G. and C. Gardebroek (2011) "Does Microfinance Reduce Rural Poverty? Evidence Based on Household Panel Data from Northern Ethiopia" *American Journal of Agricultural Economics* **93**, 43-55.

Bourguignon, F. (1979) "Decomposable Income Inequality Measures" *Econometrica* **47**, 901-20.

Bourguignon, F. and C. Morrison (2002) "Inequality among World Citizens: 1820-1992" *American Economic Review* **92**, 727-44.

Chantreuil, F. and A. Trannoy (2013) “Inequality Decomposition Values: The Trade-off between Marginality and Efficiency” *Journal of Economic Inequality* **11**, 83-98.

Charpentier A. and S. Mussard (2011) “Income Inequality Games” *Journal of Economic Inequality* **9**, 529-54.

Cowell, F.A. (1980) ”On the Structure of Additive Inequality Measures” *Review of Economic studies* **40**,521-31

Cutler, D. and L. Katz (1992) “Rising Inequality? Changes in the Distribution of Income and Consumption in the 1980s” *American Economic Review* **82**, 546-51.

Deutsch, J. and J. Silber (2008) “On the Shapley value and the decomposition of inequality by population subgroups with special emphasis on the Gini index” in *Advances on income inequality and concentration measures*, Betti, G., Lemmi, A. (eds), Routledge, London, 161-178.

Duclos, J.Y. and A. Araar (2006) “Poverty and Negative Incomes” Technical note, Université Laval, Quebec.

Duclos, J.Y., A. Araar and C. Fortin (1999) “DAD / A Software for Distributive Analysis / Analyse Distributive” MIMAP Programme, International Development Research Centre,Government of Canada , and Université Laval, Quebec.

Fambon, S. (2010) “Inequality in the Distribution of Household Expenditure in Cameroon: A Gini Decomposition Analysis Based on the Shapley-value Approach” *Educational Research* **1**, 021-031.

Fiszbein, A., R. Kanbur and R. Yemtsov (2014) “Social Protection and Poverty Reduction: Global Patterns and Some Targets” *World Development* **61**, 167-177.

Friedman, M. (1957) *A Theory of the Consumption Function* NBER, Princeton University Press, Princeton.

Gastwirth, J.L. (1971) “A general definition of the Lorenz curve” *Econometrica* **62**, 1037-1039.

Gumbo, T. (2010) “Microfinance institutions and urban housing in Addis Ababa: challenges and prospects for sustainable poverty alleviation” *Journal of Business and Administrative Studies* **2**, 54-73.

Imai, K. S., T. Arun and S.K. Annim (2010) “Microfinance and Household Poverty Reduction: New Evidence from India” *World Development* **38**, 1760-1774.

Jenkins, S.P. (1995) “Accounting for Inequality Trends: Decomposition Analysis for the UK, 1971-86” *Economica* **62**, 29-63.

Kanbur, R. and N. Lustig (1999) “Why is Inequality Back on the Agenda?” World Bank, Washington, DC.

Lawson Body, B., K. Baninganti, E. Homevoh and A.A. Lamadokou (2007) “Analyse comparative de l’état de pauvreté et d’inégalité au Togo: une approche multidimensionnelle basée sur l’indice de richesse” Cahier de recherche PMMA 2007-10, PEP (Poverty and Economic Policy) Net work, Université Laval, Quebec.

Liu, C., A. Esteve and R. Trevino (2017) “Female-Headed Households and Living Conditions in Latin America” *World Development* **90**, 311-328.

Milanovic, B. (2002) “True World Income Distribution, 1988 and 1993: First Calculations Based on Household Surveys Alone” *Economic Journal* **112**, 51-92.

Milazzo, A. and D. Van de Walle (2017) "Women Left Behind? Poverty and Headship in Africa" *Demography* **54**, 1119-1145.

National Institute of Statistics and Economic and Demographic Studies (INSEED) (2016) "Togo: Profil de la pauvreté 2006-2011-2015"

Noglo, Y. A. (2014) "Inégalité dans la distribution de la richesse non monétaire au Togo: une application de la decomposition de Gini en valeur de Shapley" *Mondes en développement* **4**, 107-128.

Noglo, Y. (2016) "The study of gender inequality among Togolese households through the (α, β)-muliti-level α-Gini decomposition: an approach using equivalence scales *Economics Bulletin* **36**, 1170-1184.

Oginni, A., B. Ahonsi and F. Ukwuije (2013) "Are female-headed households typically poorer than male-headed households in Nigeria? *Journal of Socio-Economics* **45**, 132-137.

Piketty, T. (1994) "Inégalité et redistribution" *Revue d'économie politique* **104**, 769-800.

Sastre, M. and A. Trannoy (2002) "Shapley Inequality Decomposition by Factor Components: Some Methodological Issues" *Journal of Economics* **9**, 51-89.

Sen, A. (1997) *On Economic Inequality* Oxford University Press, Oxford.

Shorrocks, A.F. (1980) "The Class of Additively Decomposable Inequality Measures" *Econometrica* **48**, 613-20.

Shorrocks, A.F. (1984) "Inequality Decomposition by Population Subgroups" *Econometrica* **52**, 1369-85.

UNDP (2016) "Human Development for Everyone" Human Development Report 2016, UNDP, New York.