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Patterns and trends in horizontal inequality in the Democratic Republic of the Congo

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Abstract: We analyse horizontal inequality in wealth and in years of education in the Democratic Republic of the Congo over the period 2001–13. We find that the trend in horizontal inequality is similar to the trend in vertical inequality over the period of analysis. In addition, horizontal inequality in years of formal education is higher among geographical, gender and linguistic groups, and lower among religious and ethnic groups. More specifically, horizontal inequality between genders is higher among individuals aged 25 years and over compared with the full sample of individuals aged 15 years and over. Based on a regression analysis, we find that household size, economic status and rural residence have a significant effect on gender-based inequality in years of education. We also find that gender-based horizontal inequality in years of education is higher in conflict-affected zones.

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1   Introduction

This paper aims to analyze group-based inequalities in the Democratic Republic of the Congo (DRC) along geographical, gender, ethnic, religious and linguistic lines. Of particular interest are the investigation of whether the country has been fairer or less fair over time from the group perspective, and the identification of the sources of potential inequality among different subgroups of populations. In addition, we will investigate whether there exists intercleavage inequality that might be a source of potential conflict, and thus of instability.

Such an investigation may be motivated by a twofold argument. First, given the role of both vertical and horizontal inequality in the development of conflict, political instability and economic outcomes (Alesina and Perotti, 1996; Nafziger and Auvinen, 1997, 2002; Collier, 2000; Collier and Hoeffler, 1998; Cramer, 2003; Stewart et. al., 2010), the paper will attempt to identify the aspects of societal structures on which one can act to prevent future developments of conflict in a post-conflict country, assuming that recent group inequalities played an important role in the recent conflicts in the DRC. This is important not only for post-conflict recovery, but also for any country in quest of fairness. Second, the evaluation of the extent of and trend in horizontal inequality will help to give a clear orientation to post-conflict recovery plans and to design policies that reliably lead to the achievement of sustainable development goals.

However, reaching sustainable development goals cannot be envisioned without proper consideration of the salient characteristics of the society in question, especially in an ethnically and linguistically diversified country such as the DRC. In particular, ethnicity—understood as any socially significant division of individuals in a society according to clearly defined characteristics—affects important aspects of the development process, and can seriously impede that process when people's access to current and future life-empowering opportunities is constrained by their ethnic membership. A common result is that ethnic diversity is a crucial cause of poverty and instability (Kaplan, 1984; Easterly and Levine, 1997), which has destructive effects on civil society and morale (Davidson, 1992) in Africa and interacts fairly extensively with class divisions in a country. It is arguable that dealing with ethnicity in Africa is crucial before we deal with problems such as political misrule, poverty and human misery (Noyoo, 2000).

In the specific case of the DRC, ethnicity as well as class plays an important role in the acquisition, maintenance and distribution of wealth, prestige and political power (Schatzberg, 1981). Thus ethnicity in all its forms is an important characteristic of the social landscape of the country. Therefore, measuring group-based inequality has important policy implications. However, there exist a very limited number of studies on either vertical or horizontal inequality in the DRC.

Among the rare papers in the literature, Moummi (2010) and Ortiz and Cummins (2011) analyze vertical inequality in the DRC and find that inequality considerably increased between 2005 and 2007. For example, the estimated Gini coefficient was 0.39 in 2005 at the national level, 0.38 in urban areas and 0.36 in rural areas. Regional disparities were characterized by higher inequality in the capital city, Kinshasa, with a Gini coefficient of 0.40, while some of the 10 provinces had relatively low levels. The Theil index was estimated at 0.32 nationwide, 0.31 in urban areas and 0.21 in rural areas. The estimated Gini coefficient was 0.422 in 2007.

Shapiro and Tambashe (1999) analyze the impact of poverty on gender differences in school enrollment rates of youth aged six to 25. The main finding is that while increased economic well-being is associated with higher enrollment rates for females and males, improved economic status does not translate into reduced gender differences in school outcomes. They argue that gender

differences in enrollment are relatively modest among the poorest households and tend to be widest in the next segment of the population. However, this analysis is limited in terms of geographical coverage as well as in terms of salient groups such as ethnic, religious and communal cleavages. In addition, the focus is on differences in school enrollment, rather than wealth and educational achievement in terms of years of formal education. Our paper, although restricted to individuals aged 15 and above, has a national and larger time coverage with a focus on inequalities in wealth and education. As such, it makes a major contribution to the understanding of the extent of horizontal inequality in the DRC over time.

We find that horizontal inequality in both wealth (economic status) and years of formal education follows the same trend as that observed in vertical inequality. On the one hand, horizontal inequality in wealth is higher among geographical areas, and lower among religious and ethnic groups. On the other hand, geographical-, gender- and language-based inequalities in years of education are higher than religion- and ethnic-based inequalities. It shall be noted in particular that gender-based horizontal inequality is higher among the population aged 25 and above than in the full sample, which includes individuals aged 15 and above. Finally, our regression analysis reveals that household size, residence (urban or rural) and wealth significantly explain the observed gender-based horizontal inequality in years of education. More specifically, an additional household member above the average household size increases gender-based horizontal inequality in education by between 0.019 and 0.038 percentage points, while an improvement in wealth leads to a decrease in horizontal inequality by between 0.046 and 0.114 percentage points. We also find a significant effect of conflict on gender-based horizontal inequality in years of education. In particular, conflict-affected zones have higher levels of inequality than non-affected zones.

The remainder of the paper is organized as follows. Section 2 describes the source of the data as well as the variables used in the analysis. Section 3 is devoted to the analysis of the extent of and trends in horizontal inequality with respect to different cleavages. The effect of conflict on group-based inequality is considered in Section 4, and the conclusion of the paper is provided in Section 5.

2   Description of the data

This section is devoted to the presentation of the data used in the analysis, and provides some important descriptive statistics as well as a description of the educational system in the DRC.

2.1   Source of the data

The analysis of horizontal inequality faces major challenges in terms of data. This is particularly true for the DRC, since one common source of data, the census, is unreliable. The only representative census that has ever been conducted was in 1984, and its various measures are currently considered obsolete and are not recommended as a reference for reliably planning and monitoring development.[1] Thus we use nationwide and representative surveys for up to five years of data between 2001 and 2013: the Multiple Indicators Cluster Surveys (2001 and 2010), the Demographic and Health Surveys (2007 and 2013) and the Consumption and Expenditure Surveys (2005).

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[1] http://ins-rdc.org/?q=content/deuxieme-recensement-general-de-la-population-et-de-l%E2%80%99habitat

We consider measures of group inequality in two socio-economic variables, namely wealth and years of formal education, along ethnic, religious, linguistic, regional, gender and geographical lines. To ensure comparability over time and among surveys, we constructed our own wealth index based on a common list of assets. The wealth index is built through factor analysis, using the first component as weights, following authors such as Sahn and Stifel (2000).

2.2   Descriptive statistics

We provide some descriptive statistics on ethnicity and education in Tables 1 and 2, based on the survey data. Table 1 shows that Christianity is the dominant religion in the DRC, and that more than 52% of the population lives in rural areas. The country's majority population is Bantu, among whom the dominant tribes are the Luba (18%), the Mongo (17%) and the Kongo (12%). However, it is important to note that, since we are not using census data, changes in various proportions of the population do not reflect real changes in population composition over time.

Table 1: Population by diversity variables

Diversity variable	Grouping	2005	2007	2010	2013
Ethnic group	Bantu		99.53	93.82	99.51
	Others		0.47	6.18	0.49
Gender	Female	51.49	55.78	51.06	53.13
	Male	48.51	44.22	48.94	46.87
Place of residence	Rural	54.28	52.76	56.99	65.36
	Urban	45.72	47.24	43.01	34.64
Religion	Christianity	86.56	91.14	84.28	91.93
	Islam	1.54	2.41	2.74	0.18
	Kimbaguism	3.09	3.58	3.29	3.15
	Animism	0.41	0.63	1.09	0.55
	Other religions	1.65	0.25	6.61	1.26
	No religion	6.75	1.99	1.99	1.31
Language	National dialects	94.84		66.27	
	Others	5.16		33.73	

Source: author's compilation.

Table 2: Percentage of population by level and years of education

		2007	2010	2013
Non-formal education		19.75	17.07	15.86
Some primary education		27.68	26.35	25.14
Completed primary and some secondary school		40.51	42.25	43.66
Completed secondary school		7.87	8.99	10.63
Some university education		3.38	2.20	3.66
University degree and above		0.80	3.14	1.05
Years of education (pop. 15+)	Full sample	6.43	7.67	6.55
	Educated	8.06	7.73	7.81
Years of education (pop. 25+)	Full sample	6.62	7.98	6.22
	Educated	8.74	8.05	7.86

Source: author's compilation.

2.3 The educational system in the DRC

The educational system in the DRC is managed at three main levels: central government, the regions, and educational institutions. The central government is responsible for general educational policy, with responsibility shared between two ministries: the Ministry of Primary, Secondary and Professional Education and the Ministry of Higher Education. At the regional level, the governor of each province is in charge of the administrative supervision of structures that represent the central government with regard to educational matters. There are four main levels: primary (six years), secondary (six years), university (five years) and post-university (four to seven years). The theoretical age ranges for the first three levels are respectively six to 11 years, 12 to 17 years, and 18 to 20/22 years.

We present information on educational attainment as well as the average years of formal education in 2007, 2010 and 2013. Table 2 shows that the proportion of the non-educated population decreased from about 20% in 2007 to about 16% in 2013, and that the proportion of the population with completed primary education and some secondary education is above 40% and has been increasing since 2007. The proportion of educated people with secondary education and above is less than 15%. Average years of education are presented for individuals aged 15 years and above, and then for those aged 25 years and above.

3 Trends in horizontal inequality

3.1 Overview of trends in vertical inequality

In this section we discuss our main results on inequality over time and across socially salient identified groups. We start by presenting measures of vertical inequality for the years considered in this paper in order to compare the trend in horizontal inequality to that observed in vertical inequality. Table 3 presents three measures of vertical inequality in years of education—namely the coefficient of variation (COV), the Gini coefficient (GINI) and the Theil index (THEIL)— and in wealth based on different surveys.

Table 3: Measures of vertical inequality (2003–2013)

Year	Years of education			Wealth		
	COV	GINI	THEIL	COV	GINI	THEIL
2001	0.5347	0.3040	0.1607	1.3241	0.6394	0.7248
2005	0.6962	0.3970	0.3768	1.0124	0.5102	0.4324
2007	1.3210	0.4705	0.6199	0.7562	0.3935	0.2522
2010	0.6406	0.2840	0.1531	0.7827	0.4113	0.2733
2013	0.8002	0.3922	0.3757	1.0101	0.49.9	0.4079
Variation (2001-2007) %	+147	+54.8	+286	-42.9	-38.5	-64.2
Variation (2007-2013) %	-39.4	-16.6	-39.4	+33.6	+24.8	+61.7

Source: author's computation.

Table 3 and Figure 1 show that the trend in vertical inequality (VI) differs for years of education and wealth. Panel (a) of Figure 1 shows that vertical inequality in education increased from 2001 to 2007 before decreasing subsequently until 2010 and then increasing from 2010 to 2013. In contrast, it can be seen from Panel (b) that vertical inequality in wealth decreased from 2001 to 2007 and then increased thereafter. Table 3 also shows the percentage change in each measure of vertical inequality for the subperiods 2001–2007 and 2007–2013.

Figure 1: Trends in vertical inequality

(a) VI in years of education   (b) VI in wealth
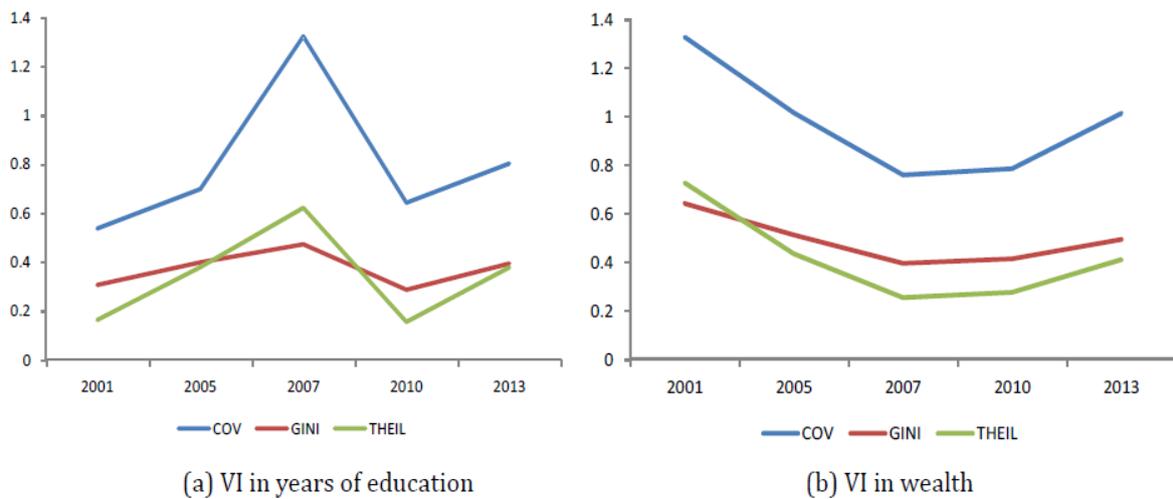
Source: author's computation.

3.2 Trends in horizontal inequality

The objective pursued in this section is to evaluate horizontal inequality along the ethnic lines previously identified, and then to compare its trend with that of vertical inequality. For each of these ethnic cleavages, inequality is measured using the three indicators suggested by Stewart et al. (2010), that is, the group-weighted Gini coefficient (GGINI), the group-weighted Theil (GTHEIL) and the group-weighted coefficient of variation (GCOV). These indicators are supplemented by the measures of cross-cuttingness and cross-fractionalization suggested by Selway (2011). We present trends in horizontal inequality first in economic status and then in years of education.

Table 4 shows higher horizontal inequality in wealth across geographical areas, namely across regions and between rural and urban residents. For both cleavages, horizontal inequality decreased from 2001 but was on rise at the end of the period of analysis. Horizontal inequality between urban and rural areas decreased until 2007 and increased thereafter, with the highest surge observed between 2010 and 2013. In contrast, horizontal inequality among regions decreased until 2010 and increased between 2010 and 2013. It can also be seen from Table 4 that the levels of horizontal inequality are lowest across ethnic, linguistic and religious groups, although these do not depict a common trend.

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Table 4: Trends in horizontal inequality in wealth

Indicator	Year	Ethnicity	Urban/rural	Religion	Region	Language
GCOV	2001		0.970		0.960	
	2005		0.651	0.136	0.770	0.239
	2007	0.078	0.540	0.080	0.537	
	2010	0.132	0.566	0.082	0.500	0.472
	2013	0.091	0.721	0.137	0.702	
GGINI	2001		0.473		0.444	
	2005		0.324	0.011	0.368	0.045
	2007	0.001	0.269	0.019	0.253	
	2010	0.027	0.280	0.017	0.227	0.136
	2013	0.000	0.343	0.016	0.301	
GTHEIL	2001		0.510		0.366	
	2005		0.092	0.060	0.105	0.065
	2007	0.035	0.080	0.018	0.052	
	2010	0.033	0.082	0.027	0.044	0.203
	2013	0.041	0.111	0.056	0.074	

Source: author's computation.

Next we analyze horizontal inequality in education, as measured by years of formal schooling, for respondents aged 15 and above (Table 5) and for respondents aged 25 and above (Table 6). The calculated values of GCOV, GGINI and GTHEIL indicate higher horizontal inequality across geographical areas, namely across regions, between rural and urban areas, and between the capital city and other areas of the country. Group-based inequality between males and females is also high, but the lowest levels of inequality are observed among ethnic, linguistic and religious groups. As far as education as a continuous variable is concerned, the observed trend in horizontal inequality is the same for all groups, and is similar to that in vertical inequality (see Table 3). More precisely, the observed levels of horizontal inequality evolve in three phases: a decrease from 2001 to 2007, a decrease between 2007 and 2010, and then an increase between 2010 and 2013. In general, inequality levels across groups are higher among respondents aged 25 and above than among respondents in the whole sample, which includes individuals aged 15 and above.

Table 5: Measures of horizontal inequality in education (age 15+ years)

	Year	Ethnic groups	Language	Religion	Region	Gender	Rural/ urban	Capital/ others
GCOV	2001				0.202	0.100	0.224	0.230
	2005		0.144	0.020	0.221	0.208	0.271	0.250
	2007	0.044		0.072	0.292	0.209	0.332	0.393
	2010	0.058	0.143	0.036	0.132	0.114	0.200	0.217
	2013	0.027		0.075	0.228	0.221	0.281	0.397
GGINI	2001				0.101	0.050	0.106	0.058
	2005		0.029	0.004	0.123	0.104	0.132	0.075
	2007	0.001		0.011	0.142	0.102	0.166	0.105
	2010	0.014	0.062	0.007	0.058	0.057	0.099	0.038
	2013	0.001		0.009	0.104	0.110	0.134	0.081
GTHEIL	2001				-0.033	-0.007	-0.025	0.222
	2005		0.003	0.000	0.015	0.022	0.017	0.224
	2007	0.019		0.024	0.017	0.028	0.032	0.169
	2010	0.008	0.025	0.009	0.001	0.007	0.004	0.096
	2013	0.009		0.029	0.010	0.020	0.020	0.182

Source: author's computation.

Table 6: Measures of horizontal inequality in education (age 25+ years)

	Year	Ethnic groups	Language	Religion	Region	Gender	Rural/ urban	Capital/ others
GCOV	2001				0.250	0.135	0.229	0.232
	2005		0.161	0.020	0.251	0.249	0.280	0.250
	2007	0.052		0.079	0.332	0.274	0.375	0.488
	2010	0.057	0.159	0.042	0.136	0.148	0.214	0.234
	2013	0.032		0.074	0.264	0.291	0.318	0.468
GGINI	2001				0.102	0.067	0.108	0.060
	2005		0.032	0.004	0.130	0.124	0.139	0.075
	2007	0.001		0.011	0.165	0.134	0.192	0.126
	2010	0.014	0.069	0.008	0.060	0.074	0.106	0.037
	2013	0.002		0.010	0.119	0.145	0.150	0.098
GTHEIL	2001				-0.039	-0.013	-0.030	0.224
	2005		0.005	-0.000	-0.008	0.031	0.014	0.224
	2007	0.022		0.070	0.093	0.131	0.138	0.538
	2010	0.008	0.004	0.009	0.001	0.006	0.004	0.106
	2013	0.011		-0.025	0.013	0.029	0.025	0.220

Source: author's computation.

The observed inequality in years of formal education between males and females is mainly explained by factors such as early marriage of girls and the financial deprivation of most households (INS, 2014). For example, about 12% and 11% of women were married before 15 years in 2007 and 2010 respectively. Generally, early marriage is accompanied by the termination of school attendance. This phenomenon is more prominent in rural than urban areas, and thus explains a significant proportion of the geographical disparities in the average years of education.

3.3 Sources of horizontal inequality

Table 7 summarizes the decomposition of horizontal inequality in years of education into a component due to characteristics that are specific to each group (within-group inequality) and a component that is due to differences between groups (between-group inequality) based on gender and geographical areas. The decomposition is achieved on the basis of the GTHEIL coefficient, which satisfies the decomposability property. As it turns out, the proportion of horizontal inequality due to characteristics that are gender-specific increased between 2007 and 2013. For individuals aged 15 years and above, this proportion increased from about 70% to 93%, while it increased from 62% to 93% for individuals aged 25 and above. Table 7 also shows that at least 30% of the increased horizontal inequality is explained by differences between men and women.

Table 7: Percentage of within-group inequality

Age range	Year	Gender	Urban/rural	Region
15 years and more	2007	69.7	72.4	67.5
	2013	92.6	36.3	32.9
	Change (%)	+22.9	-36.3	-31.6
25 years and more	2007	62.9	82.6	41.1
	2013	93.3	35.5	33.4
	Change (%)	+30.3	-47.1	-7.70

Source: author's computation.

The proportion of horizontal inequality based on geographical areas (urban/rural, region) that is explained by group-specific factors declined between 2007 and 2013, in contrast with the trend in

gender-based horizontal inequality. This implies that the observed inequality in years of education is increasingly explained by differences between rural populations and urban populations, as well as differences among different regions of the country.

3.4   Cross-cuttingness and cross-fractionalization

In the above sections we analyzed group-based inequality along ethnolinguistic, religious and linguistic lines. We were then able to decompose the sources of the observed group inequality accordingly, especially horizontal inequality in years of education as far as gender and geographical areas were concerned. However, the results obtained cannot help us to answer questions about intergroup inequality and the possibility of conflict onset. To be able to do so, we analyze the measures of cross-cuttingness and cross-fractionalization recently developed in the literature in conjunction with the study of horizontal inequality (Selway, 2011; Gubler and Selway, 2012). Following Gubler and Selway (2012), we maintain that the probability of the onset of civil war is lower when the ethnic cleavage in a society is cross-cut with other salient cleavages in that society, namely geography, socio-economic status and religion. Indeed, these three factors have been attributed with the potential for conflict onset in the literature (Matuszeski and Schneider, 2006; Collier and Hoeffler, 2004; Humphreys and Weinstein, 2008; Stewart, 2000; Stewart et al., 2010). The main point is that higher cuttingness of the ethnic cleavage with the three other salient cleavages creates a context that is unfavorable to the onset of civil war, decreasing its likelihood even in societies with other favorable conditions (Gubler and Selway, 2012), and thus leading to a more stable society and less interethnic inequality. Thus higher cross-cuttingness promotes social and political stability that is favorable for investment and economic growth.

We present the measures of ethno-religious, ethno-geographical and ethno-economic cuttingness in Table 8. The measure of ethno-economic cuttingness was calculated with respect to the wealth level of the respondents, based on wealth distribution rather than income distribution. Measures of cross-cuttingness were obtained as averages based on the Demographic and Health Survey datasets to ascertain the homogeneity of the data used. It turns out that although the DRC is not a perfect cross-cuttingness country, it is characterized by quite a high degree of cuttingness, suggesting lower interethnic inequalities. It is important to observe that all the measures of cross-cuttingness involving ethnic groups are higher than 0.85. On the other hand, there is lower cross-cuttingness with regard to educational attainment and gender, educational attainment and economic status, and educational attainment and geographical areas (urban/rural), suggesting the existence of some extent of intergroup inequality along these cross-cleavages. Here, educational attainment is measured in terms of a six-point scale (0 = no formal education; 1 = some primary schooling; 2 = completion of primary school and some secondary schooling; 3 = completion of secondary school; 4 = some tertiary education; 5 = university degree or above). Measures of cross-fractionalization globally show that there is no evidence of reinforcement of one cleavage.

Table 8: Measures of ethnic diversity

Cross-cleavage		2007	2013	Average	Change
Ethnicity/religion					
	CC	0.865	0.877	0.871	+0.012
	CF	0.171	0.161	0.166	-0.010
Ethnicity/wealth					
	CC	0.930	0.924	0.927	-0.006
	CF	0.971	0.793	0.792	+0.002
Ethnicity/educ. attain.					
	CC	0.937	0.907	0.922	-0.030
	CF	0.764	0.776	0.770	+0.012
Religion/wealth					
	CC	0.765	0.877	0.821	+0.112
	CF	0.694	0.606	0.650	-0.088
Religion/educ. attain.					
	CC	0.824	0.825	0.825	+0.001
	CF	0.338	0.676	0.507	+0.338
Wealth/educ. attain.					
	CC	0.502	0.477	0.490	-0.025
	CF	0.338	0.101	0.220	-0.237

Source: author's computation.

3.5 Measures of ethnic diversity

Understanding ethnic diversity in a society is important, since a highly diversified society may be prone to tension that can create social instability and lead to conflict. In addition, high ethnic diversity generates undesirable outcomes such as low economic growth (Easterly and Levine, 1997), high levels of corruption (Mauro, 1995), low social cohesion and low contribution to local public goods (Alesina et. al., 1999). Thus lower levels of ethnic diversity are desirable. Two measures of ethnic diversity are considered in this paper, namely ethnic fractionalization (Taylor and Hudson, 1972) and ethnic polarization (Montalvo and Reynal-Querol, 2005, 2008). While measures of ethnic fractionalization are appropriate for determining the probability that two randomly drawn individuals in a society belong to different ethnic groups, measures of ethnic polarization are more intended to capture the intensity of disagreement across ethnic groups (Alesina et al., 2003).

The indices of ethnic fractionalization and ethnic polarization were obtained using the 2007 and 2013 Demographic and Health Survey datasets. We calculated each index for each year, and then considered the average as our index of ethnic diversity. The calculated polarization index was 0.787 in 2007 and 0.759 in 2013, while the values of the fractionalization index were 0.819 in 2007 and 0.842 in 2013. We thus obtain a measure of polarization of 0.773 and a measure of ethnic fractionalization of 0.831 over the considered period. These values are quite high, and convey the idea of a highly ethically diversified society. It is important to mention that the measure of ethnic fractionalization obtained in this paper is comparable with the value of 0.875 obtained by Alesina et al. (2003) for the DRC.

4   The effect of conflict

The literature sufficiently documents the relationship between conflict and inequality, both vertical and horizontal. One strand of the literature argues that vertical inequality in national income distribution, as measured by the Gini coefficient, is a strong predictor of political instability and conflict (Alesina and Perotti, 1996; Nafziger and Auvinen, 1997, 2002), and that national income

distribution is far more significant in causing conflict than factors such as land distribution (Muller and Seligson, 1987). However, a consideration of vertical inequality alongside other factors such as income per capita, natural resource endowment and ethnolinguistic fragmentation leads to contrasting conclusions as to the role played by inequalities in causing conflict. In particular, inequality is inversely correlated with conflict, as inequality significantly reduces the risk and duration of war (Collier and Hoeffler, 1996, 1998). Thus inequality is bad for and makes no significant contribution to conflict (Collier, 2000). In addition, the empirical findings on the causal link from vertical inequality to conflict have been disputed in light of both cross-sectional data (Fearon and Laitin, 2003) and historical data (Cramer, 2003). An interesting implication of this analysis is that it may well be true that inequality produces conflict and often violence, but this need not attain the scale of civil war (Cramer, 2003).

The relation between horizontal inequality and conflict has been explored as well. Independently of vertical inequality, increasing group inequality is an important source of grievance that leads to conflict (Stewart, 2000, 2002; Murshed and Gates, 2005; Stewart et al., 2010). In particular, group inequality affects the well-being of group members, and the relative impoverishment of the group increases its members' perception that they are likely to be trapped permanently in a poor position—a perception that is more likely to trigger conflict. From this perspective it is important to identify the cleavages that are more likely to generate conflict. In this regard, ethnicity has received particular interest in many studies. For example, Robinson (2001) argues that ethnic conflict tends to increase as intergroup inequality increases, although such inequality is not immediately deduced from socio-economic inequality as usually measured. However, Esteban and Ray (1999, 2008) argue that polarization as a measure of interpersonal antagonism matters more than inequality in explaining the emergence and intensity of conflict.

It is important to note that none of the aforementioned studies has analyzed the relationship between inequality and conflict in the DRC, and that we are not aware of any such studies. Nonetheless, the main question is whether it is inequality that causes conflict in the country or vice versa. To answer this question, it is important to understand that according to UNDP (2014) conflict risk factors in the DRC are rooted in long-standing tensions over ethnicity and citizenship rights, which in turn are related to grievances over access to resources, particularly land but also minerals and other natural resources. However, the recent conflict in the country has been particularly fueled by the quest for natural resources and control over informal cross-border trading activities by many actors whose sole motive is the accumulation of personal wealth. Therefore there is room to argue that the ethnicity component has played a less important role in the conflict. Indeed, no dominant or disadvantaged groups, ethnic or otherwise, have been significantly associated with the conflict in the DRC or exclusively engaged in armed conflicts with the central government. This argument can be supported not only on the basis of the empirical evidence above related to cross-cutting, but also by Bates' (2000) argument that ethnic diversity does not imply political violence, especially when it provides a political structure that renders implicit contracts between generations credible. In addition, and also following Bates (2000), none of the largest ethnic groups in the DRC amounts to 50% or more of the population, so there is no possibility of permanent political homogeny or permanent political exclusion—circumstances under which people may change their preferred form of political action, switching from protest to violence.

In contrast, we argue that the conflict in the DRC has aggravated existing inequalities, especially vertical inequalities, and in turn these inequalities have reinforced the scope of the conflict under cover of natural resource extraction. The situation is thus comparable to the conflicts in Angola, where increasing oil and diamond production during the 1960s and 1970s considerably raised the stakes of conflicts and, together with the war itself, fueled rising inequality (Hodges, 2001). The main channels of conflict in the DRC are poor governance, the weakness of state institutions,

extreme poverty, youth unemployment, and the political and economic marginalization of the majority of the population; bad governance at the administrative, economic, political, judicial and security levels is characterized by the absence of citizen participation, the failure of parliamentary oversight of government actions, and the disconnection of elected officials from the population they are supposed to represent (UNDP, 2014). To test our argument that conflicts in the DRC have aggravated existing inequalities, we conduct a regression analysis in order to test the effect of conflict after controlling for other factors. A positive significant effect of conflict on horizontal inequality would corroborate our guess.

4.1   Empirical analysis of the relation between horizontal inequality and conflict

Figure 2: Map of the second Congo War, 2001–2003
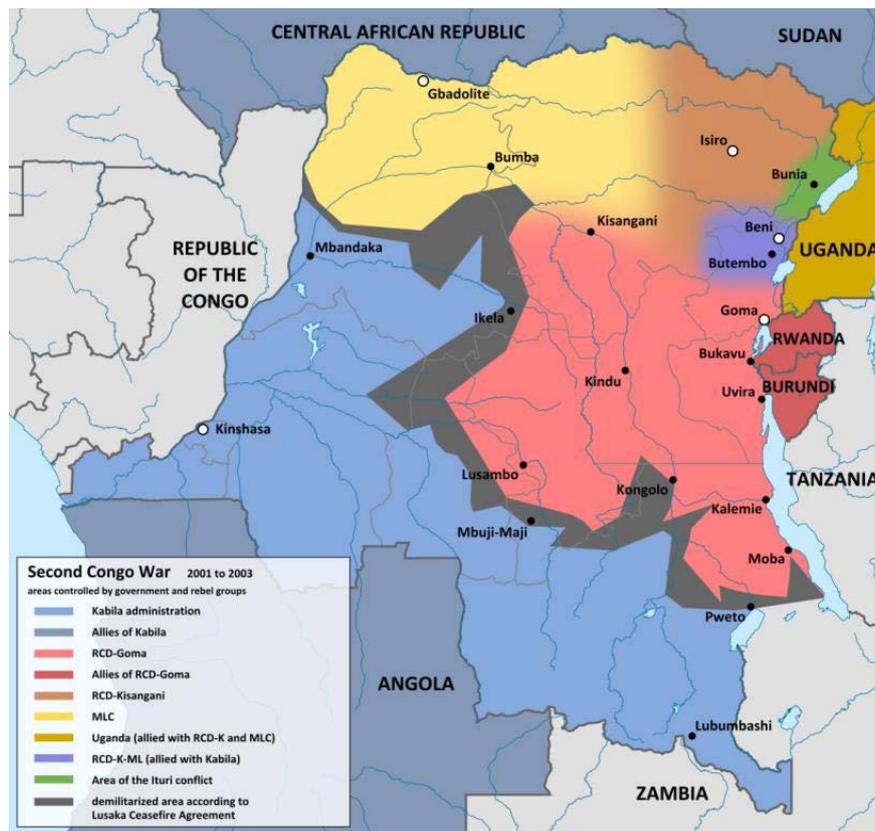
In this section we aim to assess the effect of conflict on the extent of and trends in group-based inequality in the DRC. This question is of crucial importance in the country's post-conflict era, and the data at hand cover the period of repeated unforeseen developments in the conflict. Assuming that a relatively long period of conflict can create huge inequalities between conflict and non-conflict zones that can last for many years, we split the country into two zones for the purpose of the analysis, using the map of the second Congo War (see Figure 2). The non-conflict zone is made up of all the territories that were held by the central government (the capital city Kinshasa, Bandundu, Bas-Congo, part of Katanga, Kasai-Occidental, part of Kasai-Oriental and part of

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Équateur); the conflict zone is made up of the old districts[3] and provinces that were held by rebel groups during the second Congo War (Ituri, Sankuru, Haut-Uele, Bas-Uele, Nord-Ubangi, Mongala, Tanganika, and the provinces of Maniema, North Kivu and South Kivu). Using data from the 2007 and 2013 Demographic and Health Surveys, we analyze the determinants of horizontal inequality, especially gender-based inequality in years of education.

4.2 The model

We consider the following panel data models for each of the inequality measures:

$$\text{GGINI}_{it} = \beta_0 + \beta_1 Conflict + \beta_2 Wealth_{it} + \beta_3 Hhsize_{it} + \beta_4 Rur + \beta_5 Y2013 \qquad [1]$$

$$+ \varepsilon_{it}$$

$$\text{GCOV}_{it} = \beta_0 + \beta_1 Conflict + \beta_2 Wealth_{it} + \beta_3 Hhsize_{it} + \beta_4 Rur + \beta_5 Y2013 + \varepsilon_{it} \quad [2]$$

where $Conflict$ is a dummy variable that takes on the value 1 for parts of the country that were affected by conflicts and 0 otherwise; Rur is a dummy variable that takes on the value 1 for rural areas and 0 otherwise; $Y2013$ is a dummy variable that takes on the value 1 for the year 2013 and 0 otherwise; $Wealth_{it}$ is the wealth index for a given zone i in year t; and $Hhsize_{it}$ is the average size of household in region i in year t.

Table 9: Heteroskedasticity-robust estimation of the inequality equation

Variable	GGINI equation		GCOV equation	
	(1)	(2)	(3)	(4)
Conflict		0.069***		0.174***
		(0.000)		(0.009)
Wealth	-0.058***	-0.046***	-0.142***	-0.114***
	(0.000)	(0.000)	(0.000)	(0.000)
Household size	0.031***	0.019***	0.068***	0.038***
	(0.000)	(0.000)	(0.000)	(0.004)
Rural areas	0.068***	0.060***	0.117**	0.073**
	(0.000)	(0.000)	(0.017)	(0.023)
Year 2013	-0.102***	-0.061***	-0.061***	-0.157***
	(0.000)	(0.003)	(0.000)	(0.009)
Constant	-0.013	0.012	0.012	0.065
	(0.807)	(0.770)	(0.977)	(0.538)
R^2 Within	0.7367	0.7973	0.7369	0.7964
Between	0.6726	0.7492	0.5562	0.6509
Overall	0.7044	0.7731	0.6580	0.7327
Prob(Chi2)	0.000	0.000	0.000	0.000
Observations	62	62	62	62

Source: author's computation.

Our sample is made up of 31 geographical entities over the two periods (2007 and 2013), which allows us to use 62 observations in the analysis. The two years were considered as they relate to the same survey, ensuring the same methodology of data collection. In addition, the chosen period is of interest as it characterizes the post-conflict period, during which the government implemented various policy reforms in order to boost economic growth and mitigate the effect of

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[3] Old districts have now been turned into provinces.

conflicts. More importantly, this choice allows us to learn whether the implemented policies have had any significant effect on horizontal inequality.

To achieve this, a dummy variable ($Y2013$) is included to account for trends in horizontal inequality in education. Reported in Table 9 is the heteroskedasticity-robust estimation of equations [1] and [2] with random effects. Globally, all the factors are statistically highly significant determinants of gender-based inequality in years of formal education, as all the estimated coefficients are statistically significant in both estimated equations. The significant coefficients are so at the 1% significant level, except the coefficient of *Rur* in the GCOV equation. The independent variables included in the regression explain more that 65% of the variations in the observed horizontal inequality when the conflict variable is not included in the model, and more than 73% when the conflict variable is accounted for.

Three facts are worth mentioning. First, an increase in the size of household above the average household size leads to an increase in gender-based inequality in education. Second, gender-based horizontal inequality in education decreases with the improved economic status of households, as proxied by the wealth index. Third, the level of gender-based inequality in years of education was lower in 2013 compared with 2007. Finally, gender-based inequality in years of formal education is higher in conflict-affected areas than in non-affected areas. The estimated models show that gender-based inequality in years of education is 0.069 points higher in conflict-affected areas based on the GGINI index, and 0.174 points higher based on the GCOV index.

5   Conclusion

The aim of this paper was to analyze the extent of and trends in group-based inequality in the DRC in comparison with the trend in vertical inequality. To achieve this objective, we used data from five surveys conducted between 2001 and 2013 in the categories of Demographic and Health Surveys, Multiple Indicator Cluster Surveys, and Consumption and Expenditure Surveys. To operationalize our objective, we calculated group-weighted inequality measures (GGINI, GTHEIL and GCOV) and conducted a regression analysis in order to identify the significant determinants of gender-based horizontal inequality in years of education, using the data for 2007 and 2013. The measures of horizontal inequality were complemented by measures of cross-cuttingness and cross-fractionalization.

The main finding is that horizontal inequality followed the same trend as vertical inequality over the period of analysis. Vertical inequality in years of education increased between 2001 and 2007, then decreased between 2007 and 2010, but was been on the increase after 2010. However, a different trend was observed in vertical inequality in economic status: it decreased between 2001 and 2007, and increased between 2007 and 2013. For example, the Gini coefficient of education increased from 0.30 in 2001 to 0.47 in 2007, then decreased from its 2007 level to 0.39 in 2013. The Gini coefficient for wealth decreased from 0.64 in 2001 to 0.39 in 2007, and then increased to 0.41 in 2010 and 0.49 in 2013.

Horizontal inequality along different dimensions of ethnic diversity (ethnic groups, religion, region, geographical area, language) followed the same trend as that observed for vertical inequality for both socio-economic variables (years of education and wealth). It is important to note that the levels of horizontal inequality in economic status, as measured by the wealth index, are higher among geographical areas, especially among administrative regions and between rural and urban areas. In contrast, lower levels of horizontal inequality were observed among religions and among ethnic groups. On the other hand, the analysis of horizontal inequality in years of formal education

shows that geographical, gender and linguistic inequalities are more important than those observed among religions and ethnic groups. In addition, horizontal inequality between males and females is higher among individuals aged 25 and over compared with the level observed in the full sample of individuals aged 15 years and over for a particular year.

The regression analysis of the determinants of horizontal inequality indicates that household size, economic status and rural residence have a highly significant effect on gender-based inequality in years of education. While larger size of household and rural residence increase gender-based horizontal inequality in education, improved economic status through higher levels of wealth decreases its extent. Moreover, the results confirm the decreasing trend in horizontal inequality between 2007 and 2013. Finally, there exists a significant relation between gender-based horizontal inequality in years of education and conflict. The estimated effect is positive and highly significant, showing that the conflict has aggravated existing inequalities.

These findings are important for informing the kinds of action to be undertaken in order to achieve sustainable development goals with fairness from the group perspective. To this end, there is a need to identify persistent group-specific characteristics, as well as factors that reinforce differences between groups and constrain the implementation of a fairer society in the DRC from the perspective of groups in general and more equitable groups within identified cleavages in particular. These are factors on which policies can efficiently act in order to reduce and reverse the direction of growing group-based inequalities in both economic status and years of education. The focus must then be on gender-specific issues that constrain the economic and educational empowerment of women within and across different cleavages, as well as specific factors pertaining to the rural-urban gap in terms of access to assets, public service utilities and the formal educational system.

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