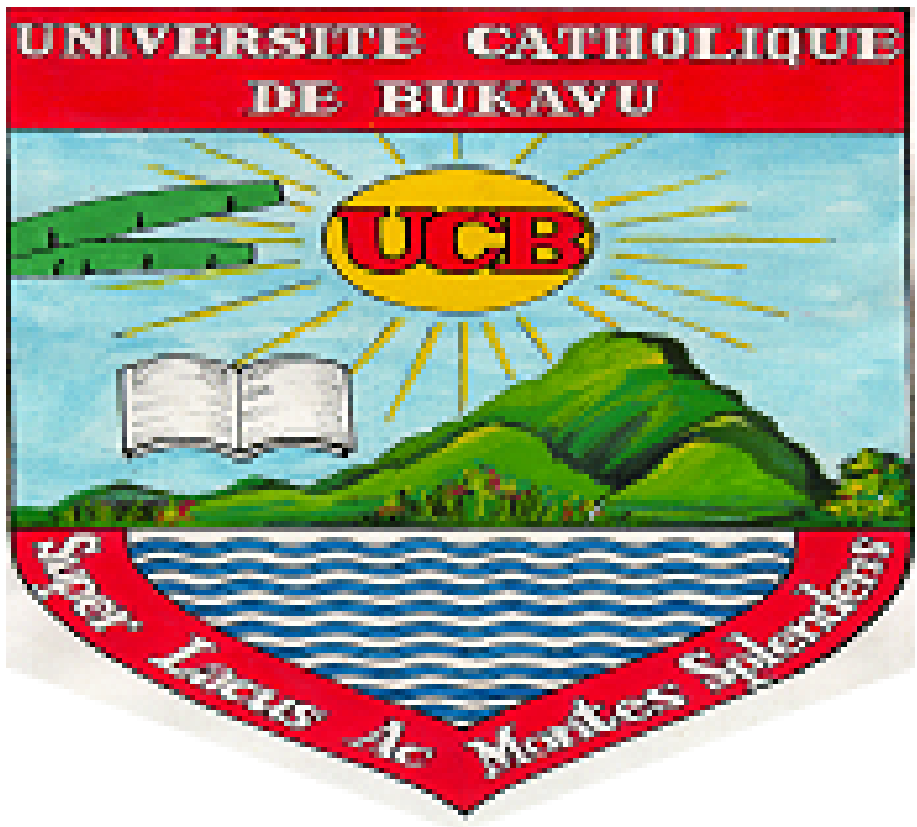


Vulnerability to Poverty and Artisanal Mining in Eastern DR Congo

An empirical study based on eight artisanal mining sites in South Kivu

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Abstract

Discussions and debates have been on going about incidents, a major cause of under productivity and poverty of artisanal mining in eastern DR Congo. To inform these debates this paper applies econometrics to artisanal mining survey data in order to estimate and determine the factors which drive vulnerability to poverty, a novel way to assess poverty. The study uses data from a random sample of 834 households collected by the Center of Expertise in Mining Governance (CEGEMI) in 2016. This paper tests the hypothesis that the factors affecting artisanal households’ vulnerability to poverty status are not necessarily the same as those affecting their extent of vulnerability. Results from the double hurdle model indicates that the same variables which influence the status of vulnerability are likely to be the same which are influence the extent of vulnerability to poverty. Marital status, level of education, religion, number of working days per week were found to influence negatively the probability to be vulnerable to poverty and its extent. Among considering chocs or incidents only health status and conflict army were found to influence positively the probability to be vulnerable to poverty and its extent. The paper concludes with policy implications aimed at renewing the focus on incidents assessment and tackled in artisanal mining in South Kivu and other areas with similar conditions like conflict army, etc.

Introduction

The artisanal mine is a key sector in DR Congo. Not only for its advantage in terms of economic well-being: this sector is a direct source of income for thousands of families and the lives of nearly 10 million people depend on the so-called artisanal mine. But also because artisanal mining is an activity tainted risks (accidents, contamination, depletion, environmental destruction, etc.) and source of conflicts and armed violence. But in this environment, we agree, especially given the work of Chaudhuri and Christiaensen (2002), that the shortcomings of the poverty analysis to induce effective policies are such that today they have justified the rise of the analysis of vulnerability to poverty. This study is part of the approach of ”vulnerability to poverty.”

The concept of ”vulnerability to poverty” is currently well documented in the agriculture and livestock sectors. We still have to make it a real state of place in relation to the artisanal mining sector. However, on the one hand, it does not focus on the perception of artisanal miners on how they are affected by the shocks they face and its qualitative explanations. On the other hand, it is already implemented quantitatively in some ad hoc work, which means that the objectives presented below find a smaller empirical base.

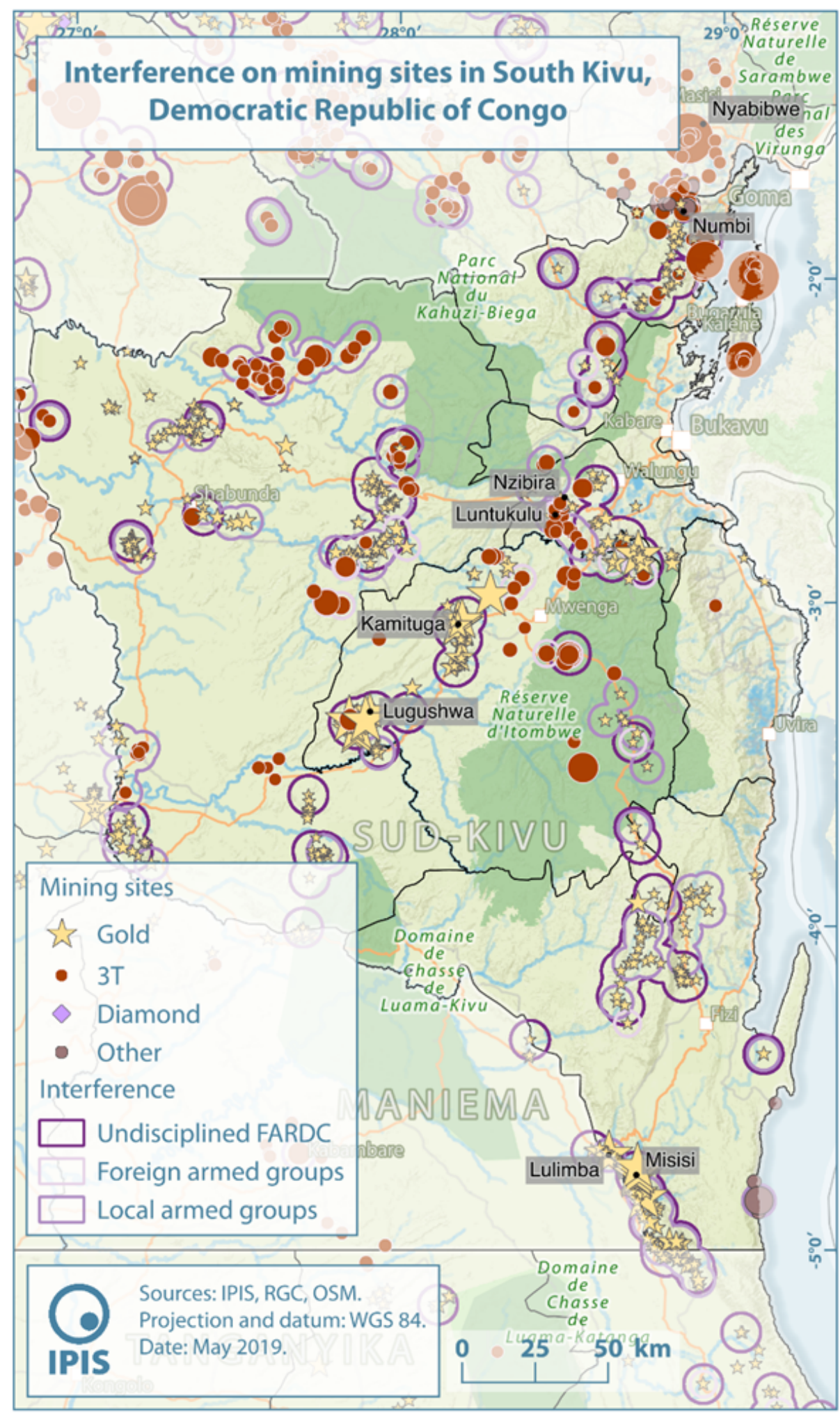
Main Objectives

1. Estimate the percentage of vulnerability to poverty.
2. Understand the binomial poverty and vulnerability to poverty
3. Determine the factors influencing vulnerability to poverty
4. Identify factors affecting the intensity of the vulnerability to poverty

Study area and Methods

Study area

The analysis of vulnerability to poverty in this work is based on household surveys carried out between July and September 2016 among 1672 households (10,199 individuals) living in and around 8 mining sites in South Kivu: Kamituga , Lugushwa, Nyabibwe, Numbi, Luntukulu, Nzibira, Misis and Lulima. These mining sites have been selected from the list of artisanal mining sites in South Kivu provided by the International Peace Information Service (IPS) in four territories of the province - the territory of Mwenga, Kalehe, Walungu and Fizi as presented on this figure. The criteria used in the selection of sites are: accessibility, safety, importance in terms of the number of diggers who work, as well as the presence of non-mining households (agricultural and commercial)



Method

With reference to previous studies, vulnerability to poverty is perceived as the probability that a household’s per capita consumption falls below the poverty line given its observable characteristics. Formally the vulnerability is defined in this way :

$$v_i \equiv P_r(C_i < z \mid x_i) \quad (1)$$

The operationalization of the equation (1) several authors assume that the logarithm of the consumption is conditionally linear as :

$$\ln C_i = x_i \beta + \varepsilon_i \quad (2)$$

Considering in addition σ_i the standard deviation of ε_i , which can be heteroscedastic between individuals, and ε_i is normally distributed, equation (1) can be reduced to :

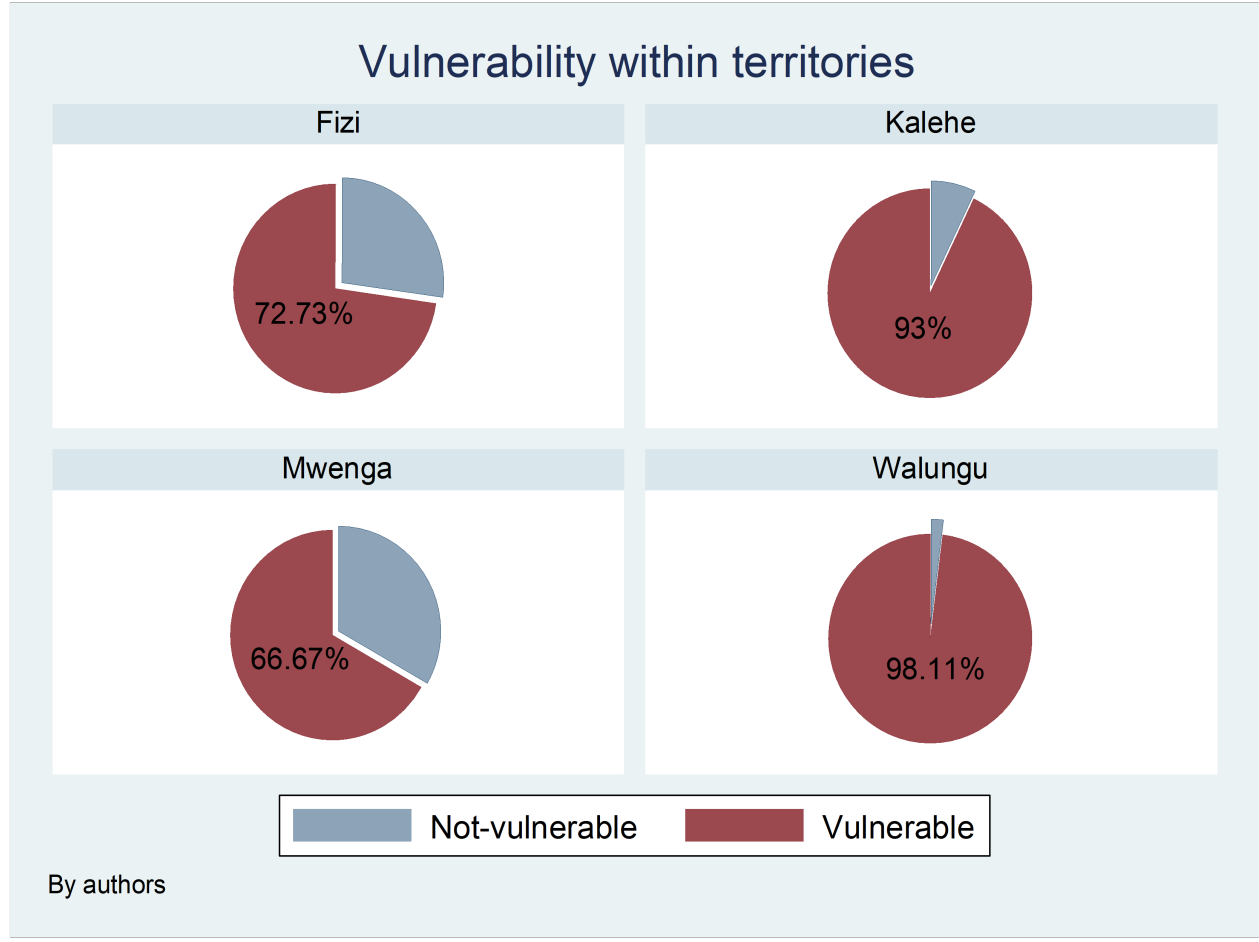
$$v_i = \frac{\phi((\ln z - x_i \beta)}{\sigma_i} \quad (3)$$

By replacing the parameters β , σ_i with their estimators in equation (3), we obtain a measure of the vulnerability. A household will therefore be classified in the most vulnerable group $v_i \geq 0.5$ and less vulnerable $v_i < 0.5$, with the value 0.5 being the separator.

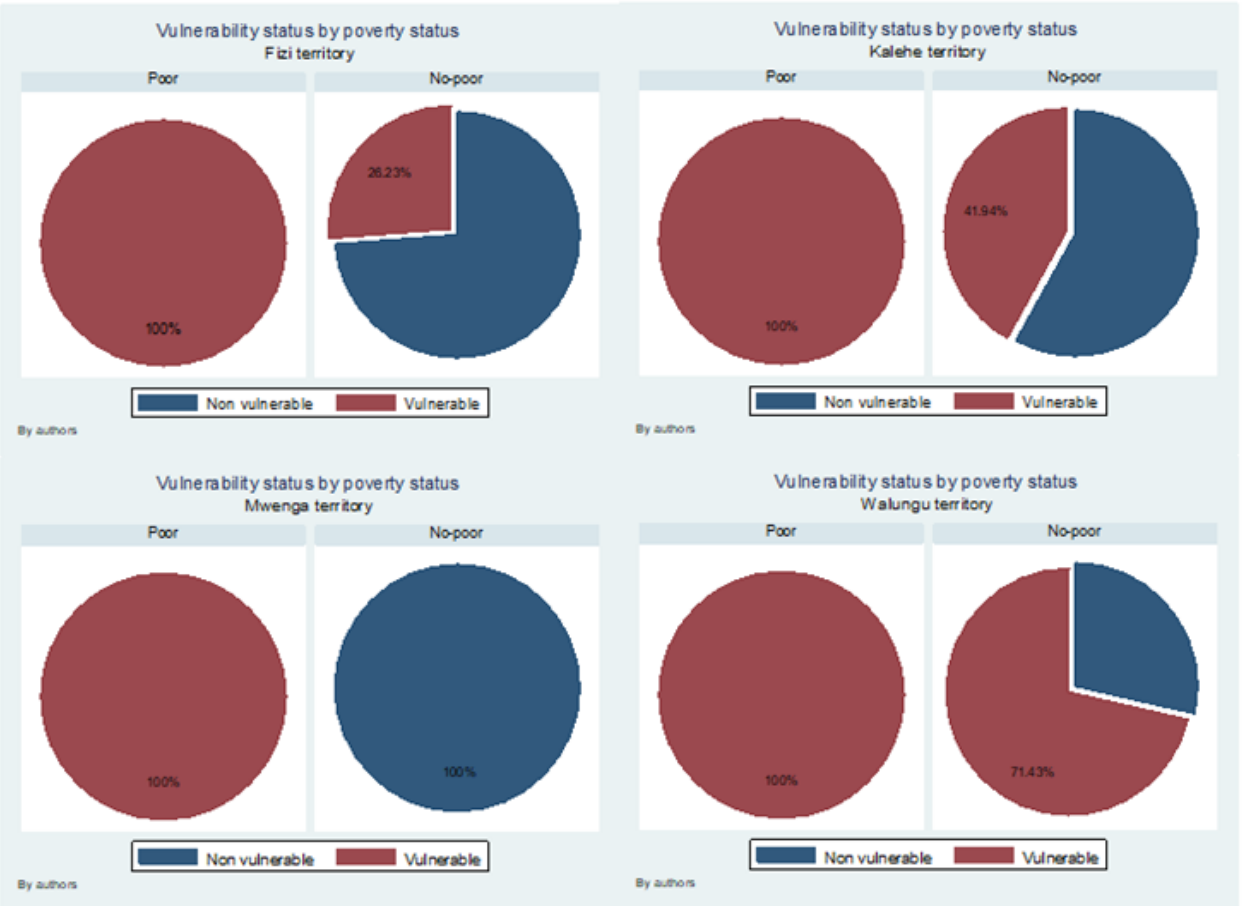
Results

Rate of Vulnerability to poverty : The results below educate the vulnerability rate of poverty in the territories concerned. The territory of Walungu reflects a highest rate of vulnerability to poverty - 98.11% - in the two mining sites considered (Nzibira and Luntukulu). The territory of Mwenga is the territory whose rate of

vulnerable households is the lowest (66.67%) in the two sites considered (Kamituga and Lugushwa). These results can be supported by the mapping provided by IPIS on the presence of foreign, local and FARDC armed forces in these mine sites. It can be seen on the map below for information that Walungu sites have a strong presence of undisciplined FARDC unlike those of Mwenga, which explains to some extent a high vulnerability to poverty.



Determinants of vulnerability to poverty in mining sector : The status of vulnerability to poverty is positively influenced by some chocs like health degradation and conflict army. Health degradation can lead on more health expenditure and then cause less expenditure for food and other important needs. In most of cases in eastern DR Congo conflict army remains the important source of lose income in rural areas. These results show the importance of incidents assessment in artisanal mining in South Kivu. Less choc can reduce considerably the probability of mining household to be vulnerable to poverty.



Determinants of Extent of vulnerability to poverty in mining sector : The results from the Tobit and Truncated model were comparable which show the robustness of our results to model specification. All the statistically significant variables had the same directional effects in all of the two models. Health state, Army conflict and regions were found to have significant effects in explaining the level of the probability to observe the per capita expenditure to be below the poverty line. These included all significant variables find in the probit model.

variables	Tobit	Probit	Truncated
Health state	0.37*	0.08**	0.08**
Army conflict	0.34**	0.10***	0.13***
Walungu	1.52***	0.41***	0.48***
Mwenga	-0.48	-0.20*	-0.25

Table 1: Double Hurdle Reduced model

Conclusions

This study provides an analysis of the determinants of vulnerability to poverty using a DH model due to a hypothesis that factors that affect the status of vulnerability to poverty may be different from those that influence the extent of vulnerability. The findings from this study indicate that although in general there is a positive correlation between probability to be vulnerable and intensity of vulnerability, we note some differences with regard to the factors that influence the two stages of analysis. Results reveal that number of working days had a negative effect on the extent of vulnerable while it had no effect on the probability to be vulnerable. The similar effect has been observed with some levels of education system like maternal, primary and secondary.

Forthcoming Research

Vulnerability to poverty can be analyzed using either instantaneous cut data or longitudinal data. The first type of data suffers from a limit, that of estimating the probability that household consumption falls below a threshold based on data from a single period. Longitudinal data would be more appropriate for research perspectives.

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