Multidimensional Poverty in Cameroon: Determinants and Spatial Distribution

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Abstract

The aim of this study was to target poverty following a multidimensional approach. The main contribution of this approach is that its study of poverty covers monetary indicators, that is, welfare indicators which cannot be acquired easily through people's incomes, or the acquisition of which hinges on the existence of certain types of infrastructure. This makes it possible to take into account the population's welfare while formulating development policies. The results of the present study show that with regard to the spatial dimension of poverty, Cameroon's regions can be divided into three: a space of extreme multipoverty, a space of non-multipoverty, and a space in between. With regard to socio-economic characteristics, the residential area variable was found to be an absolute determinant because the passage from the urban area to the semi-urban and from the urban area to the rural one increases the risk of multipoverty by about five and 76 times respectively. Monetary poverty is obviously considerable in this distribution, and so are existence poverty, infrastructural poverty and human poverty. Policies aimed at fighting poverty must target the areas of extreme multipoverty and rural areas on the basis of shortages of capabilities in all these dimensions.

Key words: Multidimensional poverty, poverty indicators, composite poverty index

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1. Introduction

Based on Sen's (1979, 1985) theory of capabilities, there is unanimity about the multidimensional conception of poverty. Donors (World Bank, 2000), the international community through its Millennium Development Goals (African Development Bank, 2006), and the governments of most African countries, through the Poverty Reduction Strategy Papers (PRSPs), have adhered to this idea. Conceptually, the multidimensional poverty approach is opposed to unidimensional approaches, that is, the welfare or basic needs approaches, which view welfare according to revenue or expenditure. Underlying the multidimensional approach is the argument that all non-monetary attributes of welfare have no markets, and when these do exist they are imperfect (Bourguignon and Chakravarty, 2002). In other words, one can have enough revenue but fail to achieve a certain quality of life if certain public amenities are not available. Even when markets exist for certain non-monetary attributes of welfare, there is no guarantee that they will be supplied with goods. That is the case, for example, in a household that is classified as non-poor in monetary terms, but whose head spends money on alcohol at the expense of his children's food, education and clothing (Thorbecke, 2005).

However, at an operational level the inclusion of the multidimensional approach in anti-poverty policies does not follow this conceptual advance, because one must first identify the poor, locate them and describe their characteristics. This was difficult to do in the unidimensional or monetary approaches due to the subjective nature of a poverty threshold based on the usefulness gained from revenue (Asselin and Dauphin, 2002; Ravallion and Lokshin, 2003).

The aim of this study is to contribute to targeting poverty within a multidimensional framework. Its specific objectives are: a) to determine the different angles of multidimensional poverty; b) to draw a profile of multidimensional poverty in order to compare it with monetary poverty; and c) to identify the determinants of poverty.

To achieve these objectives, the Multiple Correspondence Analysis (MCA) first enabled us to construct a composite welfare index (CWI) which aggregates the values of basic indicators for each household. The dynamic scatter classification further enabled us to construct three thresholds that served to draw multidimensional profiles of poverty. Finally, regression analysis was calculated to identify the determinants of multipoverty.

The remainder of the paper is organized as follows: Section 2 presents the background to the study, Section 3 is a review of the literature, Section 4 presents the methodology, Section 5 presents and discusses the results, and Section 6 concludes the paper with policy recommendations.

2. Background to study

The fact that on 28 April 2006, at the end of a joint board of directors' meeting of the International Monetary Fund and the World Bank, Cameroon reached an agreement on economic reforms to aid recovery is an indication of the context of socioeconomic reforms within which the present study was cast. That was indeed a sign of acknowledgement of the efforts made by the government to curb the economic crisis that the country had faced since the budgetary year 1985/86.

Those efforts were made in three phases. The first was the adoption of the first structural adjustment programme in 1988. The measures that were taken as part of this programme were: cutting government expenditure by laying off workers; freezing staff promotions and reducing public service employees' salaries; withdrawal by the government from the production sector; reducing and even abolishing government intervention in social sectors such as roads, health, and education; liberalizing prices and devaluing the CFAF (CFA franc) by 50% vis-à-vis the French franc in January 1994. During the second phase, which was named the Heavily Indebted Poor Countries Initiative Decision Point in 2000, the country committed itself to pursuing the reforms and developing a Public Sector Reform programme (PSRP). This phase culminated in an immediate reduction of Cameroon's debt by CFAF265 billion. The third phase, which corresponded with the completion point, was translated into the country's debt being written off by CFAF1,150 billion. Moreover, the country's debt service gradually fell from CFAF286 billion in 2006 to CFAF81 billion in 2010.

However, reaching the completion point did not mean the end of reforms, as the government still had to prove how the funds received would contribute to an effective economic recovery that would lead to poverty reduction. To this end, a seminar to validate the methodology of the implementation of the PSRP was organized in April 2006 at Kribi (MINPLAPDAT, 2006) where it was agreed that poverty would be considered a phenomenon covering several dimensions. This study is thus designed to be a contribution to incorporating the multidimensional approach into the formulation of the policies aimed at fighting poverty.

3. Literature review

Operational approaches to multipoverty

From the basic indicators of poverty, we can construct composite indices of multipoverty that are decomposable into subgroups or according to specific attributes (Bourguignon and Chakravarty, 2002; Chakravarty, Mukherjee and Ranade, 1998). But, in line with our objectives, composite indicators should be constructed to convert an individual's responses into a numerical value. There have been many suggestions to this effect, some have varied as a function of the weight attributed to each indicator. According to some authors, these weights should be equal while the CWI is an average of the responses to the different variables. This is the case with the UNDP Human Development Index (1997). Following the same logic, one can determine the threshold for each basic indicator and then add them up. The number of indicators under the threshold will give the deprivation index for an individual (Townsend, 1979; Alkire and Foster, 2008).

The approaches that suggest that the weightings allocated to the indicators must vary as a function of their contribution to welfare are the most common. The so-called entropy approach, also called the parametric approach because it is based on the optimization of an entropy function, has been used in the statistical theory of information. It inspired Maasoumi (1999) to propose an optimal composite index which minimizes a weighted sum of differences in pairs. The weights applied to the functions have been criticized because if the entropy function does not reflect the information contained in the database, they are biased (Asselin, 2002). The fuzzy set approach defines a household's deprivation index expressed as $\mu_B(a_i)$ a weighted average of deprivation levels. The weighting coefficients are in an inverse relationship with the deprivation frequency in such a way that the fewer households are deprived of a possession, the greater the weight allocated to the indicator measuring the ownership of the said possession (Costa 2005; Kojo et al. 2007; Mussard and Alperin, 2005). Such weightings are intuitive and exogenous to the database. In addition, a threshold must be fixed for the poverty indicators in order to calculate the deprivation indicator which could be risky.

All these deficiencies can be overcome if one applies the inertia approach. This is a non-parametric approach according to which all the weights are endogenous to the database from which they are determined by statistical rules. The approach actually rests on a set of statistical methods that seek to summarize the information contained in a database by a small number of composite variables or factors, or even latent variables. Thus, the idea that underlies the approach lies in the theory of capabilities where poverty is a concept and, hence, unobservable. It can only be captured through measurement

variables or indicators (Krishnakumar, 2005). According to the nature of variables and the objectives sought in a study, one can apply the Factor Analysis, the Multiple Factor Analysis or the Principal Components Factor Analysis if the variables are quantitative. The three types of analyses use the Euclidian distance in their algorithm of seeking factor axes. Where the variables are ordinal or qualitative, the Multiple Correspondence Analysis (MCA) should be used where the chi-square distance based on numbers serves as estimations.

With regard to comparisons of multipoverty, Duclos et al. (2006) developed stochastic dominance tests to establish poverty orderings that are robust for a broad class of poverty measures and a large range of poverty lines. However, the results are hardly interpretable when there are a high number of indicators. That is why Asselin (2002) and Ki et al. (2005) opted to compute a multipoverty threshold from variables that contributed to the CWI. To reduce the arbitrary nature of this, we decided to estimate the threshold. Then we decomposed the composite poverty index on the model of the Foster-Greer-Thorbecke (FGT) index in order to draw up the profiles of multipoverty.

Recent research on multipoverty in Cameroon

Recent research on multipoverty in Cameroon was inspired by theoretical advances in the area. The National Institute of Statistics (INS, 2002b) undertook to draw up two poverty profiles from the results of the ECAM II survey, one monetary and the other non-monetary. The methodology used in the latter case was the sum of privative scores obtained by assigning the code 0 if the person did not possess a commodity item and the code 1 if he/she did. The results show that 40% of the households studied, essentially from rural areas and composed mainly of farmers, did not possess 12 out of the 14 commodities targeted. Using the same methodology but expanding the number of poverty dimensions, Tachi (2003) demonstrated that 5.21% of the Cameroonian population combined all five forms of poverty that the author had designed.

The study by Njong (2008) applied the Fuzzy Set theory with the aim of identifying the sources of multipoverty as well as its variations in space and time in Cameroon between 1996 and 2001. He arrived at the conclusion that the incidence of multipoverty rose from 42.08% to 50.39%. But he also found that while the contribution of urban and semi-urban areas to multipoverty rose between the two dates, that of rural areas did not. This is a finding that can be explained by migrations of rural populations to urban and semi-urban areas.

The basic criticism levelled against the three studies mentioned above has to do with the arbitrary nature that they fixed poverty thresholds on the basic indicators.

On the other hand, there are even more studies based on the inertia approach, which was inspired by statistical mechanics and uses the techniques of factor methods. The first is the study by Ningaye et al. (2007) which used the Structural Equation Modelling to study the impact of cultural conditioning on multipoverty. The study arrived at the conclusion that the differential observed in the distribution of multidimensional poverty was significantly (which does not mean exclusively) influenced by the cultural diversity of the country's populations. The researchers' aim was not to draw up a profile of multidimensional poverty, as is the case in the present study.

The second study is that by Foko et al. (2007) which, while following objectives that are close to ours, obtained weightings on indicators by using the Multiple Factor Analysis (MFA). But the methodology they used can be criticized on two grounds: Firstly, the MFA deals with several sets of variables with the aim of highlighting those of these sets for which the structures of individuals are on the whole identical. That is why, when there are only two sets of variables, one is considered explained and the other explanatory (Diday et al., 1982). The present study used a method that directly responds to the concern of the theory of capabilities, which lies in finding a latent variable that is representative of the concept of multidimensional poverty, that is, representative of human capacities. Secondly, the MFA algorithm has been conceived primarily for quantitative variables and can be adapted to qualitative variables only at the price of intermediate computations (Foko et al. 2007). The present study used the Multiple Correspondence Analysis (MCA) which is directly applicable to qualitative variables, as it is based on the distance of the chi-square, a distance that is calculated on the basis of numbers and not Euclidian distances.

4. Methodology

The research methodology involved first choosing the basic indicators from which a composite welfare index as well as the poverty lines have been constructed. Then the FGT index has been decomposed to draw profiles of multidimensional poverty. Finally, logistical regression is permitted to identify the determinants.

Source of data

The analysed data have a secondary source. It is therefore important to justify the choice of the retained variables.

Presentation of ECAM II survey

The data analysed were taken from a large-scale national survey called ECAM II that was carried out by the National Institute of Statistics in Cameroon between September and December 2001 (INS, 2001).

The main characteristic of this survey is that the country was divided into strata with Douala and Yaoundé as strata on their own. Each of the 10 regions was divided into two strata: one rural and one urban. In total there were 22 strata — 10 rural and 12 urban. The limitations on the choice of the sample had to do with the aim of the survey, which was to draw up a poverty profile at the national level and the level of the 10 regions. On this basis, one goal was to collect data on a minimum of 300 households per stratum. Another goal was to analyse the behaviour of the various socioeconomic groups in Douala and Yaoundé, a sample of 1,500 households was selected in each of the two cities. For the remaining 20 strata 8,800 households were surveyed, with the sample by region being proportional to its population. Finally, in each region, the sample was distributed in a proportion of 4/7 for the urban area and 3/7 for the rural area, which corresponded to 450 and 320 households, respectively. The final sample answers that were analysable was made up of 10,992 households, distributed as shown in Table 1.

The questionnaire used in the survey was divided into 16 sections (see Annex 1), which did not enquire about poverty only. Nevertheless, the poverty indicators that they contain are credible, since the survey had taken into account the views from the people's participation in the PRSP consultations that had taken place and during which the people themselves had stated what they understood by poverty and how this manifested itself (MINPLAPDAT, 2000).

Table 1: Size of household sample used in ECAM II, by strata

Stratum	Size
Douala	1,118
Yaoundé	1,095
Other urban areas	2,762
Rural areas	6,017
Total	10,992

Source: INS, 2002a.

The process was a practical application of Sen's (1985) thinking that the operational choice must be the result of collective investigations and discussions in order to be able to detect the life components that are most valued by the society.

Presentation of study's variables

From ECAM II, we had to extract the basic indicators of poverty. To this effect we had at our disposal several theoretical proposals for the identification of poverty dimensions as well as how they worked (Hulme and McKay, 2005; Asselin and Dauphin, 2002; Razafindrakoto and Roubaud, 2001; Sindzingre, 2005; Polomar, 2005). For example, Polomar (2005) dwells on the subjective dimension and explains that this is essential as it enables one to understand how people perceive the notion of poverty, its causes and its consequences. Further, it enables one to know how people evaluate themselves, that is, whether they consider themselves to be poor. The questions that were part of the ECAM II questionnaire in relation to this dimension were: a) How do you live in relation to your neighbours? b) How do you live in relation to your relatives? c) Are the people in the village or the neighbourhood poor? d) How do you rate your household in relation to poverty? e) Do you think that your household is poor or rich? f) Do you think that Cameroon is a poor country? From these questions 37 variables (see Appendix 2) were extracted as indicators of multidimensional poverty in the context of this study. The question that arises is whether those variables were adequate to measure poverty within a multidimensional framework. This is a limitation which we could not escape because, after all, there was no other study that had asked such a variety of questions on household living conditions as this one.

All 37 basic indicators were not taken into account in the construction of the CWI for two reasons: firstly, recent research established profiles of subjective poverty that are different from objective profiles (Pradhan and Ravallion, 2000). We are referring here to the differences that account for the impact of the residential area, the level of education and age on perceptions of welfare (Ravallion and Lokshin, 2000). This made Thorbecke (2005) state that subjective indicators are suited to small entities such as villages and communities, as people's responses refer to observations of the vicinity rather than to the concept of subsistence level itself. For all these different reasons, the six indicators of subjective poverty mentioned above were excluded from the construction of the CWI in our study, as this CWI would be used to make comparisons at the national level. Secondly, the question that sought to provide information about whether the head of the household had been ill for the previous two weeks did not seem relevant for our study,

as the answer could depend on seasons without necessarily reflecting the real state of health. Therefore, that variable was also excluded.

At the end of this analysis, the remaining 30 variables were prepared for a multiple correspondence analysis (MCA). To this end, the quantitative variables that were very limited in number, such as distances in relation to basic infrastructure, were first re-coded as ordinal in order for all the variables to be analysed to be of this nature. Then, the modalities that obtained marginal frequencies were merged with neighbouring modalities. Finally, the codes for the modalities of variables were made sequential and to start with the number 1. To respect the ordinal nature of variables, the modalities were reorganized to reflect the evolution of a poverty situation to that of non-poverty.

Construction of composite welfare index

To construct the composite welfare index, we had to aggregate the answers of every household in a numerical quantity. But it is necessary to determine the weight of each variable in this process of aggregation.

Application of multiple correspondence factor analysis

The MCA is applicable when the variables to be analysed are ordinal, which was the case in our present study. Indeed, the digits used to codify the modalities of this type of variable do not have metric properties. That is the case, for example, with the materials used to construct the roof; they can be assigned the code 1 to refer to a corrugated iron sheet roof, and 2 to refer to a mat roof. Rather than use these digits, the MCA is interested in the numbers n_{ij} of individuals who possess modalities *i* in rows and *j* in columns. Moreover, in the diagonalization phase the MCA uses a particular distance, the c^2 distance, instead of the Euclidian distance (Benzécri, 1980). In the present study, the interest of the MCA is twofold: first, to identify multipoverty dimensions as well as their measurement variables; second, to construct a CWI for each household. The rationality of the choice of variables to be included in the computation of the CWI is the property of the First Axis Ordinal Consistency (FAOC). According to this property, the modalities of the indicators describing a poverty situation must have increasing scores on the first factor axis, which is the poverty axis (Asselin, 2002). From these exploratory results the first specific value λ_1 was estimated at 0.2533 and the second at 0.0950. They account for 15.5% and 5.81% of the inertia of the cloud, respectively. Seven variables which did not satisfy the FAOC property were excluded from the analyses. They are: "the period of the last consultation", "the appreciation of one's health state", "the number of times when the household was deprived of water for the past 12 months", "the number of times when the household was deprived of the telephone for the past 12 months", "the distance from the point of supply of drinking water", "the number of times when the household was deprived of electricity" and, "does the household's income cover its monthly expenses?". The MCA of the 23 variables with 56 modalities (see Table 2) brings about an improvement in the specific values ($ë_1$= 0.30 and $ë_2$= 0.10) as well as their explanatory powers of 20.66% and 7.03%, respectively.

Table 2: Results of MCA

N	Variables		Modalities	
	Description	Disc*.	Description	1st axis score**
1	Living standard	0.28	Monetary poor	- 0.75
			inter-monetary	- 0.26
			Monetary non-poor	
0.45				
2	Source of lighting in the house	0.55	Paraffin oil lighting	-0.89
			Electricity lighting	0.58
3	Source of energy used for cooking	0.64	Sawmill waste/collected firewood	-0.82
			Bought firewood/charcoal	0.29
			Electricity/gas	1.29
4	Type of toilet	0.44	Non-fitted latrines	-0.69
			Fitted latrines	
0.60				
5	Materials used to build the walls	0.12	Mud/stubble	-0.47
			concrete/perpend/stones	0.78
6	Materials used to build the roof	0.31	mat/thatch	-1.37
			Iron sheet/tile	
0.21				
7	Materials used as flooring	0.60	soil	-0.94
			cement/tiles	0.61
8	Possession of fixed telephone	0.07	No fixed telephone	-0.05
			Possession of fixed tel.	1.59
9	Possession of mobile telephone	0.23	No mobile telephone	-0.15
			Possession of mobile tel.	1.42
10	Possession of a radio	0.28	No radio	-0.63
			Possession of radio	
0.39				
11	Possession of a gas stove	0.28	No gas stove	-0.23
			Possession of gas stove	1.14
12	Possession of paraffin-oil stove	0.19	No paraffin oil stove	-0.29
			Possession of paraffin oil stove	
0.61				
13	Possession of a TV set	0.44	No TV set	-0.37
			Possession of TV set	1.09
14	Possession of an iron	0.39	No iron	-0.52
			Possession of iron	
0.68				
15	Source of drinking water supply	0.08	Wells/rivers	-0.75
			Water seller/public fountain	0.45
			tap/borehole	0.62
16	Type of health centre	0.07	Traditional healers	-0.56
			Modern health centre	
0.12				

Continued next page

Table 2: Continued

N	Variables		Modalities	
	Description	**Disc*.**	**Description**	**1st axis score****
17	Level of education	0.44	No formal education Primary education Secondary education Tertiary education	-0.77 -0.23 0.50 1.30
18	Number of children expelled from school	0.045	Children expelled at least once Children never expelled	-0.08
0.29				
19	Change in level of education since 1996	0.027	Level diminished Level did not change Level improved	-0.19 0.16 0.25
20	Distance from the nearest primary school	0.16	Distance>=6km 2<=distance<=5km Distance<=1km	-1.54 -0.35
0.19				
21	Distance from an integrated health centre	0.29	Distance >=6km 2<=distance<=5km Distance<=1km	-1.19 -0.11 0.39
22	Distance from the nearest market	0.28	Distance>=6km 2<=distance<=5km Distance<=1km	-1.17 -0.19
0.32				
23	Distance from the nearest asphalted road	0.47	distance>=6km 2<=distance<=5km distance<=1km	-0.93 -0.32
0.57				

Source: Estimations by the authors.
*= discriminations, ** = first-axis factor scores

The first interpretation of the results of a factor analysis lies in highlighting the significant axes. The stopping rule is to eliminate those factors that contain marginal information. To this end, the number of axes are represented on a graph on the abscissa and the inertia percentages that they produce are represented on the ordinate. Then, the factors located after the change in the hollow of the curve are eliminated. By applying the stopping rule, only the first factor is significant. Although for the purposes of clarity the modalities were represented in the plane formed by the two axes, the interpretation of the results will be based on the evolution of the scores along the first axis.

The second interpretation of the results of the MCA is based on the observation of the factor scores of the modalities on the axes (Table 2). Here we are interested in axis 1, which is particularly significant. The modalities with a positive score (on axis 1) positively contribute to welfare, while those with negative scores reduce welfare. In this respect, the possession of a fixed telephone is the most significant sign of welfare

(because of its score of 1.59), while having the nearest primary school at a distance of more than 6km (with a score of 1.54) is the most patent sign of poverty. All the results of multipoverty quantification in the inertia approach are based on these scores.

The third interpretation of the results of an MCA is based on the observation of the measurements of the variable discriminants (see Table 2). They are numbers that correspond to the variance of the factor scores of the modalities of the variable. As the measurement of discrimination is a variance, it accounts for the importance of the variable in the measurement of the phenomenon. Its values on the first axis, which is the poverty axis, show that when several indicators are taken together those that best separate the poor from the non-poor are relative to existence poverty. That is particularly the case with the variable "source of energy used for cooking" (with a score of 0.63) and of the variable "materials used as flooring" (with a score of 0.60).

Dimensions of multipoverty in context

Like all factor analyses, the MCA brings to the fore the main dimensions of a phenomenon with minimal loss of information. But its special nature lies in the fact that its interpretation of dimensions is based on grouping together the modalities of the analysed variables (Lautsch and Plichta, 2003). The projection of the 23 variables with 56 modalities in the plane formed by the first two axes in Appendix 3 is hard to read, which is not the case if one makes projections of the modalities of potential indicators for each of the dimensions, all else being equal.

The modalities of the variables are represented in the planes formed by these two factors as a function of their respective coordinates on each of these factors. For example, the "monetary non-poor" modality has the coordinates 0.45 and -0.07 on factor 1 and factor 2, respectively. All the coordinates of the modalities of all the variables on the first axis appear in Table 2. All those interpretations lead to distinguishing between five dimensions:

- The *monetary poverty* dimension. The ratio of the monetary indicator of living standards was estimated in the ECAM II survey (INS, 2002b) using the households' final annual consumption (instead of using their income, which would be very difficult to measure) based on four elements: Monetary consumption, self-consumption, transfers in kind received from other households, and the rent imputed to households owners of their houses or housed free of charge. The threshold of monetary poverty was based on essential needs. The Recommended Dietary Allowances equivalence scale was built on the assumption that an adult consumes 2,900 calories per day, an amount that reduces with age. The application of all these different computations led to a minimum poverty threshold of CFAF232,547 and a maximum of CFAF345,535. Based on these figures, the ECAM II assigned codes to three categories of living standards: the households whose adult-equivalent expenses were less than CFAF232,547 were considered poor; those whose expenses were between CFAF232,547 and CFAF345,535 were considered intermediate, while those whose expenses were higher than CFAF345,535 were considered non-poor. The graph in Appendix 3 illustrates an important dimension in the study of poverty as it contrasts, on the left-hand side, the "monetary poor" with the "monetary non-poor" on the right-hand side and, in the middle, the "intermediate".

- The *existence poverty* dimension. This is an objective, non-monetary indicator that looks at poverty from the standpoint of results rather than of means from the material conditions of housing. The goal was to bring into the study of the phenomenon a dimension of stocks that was durable in time, as opposed to monetary variables that are subject to variations linked to the current economic situation. Fourteen indicators were taken into account: a) source of lighting in the house; b) source of energy used for cooking; c) type of toilet; d) materials used to build the walls; e) materials used as roofing; f) materials used as flooring; g) possession of fixed telephone; h) possession of mobile telephone; i) possession of a radio; j) possession of a gas stove; k) possession of paraffin-oil stove; l) possession of a TV set; m) possession of an iron box; and n) source of drinking water supply. These indicators are appropriate for measuring this dimension because Appendix 3 contrasts houses with roofs in mats or thatch, with flooring in soil, without fitted toilets, with walls in mud or in stubble, those using paraffin oil for lighting, and with no access to a source of drinking water supply with those houses using electricity for lighting, whose roofs are in corrugated iron sheets or tiles, whose walls are in perpend or in stone, which use electricity or gas for cooking and have access to a source of drinking water supply. Similarly, it contrasts those households that do not possess a fixed telephone, a mobile telephone, a radio, a TV set, an iron box, and a gas or paraffin-oil stove with those that do.

- The *human poverty* dimension. This approach brings the concept of poverty to the fore by highlighting the shortage of capabilities. As in the case of the preceding dimension, the indicators bear on a stock that has not been affected by unforeseen factors linked to the current economic situation. They thus capture a structural form of poverty. Two of the five variables characterizing "shortages" in terms of human capital and which were measured in ECAM II satisfy the FAOC property: a) the level of education of the head of the household, and b) the type of health centre the household goes to for medical care. The two variables form a dimension of poverty as indicated in Appendix 3 which contrasts people without formal education or with just primary education and who went to traditional healers for medical care when they were last taken ill, to people with secondary or tertiary education who went to a modern health centre.

- The *infrastructural poverty* dimension. There are four items for which there was a satisfactory statistical solution to capture this latent variable. Here, Appendix 3 contrasts households that are located more than 6km from the nearest primary school, the nearest health centre, the nearest market, and an asphalted road with those that are located less than 1km from these facilities. Between the two extreme distances are households that are located between 2km and 5km from the same facilities.
- The *financial poverty* dimension. This reflects subjective monetary poverty which concerns households that can have a sufficient level of consumption but are still vulnerable due to the precarious conditions they live in. The dimension incorporates the notion of dependence (of those who borrow, save less, and attain their current level of consumption with difficulty) and in one way or another captures those households that are likely to fall into poverty. There are two items in the appendix for which signs of weak financial capability were measured: that which refers to the

number of times a child has been expelled from school for non-payment of school fees, and the evolution of living standards for the past five years. The projection of the modalities of these variables on the graph in Appendix 3 confirms the relevance of this dimension of poverty; it contrasts, on the left-hand side, households whose standard of living has been diminishing and who saw their child expelled from school for lack of fees at least once during the previous year, with those on the right-hand side, whose child has never been expelled from school and whose living standard has been rising.

These statistical results show that poverty is a multidimensional phenomenon covering five facets, the monetary dimension being one of them. We now have to characterize each household using a CWI that takes into account this multidimensional nature.

CWI and thresholds of multidimensional poverty

Asselin (2002) was inspired by the CWI results and, in particular, the coordinates of the modalities on the axes and proposed a CWI. In its functional form, Ci (the CWI of household i) is defined by the author as:

$$\mathrm{Ci} = \frac{\sum_{k=1}^{k}\sum_{j_k=1}^{j_k} W^{k}{}_{j_k} I^{k}_{i,jk}}{K} \qquad (1)$$

where K is the number of indicators in ordinal form; J_k is the number of modalities of the indicator K; $W^{k}{}_{j_k}$ is the weighting coefficient corresponding to the standardized score on the first factor axis of the modality J_ν $\left(score/\sqrt{\lambda_1}\right)$ that are reported in Table 2. λ_1 is the specific value of the first factor, $I^{k}_{i,jk}$ is the binary variable taking the value 1 while the household has the modality p and 0 otherwise.

After the computations, the CWI is a quantitative variable with a minimum of -14.98 and a maximum of 15.20. As most of the computations of a welfare indicator are designed according to the assumption that it is a positive variable, we did a translation of the CWI by adding 15 to its values. The final CWI thus has a minimum of 0.02 and a maximum of 30.20. Its mean is 15.06 and its standard deviation 6.65.

From this distribution of the CWI, several proposals were made in estimating the lines of multidimensional poverty (Asselin, 2002). The relative approach consists in assigning to this poverty the value of a quintile of the CWI. However, there exists no rule that specifies which quintile to choose. Following the absolute approach, for each indicator a modality is chosen as a poverty line for this variable. There are thus as many poverty thresholds as there are basic indicators that are taken into account in the computation of the CWI. The fundamental criticism is the arbitrary nature of these

thresholds. To overcome these handicaps, the variables are left to decide themselves on the clusters that can be constituted depending on whether they have a strong internal homogeneity and a strong external heterogeneity on the basis of poverty indicators. This is the automatic classification method highly recommended by Luzzi, Flückiger and Weber (2005) for identifying poverty typologies in a multidimensional approach. Considering the size of the sample (10,992 households) an algorithm of the "dynamic clouds" type was applied. The "dynamic clouds" approach was first proposed by Diday (1971) to generate a partition of a big set of items, whose number could reach 40,000, while the classical methods of classification can only handle a few hundred individuals. The said algorithm works as follows:

- We start from a choice of k nuclei estimated or drawn from the set of admissible nuclei, a set called L. But we can also start from k classes determined at random or by a hierarchical classification.
- Each individual is then assigned to the nucleus he/she is closest to. In this way we obtain a partition in k classes for which nuclei are computed.
- We start all over again with new nuclei until we reach convergence.

A complete cycle of these computations is an iteration. There is convergence when, after several iterations, we arrive at a stable solution, that is at a situation when it is no longer necessary to change the class of any individual at all. The smaller the number of iterations that lead to convergence, the more authentic the partition is (Diday et al., 1982). For two classes the convergence was reached after only eight iterations (see Appendix 4), compared with 25 iterations for three other classes. The number of iterations became very high with the increase in the number of classes. By considering the partition into two classes[1], cluster 1 has 5,949 households. The maximum value of the CWI for this cluster is 30.20 and its minimum value is 14.57. For its part, cluster 2 has 5,040 households. The maximum value of the CWI for this cluster is 14.64 while its minimum value is 0.02.

From these figures, and in order to reduce arbitrariness in (i) the distinction between the poor and the non-poor and (ii) in the comparison of the monetary poverty profile with that of multidimensional poverty, we set up three multidimensional thresholds. The first is a higher threshold (ssup) obtained from the results of the partitioning into two classes and approximated by the [maximum value of the CWI in the class of the poor] * [weight of the class of the poor] + [minimum value of the CWI in the class of the non-poor] * [weight of the class of the non poor] (Ki et al., 2005; Asselin, 2002). The application is [14.57* (5949/10989)] + [14.64* (5040/10989)] = 14.6. The second is an intermediate threshold (sint) designed in a way to have the same poverty rate as that of 40.2 obtained through the monetary approach. Its value is 9.9. The third is a lower threshold[2] (sinf) designed to reflect the extreme multipoverty. It is derived from a three-class classification and its value is 8.28.

Multidimensional poverty index

From the distribution of the CWI and the calculated threshold, several measures of poverty emerge. The measure used in the present study is the Pá class of measures of poverty developed by Foster, Greer and Thorbecke (1984). Its general formula is given by the following expression:

$$FGT\alpha\ (z) = \frac{1}{N}\sum_{i=1}^{q}\therefore\left(1-\frac{y_i}{z}\right)^{\alpha} \tag{2}$$

where z is the poverty threshold, y_i is poor people's revenue, N is the total population, q is the number of poor people, and α is a parameter of poverty weighting.

As the ECAM II basis which our study is built on has the household as the statistical individual, the parameters N and q had to be weighted by the product of the size of the household and the extrapolation coefficient. Moreover, if α = 0 FGT0 (z) simply gives the proportion of the poor, also called the poverty incidence. This is the main index that was used in the present study.

Contrary to other measures of poverty, the Pα measure has the advantage of being decomposable into subsets. The measure of poverty at the national level can be expressed as a combination of the measures of the poverty of clusters weighted by the share of the population of each cluster. That can be expressed by the following equation:

$$p_{\alpha} = \sum_{j=1}^{m} k_j p_{\alpha j} \tag{3}$$

where j= 1,-----m are the clusters and kj the share of the population of cluster j in the total population, while $p_{\alpha j}$ is the poverty index in t=region j.

Such a decomposition makes it possible to calculate the contribution of region j to the total poverty using the formula:

$$c_j = \frac{k_j p_{\alpha j}}{p_{\alpha}} \tag{4}$$

If we compare k_j and c_j, we can easily identify the clusters that are most affected by multipoverty.

Logistical regression

Logistical regression is the statistical technique that we found most appropriate for identifying the determinants of multipoverty. Indeed, some of these determinants are measured by qualitative or ordinal variables and others by quantitative variables. They are symbolized by x_1----------x_p. The multipoverty to be explained (y) can be coded binary by assigning the value 1 to a poor person and 0 to a non-poor one. We posit $p_x = p_r$ (y=1/x) the probability of y=1, that is, to be poor for any value of x. From p_x we define a logit p_x quantity by:

$$\log it\ p_x = \log \frac{p_x}{1 - p_x} \tag{5}$$

It has been demonstrated that there exists a linear relationship between the logit p_x and the explanatory variables x_1----------x_p to the extent that one can say that

$$\log it\ p_x = \log \frac{p_x}{1 - p_x} = \beta_\alpha + \beta_1 + ------ \beta_p \tag{6}$$

The estimation of Equation 6 by the likelihood method gives the β coefficients[3] from which we can deduce the odds ratio, that is, the ratio of likelihood between the modalities of each on the x variables. This is, for example, the ratio of the likelihood of a person from the rural area to be poor compared with a person from the urban area. This means that the "rural vs. urban residential area" was assigned the code 1 for a rural person and 0 for an urban person, as a higher poverty rate was observed in the rural area than in the urban area.

If the odds ratio is greater than 1, the variable x points to an aggravation of poverty and additional tests will indicate whether the likelihood differences are significant. If x is a quantitative variable, it is considered as such in the modelling. It is the same if x is binary. But if, on the other hand, x is ordinal having g+1 as modalities, it is introduced by the indicator g variables obtained by:

x1	Z1	Z2	———————————————	zg
			-	
0	0	0		0
1	1	0		0
2	0	1		0
g	0	0		g

For x, the 0 modality is called basic modality and will serve as the reference for interpretation. For each Z, 1 indicates that it is the modality concerned. An observation of the profiles shows that all the explanatory variables were transformed into ordinal variables, and then into indicator variables.

5. Results

The results rest on the profiles of multipoverty and on the identification of its determinants.

Profiles of multidimensional poverty

There are two possible profiles of multipoverty. The first results from the spatial decomposition of the composite index while the second results from its decomposition according to household socioeconomic characteristics. The variables that led to the building of the CWI are no longer considered. We linked the monetary profile to each case.

Table 3, which is a summary of the decomposition of multipoverty on the spatial level, reveals a relatively stable classification of regions.

Table 3: Spatial distribution of multipoverty in Cameroon

Region index	Composite index						Monetary	
	Ssup(14.6)		Sint (9.9)		Sinf (8.28)			
	p_{0j*}	C_{0j**}	P_{0j}	c_{0j}	p_{0j}	c_{0j}	p_{0j}	c_{0j}
Total population	59.0	100	40.2	100	31.2	100	40.2	100
Yaoundé	3.6 (12)&	0.5	0.2 (12)	0.0	0.0 (12)	0.0	18.3 (12)	3.9
Douala	5.9 (11)	0.9	0.2 (11)	0.0	0.0 (11)	0.0	18.5 (11)	4.4
Adamaoua	70 (6)	5.3	37.5 (7)	4.1	28.4 (7)	4	45.8 (5)	5
Centre	76.3 (3)	10	45.6 (5)	8.9	33.4 (5)	8.4	60.3 (1)	11.7
Est [East]	75 (4)	6.1	54.4 (3)	6.5	43.4 (3)	6.6	47.0 (4)	5.6
Extrême Nord [Extreme North]	90.1 (1)	2.7	73.1 (1)	3.2	60.8 (2)	34.5	41.7 (6)	18.4
Littoral [Coast]	44.3 (10)	3.6	18.3 (10)	2.2	10.1(10)	1.5	44.1 (7)	5.3
Nord [North]	79.6 (2)	9.7	67.3 (2)	12.1	63.2 (1)	14.7	49.0 (3)	8.8
Nord-Ouest [North-West]	71.8 (5)	14	49.3 (4)	14.3	35.1 (9)	12.9	52.7 (2)	15.1
Ouest [West]	64 (7)	13	42.5 (6)	12.7	29.5 (6)	11.4	38.0 (9)	11.4
Sud [South]	55.1 (8)	3.2	28.9 (8)	2.5	18.4 (8)	2	38.6 (8)	3.3
Sud-Ouest [South-West]	47.7 (9)	6	22.2 (9)	4.1	14.6 (9)	3.5	35.0 (10)	6.5

*p_{0j} is the FGT index for α=0. It gives the incidence of poverty in region j as a percentage

**c_{0j} gives the contribution of region j to total poverty as a percentage

@& The figures in brackets indicate the decreasing classification of the poverty incidence according to the threshold considered

Source: Authors' estimations

The table enables a division of the country into three areas: the first is an area of extreme multipoverty where the incidence of the composite index is always higher than the national value irrespective of the threshold considered. The area in question is composed of the Extreme North, the North, the North-West, the East and the Centre. The second is an intermediate area where the incidence of multipoverty is lower than the national value and is composed of the regions of the South, the South-West, the West, Adamaoua and the Coast. The third is an area of non-poverty composed of the two big cities, namely Douala and Yaoundé.

In order to understand the reasons for this spatial discrepancy, we examined the indicators that were taken into account in the building of the CWI. To this end, the regions of the Extreme North and the South were chosen as representative of each of the areas of extreme poverty and intermediate poverty. It turned out that the monetary element was significant, but not as much of a determinant as the other types of shortages of capabilities related to existence poverty and human poverty. Indeed, 25.4% of the population in the extreme poverty category, against 38.5% in the intermediate poverty category, was classified as poor on the monetary dimension. However, considerable disparities were observed in two dimensions: the first was in existence poverty whereby 42.4% of the extreme poverty population had fitted latrines, compared with 60.2% for the intermediate category. Likewise, 74.5% of the extreme poverty population had houses whose floors were made of earth while 63.9% of the intermediate poverty population had houses whose floors were made of cement or tiles. Moreover, up to 41.3% of the extreme poverty population had houses whose roofs were built of mats, compared with only 2.6% for the others. The second dimension where big disparities were observed was in human poverty where 64.6% of the extreme poor population did not have formal education compared with 7.10% for the other side. Also, when taken ill 23.79% of the extreme poor population sought medical care from traditional healers compared with 9.3% of the population living in less multidimensional poverty.

This spatial decomposition enables us to identify the areas with a concentration of poor households. For a more effective implementation of anti-poverty policies, the characteristics that are specific to households or individuals and which contribute to multipoverty had to be highlighted (see Table 4). Apart from the size of the household, the hierarchy of incidences of multipoverty has been retained with regard to the different thresholds.

The analysis based on the environment variable shows that multidimensional poverty is primarily a phenomenon of the rural area, irrespective of the threshold. At the lower threshold, it contributes 98.8% of the poverty at the national level, with an incidence of 54.1, compared with 2% contributed by the semi-urban area and 0% by the urban. Generally, the rural area faces numerous shortages of capabilities compared with the urban area. On the monetary poverty dimension, 68.12% of urban dwellers were classified as non-poor, against only 32.71% of rural dwellers. Similar results were observed on the dimensions of existence poverty, human poverty, equipment poverty and infrastructural poverty. The multipoverty incidence varies from 38.1% for a one-person household to 38.3% for households with eight people and more. Even if it reaches 42.9% in the two-people group, the multipoverty incidence does not vary much with the size of the household. This low variation could be due to the fact that the survey concentrated on households where several individuals shared the same living conditions.

Table 4: Decomposition of poverty according to household socioeconomic characteristics

Modality	Composite index						Monetary index	
	Ssup(14.6)		Sint (9.9)		Sinf (8.28)			
	p_{0j*}	c_{0j**}	p_{0j}	c_{0j}	p_{0j}	c_{0j}	p_{0j}	c_{0j}
Total population	59.0	100	40.2	100	31.2	100	40.2	100
Residential area								
Urban	11.5	6.7	1.3	1.1	0.00	0.00	22.1	19.1
Semi-urban	34.5	4.7	7.3	1.4	3	0.00	24.9	5
Rural	91.6	88.4	68.5	97.3	54.1	98.9	53.4	75.8
Household size								
1 person	57.5	0.2	38.1	2.5	27.3	2.3	11.8	0.07
2 people	61.3	5.6	42.9	5.7	30.7	5.3	17.2	2.3
3-4 people	59.8	18	41.7	18.4	33.5	19.0	29.3	12.9
5-7 people	61.6	35.3	41.2	34.8	30.9	33.6	41.7	35.2
8 people and more	56.3	38.4	38.3	38.4	30.7	39.6	48.6	48.7
Age of head of household								
Less than 30 years of age	58.3	15	41.2	15.6	30.9	15	31.05	11.7
30-40 years	51.1	30.3	33.3	29.1	25.5	28..7	35.7	31.2
45 -59 years	58.9	30.4	39.5	30	32.5	31.8	45.2	34.3
60 years and above	74.5	24.1	52.8	25.1	39.7	24.3	47.5	22.6
Sex								
Male	59.5	82.3	40.6	82.6	31.6	82.8	40.5	82.3
Female	56.8	17.6	37.9	17.3	29.5	17.4	38.7	17.6
Type of household								
Impersonal	56.9	2.5	37.8	2.5	27.1	2.3	11.6	0.00
Single parent, strictly	64	6.5	43.8	6.5	33.9	6.5	41.7	0.006
Single parent, extended	50	8.9	30.6	8	23.4	7.9	42.3	11.1
Nuclear family, strictly	64.8	28.4	46.34	29.9	36.6	30.4	42.4	27.3
Nuclear family, extended	44.6	20.5	28.2	19.1	21	18.3	37.9	25.6
Other type, extended	70.5	32.9	49.2	33.8	38.9	34.3	41.9	28.7
Status								
Single		37.3	4.6	19.5	3.5	14.3	3.3	23.7
4.3								
Married, monogamous	57.1	48.9	39.4	49.6	30.8	49.9	39.3	49.5
Married, polygamous	69.2	29.1	48.2	29.8	38.4	30.5	46.7	28.8
Widower/widowed	67.6	10.9	45.5	10.8	35.8	10.9	43.4	10
Divorced/separated	59.3	2.8	41.9	3	28.5	2.6	34.3	2.4
Cohabitation	42.6	3.4	26.1	3.1	16.6	2.5	37.4	4.5
Agro-ecological area								
Yaoundé	3.6	0.0	0.2	0.0	0.0	0.0	18.3	3.9
Douala	5.9	0.0	0.2	0.0	0.0	0.0	18.5	0.4
Other towns	19.1	5.2	2.6	0.1	0.0	0.0	26.2	10.6
Rural area, forest	78.1	19.1	49.5	17.8	37	17.1	55.3	19.9
Rural area, high plateau	78.6	34.9	50.6	33	35.0	29.4	50.7	33.1
Rural area, savannah	94.4	39.1	78.5	47.8	67.7	53.1	45.6	27.8
Public administration	12.9	0.1	4.6	0.0	2.7	00	13.0	2.6
State-owned company	35.5	0.1	6.7	0.0	1.9	0.0	36.4	2.2
Formal private enterprise	18.9	0.3	4.2	1.2	2.1	0.0	16.8	4.8
Sector								
Informal farming enterp.	91.4	74.8	70	84	56.0	86.8	54.5	65.6
Informal non-farming ent.	37.6	11.5	16.9	7.6	11.4	6.6	33.1	14.9

Source: Estimations done using DASP

The three thresholds confirm that multipoverty is greater in the group of those aged less than 30 years. It then decreases for the next age group and increases for the other age groups. The statistics show that at less than 30 years of age, people had a sufficient income to be classified as non-poor. Thus, 66.2% of people in this age group were classified as non-poor, compared with 54.9% in the 30-to-40-year-old group. They had not yet acquired certain durable goods items like a fixed telephone or a gas stove: only 0.8% of them possessed the former and 20.8% the latter, compared with 2.5% and 21.6% respectively for those in the higher age-group. And they did not yet possess a comfortable house. The rural aspect also seems to be a contributing factor: 30.8% of people in that age-group were rural, compared with 28.8% for the next age-group. And yet the rural area is characterized by a shortage of basic infrastructure.

With regard to sex, multipoverty was found to be slightly more severe in households whose head was a male than in households whose head was a female. However, this should not overshadow the three main areas where male capabilities were higher than female ones. The first is human poverty where 37.60% of female heads of households were without formal education, compared with only 23.4% for their male counterparts. Likewise, only 3.6% of the female heads of households had a tertiary education, against 9.30% of males. The second concerns certain aspects of the "equipment poverty" dimension: 55.46% of the households headed by females did not possess a radio, against 33.73% of those headed by males; 63.41% of the former did not have an iron box, against 55.87% of the latter; and 79.45% of them did not have a TV set, compared to 74.19% of those headed by males. The third area concerns all the indicators of financial poverty: 50.2% of female heads of households against 33.03% of their male counterparts reported that their income had fallen and that they had had a child expelled from school for non-payment of school fees. This means that despite their more favourable position, the female-headed households experienced greater difficulty in maintaining their living standards.

Irrespective of the threshold, the impersonal household type experienced a multipoverty incidence that was higher than that of the "extended single parent" type. And yet the people in that type had the lowest proportion of monetary poverty and were the most highly educated. Age seems to be a relevant variable here because 49.6% of the people in the impersonal household type were below 30 years of age. This explains why in spite of their monetary resources they had not yet acquired a certain number of durable goods that would have contributed to higher scores in their classification.

Differences in the status of households reveal three typologies of multipoverty. The first one contrasts polygamous households with monogamous ones: multipoverty was found to be more severe in the case of the former than the latter. The most significant shortages were observed in the human dimension poverty where 23.31% of heads of monogamous households had not had formal education, compared with 39.47% of polygamous households. 52.7% of monogamous households reported that their standard of living had dropped, while 33.6% said that their child had been expelled from school; the figures for polygamous households were 57.8% and 38.1%, respectively. A similar trend was observed in relation to indicators of existence poverty.

The second typology contrasts the widowed with the divorced: 57.82% of those widowed were without formal education, while only 38.24% of the divorced were.

Similarly, only 11.71% of the widowed had had secondary school education compared with 24.71% of the divorced. The difference in the monetary poverty dimension is equally remarkable as only 48.57% of the widowed were non-poor while 59.71% of the divorced were. In the other dimensions, the differences were not significant. All in all, multipoverty was more marked among the widowed than among the divorcees.

The third typology of poverty with regard to matrimonial status contrasts single people with couples in cohabitation. These two groups are very similar in the sense that they usually do not have children, which enables them to allocate the bulk of their resources to improving their living conditions. The poverty incidence for these two groups were found to be very similar and lower than those for the other groups.

The agro-ecological area variable, which distinguishes between types of cash crops farmed, confirmed that multipoverty is more a rural than an urban phenomenon. But it also revealed varied rates of poverty incidence: 49.5% for the forest rural, 50.6% for the high-plateau rural, and 78.5% for the savannah rural, if one considers the higher threshold. The figures show that the savannah rural area, which is the poorest at a multidimensional level, had shortages compared with the other rural areas on two dimensions. First, there is the existence poverty dimension where 74.0% of households used paraffin oil for lighting, 92% had houses with walls built of mud, 55.5% had houses with roofs built of mats, 74.0% had houses with flooring made of earth, and 93.8% did not possess a TV set. The figures for the same variables are 56.7%, 70.7%, 5.5%, 52.7% and 80.4% for the high-plateau rural area, and 52.0%, 80%, 12.9%, 56.2% and 84.6% for the forest rural area. Second, there is the human poverty dimension and, in particular, the level of formal education, where 64.3% of the households in the savannah rural area were without formal education compared with 24.7% for those in the high-plateau rural and 18.4% for the forest rural area. The forest rural area's road infrastructure is inadequate where 63.6% of its population reported living more than 6km from the nearest asphalt road. The figures are 51.4% for the high-plateau rural and 57.5% for the savannah rural areas.

The biggest incidences of multipoverty were observed in informal farming enterprises and non-informal farming enterprises. These sectors generate small monetary revenues (41.9% of the employees of the informal farming sector and 20.1% of those in the non-informal farming sector were classified as poor), employ a workforce that is less educated (44.7% of the employees in the informal sector and 24.6% of those in the non-informal sector were classified as being without formal education) and are, mostly, to be found in rural areas.

Determinants of multidimensional poverty

The identification of the determinants of multidimensional poverty is based on an explanatory method in order to see if the variations revealed by observing the profiles of poverty are statistically significant. The logistical regression used in the present study was initially conceived to deal with a binary explained variable and one or several explanatory variables that are also binary. But nowadays it has been generalized to cases where the explanatory variables are qualitative, ordinal, or quantitative, as long as the conditions explained under logistical regression are met.

Three models have been tried following different thresholds of multipoverty. The model corresponding to the higher threshold is the preferred one with its pseudo-R of 0.5390, compared with 0.5367 for the intermediate threshold and 0.4692 for the lower one. The estimations are shown in Table 5.

The results show that the size of the household is not a potential determinant, because moving from a one-member household to households with as many members as eight did not increase the risk of falling into multipoverty. Nor is the sex of the head of the household variable. The no odds ratio for the modalities of the two variables was indeed greater than 1.

Table 5: Determinants of multipoverty

No.	Description	Odds ratio	Std. error	z	P>z	X0= basis
1	2 persons	.2279358	.2267252	-1.49	0.137	1 person
2	3-4 persons	.2463366	.2460908	-1.40	0.161	
3	5-7 persons	.2793475	.2792249	-1.28	0.202	
4	8 persons and more	.202785	.2031627	-1.59	0.111	
5	Below 30 years of age	.8919417	.0845225	-1.21	0.228	30 to 40 years
6	49-59 years	1.226548	.107481	2.33	0.020*	
7	60 years and more	1.663045	.190159	4.45	0.000**	
8	Semi-urban	5.583298	.975467	9.84	0.000**	Urban
9	Rural	76.83344	14.01717	23.80	0.000**	
10	Male	1.002981	.1258508	0.02	0.981	Female
11	Impersonal	.3894492	.3886887	-0.94	0.345	
12	Strictly single parent	1.695225	.3146146	2.84	0.004*	Extended nuclear
13	Extended single parent	1.184096	.2010107	1.00	0.320	
14	Strictly nuclear family	1.834535	.1967547	5.66	0.000**	
15	Other extended family	1.635165	.208063	3.86	0.000**	
16	Married, monogamous	1.152396	.1528233	1.07	0.285	Single
17	Married, polygamous	1.132551	.164223	0.86	0.391	
18	Widower/widowed	1.669936	.2595383	3.30	0.001**	
19	Divorced/separated	1.544926	.2754303	2.44	0.015	
20	Cohabitation	.9407672	.1641845	-0.35	0.726	
21	Yaoundé	.5086908	.1286155	-2.67	0.008*	Douala
22	Other towns	3.074032	.4841229	7.13	0.000**	
23	High plateau rural	6.5889173	.0642013	-4.86	0.000**	
24	Savannah rural	8.562836	.3150146	7.66	0.000**	
25	Public administration	.4107405	.0633263	-5.77	0.000**	Formal public enterprise‡
26	Public enterprise†	1.010613	.2159796	0.05	0.961	
27	Informal farming enterp.#	7.92853	.8718349	18.83	0.000**	
28	Informal non-farming enterprise@&	2.852594	.2949631	10.14	0.000**	

* significant at the 5% level, ** significant at the 1% level, ‡ formal private enterprises, † public enterprises, # informal farming enterprises, @& İnformal non-farming enterprises
Source: Authors' estimations

The odds ratios measure the ratio of chance when one moves from the reference modality to another modality within the same variable. If it is higher than 1, this movement leads to an increase in the risk of falling into multipoverty. If, in addition, the probability (p>z) is < 1% or 5%, then the risk is significant. If, during the process of analysis two

indicator variables are correlated, one will be automatically eliminated. This was the case for the forest rural area modality which, in Table 4, already had a multipoverty profile very similar to that of the high-plateau rural area.

On the other hand, the "residential area" variable was found to be the only determinant threshold because moving from the basic modality to the other modalities significantly increases the risk of falling into multipoverty in all cases. For example, people living in the semi-urban area are five times more likely to fall into poverty than those living in the urban area. The same risk is 76 times higher for those living in the rural area.

Halfway between the two extreme cases are relative determinants. With the variables at this intermediate level, moving from the basic modality does not significantly increase the risk of increasing poverty for all the other modalities. Thus, the poverty for the less than 30 years bracket was not found to be significantly higher than that for the 30-40 years bracket, which was considered the basis. It is the opposite for all the other age brackets. For the type-of-household variable, the poverty for the "impersonal" and "extended single parent" modalities was not significantly different from that of the "extended nuclear family" modality taken as the basis. However, it was for the other types of modality, namely "strictly single parent", "strictly nuclear family", and "other extended family". The marital status is also a relative determinant in the sense that the poverty of single people, married monogamous people, married polygamous people, and of those cohabiting were not found to be significantly different, as one would have expected from their profiles. Nonetheless, moving from being single to being widowed or divorced/separated significantly increases the risk of seeing multipoverty rise. The agro-ecological zone was also found to be a relative determinant in the sense that the multipoverty profiles for Douala and Yaoundé are very similar. In the other cases, the risks of falling into multipoverty become higher as one moves from these cities into rural areas. They become even higher when one moves to a savannah rural area. The last relative determinant is the activity sector: Moving from formal private enterprises to public administration or public enterprises does not increase the risk of poverty. However, this risk becomes real when moving to informal non-farming enterprises or informal farming enterprises.

Multidimensional poverty and monetary poverty

As monetary poverty and multidimensional poverty use different methodological and conceptual approaches, it is not possible to directly compare their respective incidences. In the following paragraphs we will make comparisons based on how the two approaches classify their poverty profiles.

On the spatial distribution dimension, and considering the intermediate threshold (which had enabled us to get the same poverty incidence as the monetary approach), as shown in Table 3, the two approaches agree in that the big cities of Douala and Yaoundé experience less poverty. Despite this similarity, the multidimensional approach reversed the classification based on the monetary approach. For example, the two poorest regions on the monetary level turned out to be the Centre and the North-West while on the multidimensional level the two were found to be the Extreme North and the North. On the whole, five regions saw their classification tumble (which means more poverty) by

moving from the monetary to the multidimensional poverty. The five are the East, the Extreme North, the North, the West and the South-West. The situation was reversed for the other five regions, namely Adamaoua, the Centre, the Coast, the North-West and the South. In order to understand what underlies these conflicting results, we analysed the indicators taken into account in the construction of the CWI for the extreme cases, that is those of the Extreme North and Centre regions.

The two approaches produced similar results with regard to their classifications of the modalities of two variables related to household socioeconomic characteristics. The first variable is the sex of the head of the household in all cases poverty was slightly more severe in the households headed by males. However, the explanatory approach showed that the difference was not significant with regard to multipoverty. The second variable is the residential area. However, in relation to this the CWI lays emphasis on rural poverty in the sense that it suggested that this type of poverty contributed to national poverty by 97.3% compared with 75.8% contributed by monetary poverty (the idea is that the rural area contributes 97.3% to the national poverty when multipoverty is considered and 75.8% when one considers the monetary poverty).

Apart from the two characteristics, the two approaches produced different results from the other variables. Here are three illustrative cases: the first suggested that the incidence of monetary poverty increased with the size of the household. However, both the observation of profiles and the approach based on determinants confirmed that those variations were not significant according to the multidimensional perspective. The second case showed that the incidence of monetary poverty increased with the age bracket. Multidimensional poverty was found to be higher for those aged less than 30 years. It then reduced in the next age bracket but rose again in the other age brackets. In the third case, monetary poverty identified the impersonal type of family size as the least poor whereas multipoverty identified the extended nuclear family type as the least poor.

On closer analysis, we realized that the two approaches diverged on such a big number of variables because the multidimensional approach included, in its study of poverty, first monetary indicators, followed by the welfare indicators that cannot be easily acquired through people's incomes. This is the case with infrastructure of all kinds. It further included the welfare indicators which can only be acquired at the cost of an effort to save or the acquisition of which is conditioned by the existence of a given type of infrastructure. This is the case of TV or radio sets which require the pre-existence of electrical infrastructure. It is also the case of the level of education and the type of health centre variables which hinge on the prior existence of schools and modern health centres. The multidimensional approach thus seems appropriate when the country is called upon to improve the living conditions of its people. The policies of direct increase of income are thus no longer enough.

6. Conclusion and recommendations

The aim of this study was to target the poor through a multidimensional approach. The MCA enabled us to select 23 poverty indicators and to construct a CWI for each household. The typological analysis later enabled us to compute two poverty thresholds to which we added a third that makes it possible to have the same poverty incidence as the monetary dimension. Finally, the poverty profiles were obtained through decomposing the composite index, while the logistical regression was applied to identify the determinants of multipoverty.

Below is the gist of the findings of the present study. On the spatial level, three areas were identified. The first comprises of the following regions: the Extreme North, the North, Adamaoua, the East, the North-West and the Centre. This first area was referred to as one of extreme multipoverty because the incidence of poverty is always higher there than elsewhere in the country irrespective of the threshold taken into account. The second area is that composed of the South, the South-West, the Coast and the West regions. It is an area of intermediate poverty. The third is an area of non-poverty composed of the two biggest towns, Douala and Yaoundé. Monetary poverty is, admittedly, unequally distributed, but it is not as essential in the spatial distribution of multipoverty as are existence poverty, infrastructural poverty and human poverty. Anti-poverty policies must be implemented in areas of extreme multipoverty on the basis of shortages of capabilities on those dimensions.

On the level of socioeconomic characteristics, the residential area variable was found to be an absolute determinant of multipoverty in that moving from the urban to the semi-urban area increased by five times the risk of seeing one's multipoverty level rise. This risk became 76 times higher if one moved from the urban to the rural area. As a matter of fact, compared with the urban area, the rural area was faced with numerous shortages of capabilities on the dimensions of existence poverty, human poverty, equipment poverty and infrastructural poverty. For their part, the variables of activity sector and agro-ecological area were found to be relative determinants as moving from the basic level did not significantly raise the risk of seeing one's level of poverty increase for all the modalities of the variables. Nevertheless, the study found that employees in the informal farming enterprises and the inhabitants of the savannah rural areas were the poorest.

Classifications of the profiles of multidimensional and monetary profiles were very different for the majority of variables. This was due to the fact that the main contribution of the multidimensional approach to the study of poverty included several dimensions of living conditions. This enabled us to better take into account the people's welfare in the formulation of development policies.

Notes

1. The results of the partitioning into three groups are the following: cluster 1 with a number of 3,833, a maximum value of 11.81 and a minimum value of 0.02; cluster 2, with a number of 3,936, a maximum value of 19.58 and a minimum value of 11.62; cluster 3 with a number of 3,220, a maximum value of 30.20 and a minimum value of 19.36.

2. We wanted to obtain two thresholds from the partitioning into two classes. But only 30 people were found to have CWI values between 14.64 and 14.57.

3. It is sufficient to write $odd\text{-}ratio = e^{\beta}$

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Appendixes

questionnaire

Section	Description	Summary of the contents
Section 0	Identification of the household	Administrative division and district, name of the head of the household, number of persons surveyed
Section 1	Composition of the household and characteristics of the household's members	Names, age, sex, marital status, and occupational status of the household's members
Section 2	The household's members' health area	Last medical consultation, reason, of consultation, cost
Section 3	Level of education of the household's members	Literacy level, type of school attended, and the highest study certificates obtained
Section 4	Activity of the household's members	Employment status, activity sector, type of enterprise
Section 5	Birth, mortality and fertility rates	Live births, deaths
Section 6	Anthropometry and coverage vaccinations	Spacing out of births, prenatal visits
Section 7	The household's housing and its furniture	Nature of housing, source of energy, materials used in building their house's walls, floor and roof, and furniture
Section 8	The household's moving houses changing	Reasons for moving house or the residential area
Section 9	Access to basic infrastructure	The distance the household has to cover to get to basic facilities such as schools, health centres, bus stations and market places
Section 10	Perceptions of living conditions	Self-evaluation about the level of poverty, the psychological income needed to make a living
Section 11	Non-farming family businesses	Areas of setting-up non-farming family enterprises, difficulty in acquiring raw materials

continued next page

Annex 1: Continued

Section	Description	Summary of the contents
Section 12	Material and financial property. Sources to of income	Access to land and property, access savings and share capital
Section 13	Farming and activities of the rural area	Animal husbandry, fish farming, fishing, beekeeping, agriculture Farming assets, expenses and cos
Section 14	The household's non-food retrospective expenses	Expenditure on clothing, water, rent, electricity and other sources of energy
Section 15	The household's daily expenses and acquisitions	Precise description of the product, goods or services bought, paid for, debited or self-produced, or received as a gift

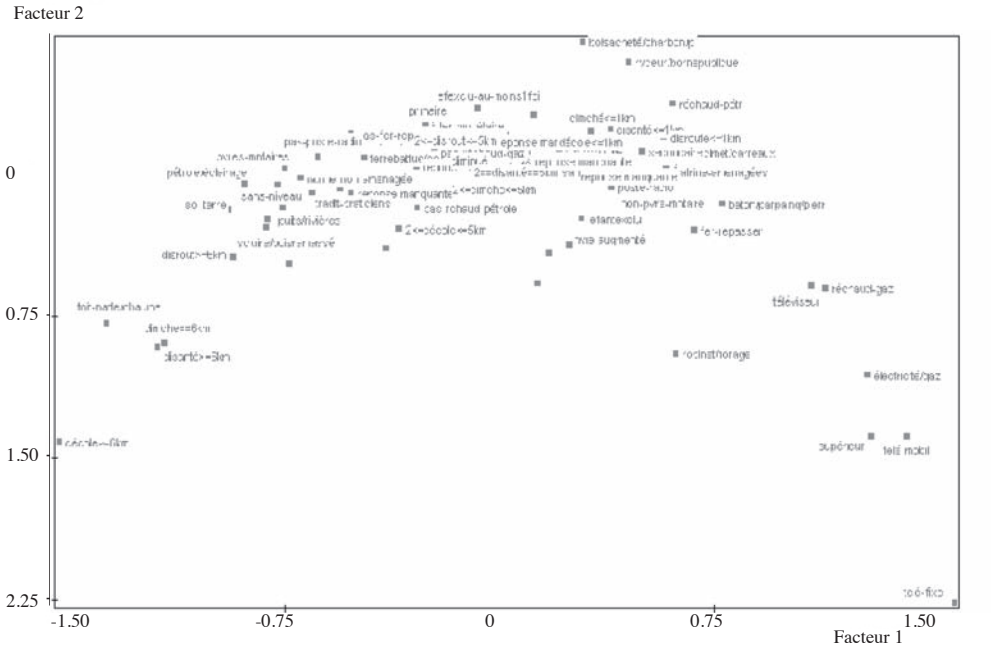
Source: Summary of ECAM II questionnaire

Appendix 2: 37 Poverty indicators extracted from ECAM II

No.	Basic indicators of poverty
1	Source of energy for cooking
2	Materials used as flooring in one's house
3	Source of lighting for the house
4	Possession of a TV set
5	Type of toilet
6	Level of education
7	The nearest asphalted road
8	Possession of an iron box
9	Materials used as roofing
10	Possession of a radio
11	Standard of living (the monetary indicator)
12	Possession of a gas stove
13	Distance from a modern health centre
14	Distance from the nearest food market
15	Possession of a mobile telephone
16	Number of times the household has no electricity due to a power cut
17	Number of times the household has no water because it's been cut off
18	Possession of a paraffin-oil stove
19	How do you live in relation to your neighbours?
20	Materials used in building the walls of your house
21	Distance from the nearest public primary school
22	Classification of your household
23	Do you think that your household is poor?
24	Possession of a fixed telephone
25	Type of health centre
26	How many times has your child been sent away from school for non-payment of school fees?
27	Evolution of the standard of living since 1996
28	Do you think that Cameroon is a poor country?
29	Do you think that the people in the neighbourhood/village are poor?
30	Were you taken ill in the past two weeks?
31	Are the monthly expenses covered by the household's members' income?
32	When did you last go for medical consultation?
33	How would you appraise your own state of health?
34	How do you think you live in relation to your parents?
35	Number of times the household was without a telephone for the past 12 months
36	Distance from the nearest supply of drinking water
37	Source of supply of drinking water

Source: Analysis of ECAM II data

Appendix 3: Pooled data projection of modalities in the first two axes



Source: Estimations by authors

Annex 4: Convergence of the algorithm of historical classification of iterations

Changes in the class centres

Iteration	1	2
1	10.192	9.523
2	.135	.164
3	5.444E-02	6.507E-02
4	2.007E-02	2.374E-02
5	1.111E-02	1.310E-02
6	8.026E-03	9.487E-03
7	2.073E-03	2.449E-03
8	.000	.000

Source: Estimations by authors

Convergence achieved The distance covered is 0 or very short. The maximum distance covered by a centre is .000. The current iteration is 8. The minimum distance between the initial centres is 30.917.
multipoverty

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