

Analysis of the Movement of Entry and Exit of Food Poverty in West Africa: A Case Study of Benin Using a Multinomial Logit on Panel Data

Njoupouognigni Moussa¹

Abstract

This article analyzes the dynamics of food poverty, the movements into and out of poverty and the factors that determine them. Based on data from the integrated modular household living conditions survey in Benin (2006, 2009 and 2011), recorded in the annals of the National Institute of Statistics and Economic Analysis (INSAE), movements into and out of food poverty are analyzed using a transition matrix. Multinomial logit regressions allowed us to highlight the determinants of membership in each cell of the transition matrix as well as the chronic and transitory poverty situation. This analysis shows that between 2006 and 2011, 40.37% of the initial poor households changed status or "transient poverty", while 55.69% of the initial households remained there or "chronic poverty". As a result, 30.69% of households fall into poverty in 2011.

Key words: Food Poverty; Entry and Exit movements; Panels data, Multinomial logit, Benin.

JEL Classification:C33;I30; I32

1. Introduction

Most of the work on poverty that has led to the development of anti-poverty policies in developing countries tends to focus on measuring income poverty at a given point in time, or comparisons of poverty in the developing world. Time using survey data from different dates (MEDEV, 2004, Fatou CISSE, 2009). On this basis, Oxley and al (2000) find that the statistical poverty indices do not provide information on the degree of mobility or the length of time households remained in poverty. Moreover, they dwell on monetary and multidimensional poverty.

However, in the case of developing countries, food poverty is permanent. In recent years, it has been developed and supported by the School of Basic Needs and those of the School of Capabilities and Operations with SenAmartya as leader. SenAmartya, echoed by Bertin Alexandre (2005) emphasizes that the poor are not only those with low incomes but also those who cannot meet their basic needs for food, shelter, clothing, health, education, etc.

On the other hand, the utilitarian vision considers the poor as any individual who has insufficient income that does not allow him to provide the necessary needs for himself. This approach only gives a very incomplete view of the different shortcomings of which the poor suffer. Viewed as a polysemic and multidimensional concept, poverty is very difficult to define. Whatever definitions may reasonably be given to this concept, it is evident that many households are currently living in unacceptable conditions. The concept of poverty changes according to the position of the analysts: the community (Muslim, Christian, Yoruba, Fon, Nago, Haoussa, etc.), professions (economists, sociologists, anthropologists, philosophers, etc.)

Much work has been done on Benin, notably those of Marie Odile (2004), Mededji and al (2008), Hodonou and al (2010) and Oloukoi, L, Amoussouga, G and al (2013) to name only this. These authors have raised various issues and interesting methods, but only one of these works has focused solely on food poverty. Knowing that Benin's economy is essentially based on growing cotton, grain and transit trade, it is important to question the contribution of this sector in improving the welfare of the population.

¹ Enseignant-chercheur des Universités-Université de Douala, Pobox1872 Douala/ENSET- E-mail :mnjoupouognigni@yahoo.fr

Similar work was done in Burkina Faso by Kaboré (2010) and based on the approach of Datt and Ravallion (1992). Hence the interest of this article on the dynamics of food poverty in Benin. To achieve this, we used the database of the National Directorate of Statistics (INSAE). To this end, it will be a question of examining the double movement of entry and exit between the periods considered at first². Next, analyze the factors that explain the position of the household in a situation of "transient food poverty" or "chronic". Finally, to measure the roles of growth factors, redistribution and displacements of the population of the main economic sectors in the dynamics of poverty in Benin eventually. This paper readily embraces the IMRAD approach: Introduction, Methodology, Results, Analysis and Discussion.

2. Literature review and methods

2.1 Analysis of the movements of entry and exit of poverty

Poverty is characterized by several phases depending on the well-being of households. To understand this mobility, previous studies show that the transition matrix makes it possible to better appreciate them in that it specifies the proportions of those who leave from one state to another. These two periods give rise to four categories of household: poor households that have remained poor (PP); poor households that have become non-poor (PNP); non-poor households who remained non-poor (NPP); non-poor households who have become poor (NPP). For this purpose, a mobility index was born in 1978 by Shorrocks and standardized to take values between 0 and 1. When it is close to 1, mobility becomes more and more important. Let M be the transition matrix and I the mobility index:

$$I(M) = [(n - M^t)/(n - 1)] \quad (1)$$

With M^t the trace of the matrix M and n the number of states. Several classifications are made according to income or size. It is part of the work of (Jalan et al, 2000). They advocate a systematic approach to classifying poverty (chronic and transitory) based on a variant of Milton Friedman's hypothesis. The trend of Baulch and Hoddinott (2002) shows poor non-poor households and poor non-poor households as the "often poor" group, which is generally large and non-homogeneous. To appreciate the chronic character, we use the well-being, which would be the inter-temporal mean while the transient character operates by the residue in place of well-being. We realize that the chronic character does not always mean poor because it is one of the subsets. To consider several dimensions of poverty (severity according to the degree of dislike granted to countries, depth ...), Foster, Greer and Thorbecke (1984), start from the classification of households. They put together an index that has the advantage of being both additive and decomposable in groups.

In this research, the standard of living of households is measured by income or expenditure of food production. We will focus only on the variables of agricultural and non-monetary production. To implement the determinants of entry and exit movements, as well as persistence in poverty, we have discussed the transition matrix. It helps to understand the socio-economic factors that explain the position of households in its different cells on the one hand, and chronic and transient poverty on the other.

2.2 Analysis of the determinants of entry, exit and persistence movements in poverty

The analysis of explanatory factors is based on the multinomial logit model. We will consider y_{is} as a multinomial dependent variable characterizing the "s" groups of households identified from the introduction to which the household can belong. Having four groups, "s" can take the following values ($s=0, 1, 2, 3$). In this study we consider that for $s = 0$ we have non-poor households that are not poor; for $s = 1$ poor households remained poor; $s = 2$ poor households become non-poor; $s = 3$ is for non-poor households who have become poor. The probability P_{is} of the household i to belong to the group is given by: $P_{is} = P_{s(X_i, \varphi)} = \frac{\exp(\gamma_s)}{\sum_t \exp(\gamma_t)} \quad (2)$

With X_i the vectors of explanatory variables $k \times 1$, φ the parameters to estimate and which are specific to the group (γ_i) or to all the groups (γ_i). Cramer (1991) believes that this model has many parameters. The γ parameters being determined to an additive constant, we can add a constant β to all the parameters γ without affecting the probability P_{is} . The differences ($\gamma_s - \gamma_t$) are decisive and for that, one of the modalities (a vector of the $k \times 1$ vectors of parameters) is redundant (difference of parameter equal to zero).

²2006 and 2011. The sample is constituted of the same economic agents observed in 2006 and 2011. With the new been excluded.

To solve this problem, it is necessary to eliminate a vector r of the $k \times 1$ vectors that is to say by subtracting γ_r from γ_s . The corresponding modality $s = r$ is called the reference mode. We can then rewrite the model (1) in two equations:

$$P_s(X_i, \varphi) = \frac{\exp(X_i \delta_s)}{1 + \sum_t \exp(X_i \delta_t)} \quad \text{Pour } s \neq r \quad (3)$$

$$P_r(X_i, \varphi) = \frac{1}{1 + \sum_t \exp(X_i \delta_t)} \quad \text{Pour } s = r \quad (4)$$

$$\delta_s = \gamma_s - \gamma_t$$

It is the parameters δ_s that maximize the likelihood function to deliver the marginal effects of the explanatory variables X_i which are the first deviations of the probability with respect to X_i . We will refer to the control modality that corresponds to the group of non-poor who remained non-poor. In this case $s = r = 0$.

With respect to the determinants of transient and chronic poverty, the proposition of variables X_i is an inspiration from the literature on the determinants of poverty. X_i retained to categorize households are relative to demographics (household size, number of children in household, gender and age of head of household), human and physical capital factor, and group's place of residence. Couloumbe and McKay (1996); Datt and Jolliffe (1999); Geda and al (2001) have shown the benefits of "human capital" and "physical capital" factors in determining poverty. As well as the significant effects in the determination of poverty by demographic variables have been studied by (Glewwe 1991, House 1991, Grootaert 1996, Rodriguez and Smith 1994, White and al 1998). Experience has shown that poverty is not just about determinants. The government always intervenes by developing policies that generate sufficient growth to reduce poverty and ensure a good distribution of wealth for the benefit of (poorer) rights holders.

2.3 Role of growth, redistribution and sectoral displacement of populations in the dynamics of poverty

Many studies have highlighted this approach of growth and redistribution to the dynamics of poverty. These approaches rely on the value of Shapley³, which gives an exact decomposition (Shorrocks 1999). Alternative approaches exist but with residual effect (Datt and Ravillion 1992, Ravillion and Huppi 1991). We can decompose the variation of poverty between two periods into two components ("growth effect" and "redistribution effect") without "interaction effect" by the Shapley decomposition proposed by Shorrocks in 1999. Consider the decomposition of poverty between two periods as follows:

$$\Delta P_k = G_k + D_k \text{ with;}$$

ΔP_k the variation of poverty between two periods,

G_k the growth effect, D_k the redistribution effect; we will have the following equations:

$$G_k = \frac{1}{2} [(p(\mu_2, l_2) - p(\mu_1, l_2)) + (p(\mu_2, l_1) - p(\mu_1, l_1))] \quad (5)$$

$$D_k = \frac{1}{2} [(p(\mu_2, l_2) - p(\mu_2, l_1)) + (p(\mu_1, l_2) - p(\mu_1, l_1))] \quad (6)$$

With μ_1 and μ_2 the average expenditures of periods 1 and 2; l_1 and l_2 the Lorenz curves of periods 1 and 2 and $p(\mu, l)$ the measure of poverty. When we take the sectoral contribution and the mobility of the population, the decomposition of Shorrocks takes another form by integrating new parameters. The variation will depend at this time on the contribution of the shares $\Delta \vartheta_{kt}$ and those of the poverty measures within the sector ΔP_k and K the set of sectors. From the decomposition of the FGT index, we can write:

$$\Delta P = \sum_{k \in K} \vartheta_{k2} P_{k2} - \sum_{k \in K} \vartheta_{k1} P_{k1}$$

Respectively the poverty of the population at time t and the variation of poverty between two periods considered.

$$\Delta P = \sum_{k \in K} \frac{\vartheta_{k1} + \vartheta_{k2}}{2} \Delta P_k + \sum_{k \in K} \frac{P_{k1} + P_{k2}}{2} \Delta \vartheta_{kt} \quad (7)$$

This decomposition presents respectively the contribution of sectoral poverty variations and the second one the contribution of changes in the shares of the population. When we substitute the relations (5) and (6) in (7), we obtain (8) which allows us to derive the growth effects (G_k) on the variation of the total population ($P_2 - P_1$) for the purpose of to appreciate the contribution of growth and sectoral redistribution in the dynamics of poverty.

³ It is an allocation of solution proposed by Lloyd Shapley in 1953 in order to share cost or a surplus of n players in a cooperative game. For detail values of Shapley.

$$\Delta P = \sum_{k \in K} \frac{\vartheta_{k1} + \vartheta_{k2}}{2} \Delta P_k (G_k + D_k) + \sum_{k \in K} \frac{P_{k1} + P_{k2}}{2} \Delta \vartheta_{kt} \quad (8)$$

The absolute impact of the growth component on the poverty change is obtained by weighting the growth effect by the average share of the population of sector K between the two periods considered. The impact of redistribution is calculated in a similar way and relative contributions are obtained by dividing the absolute contributions by the variation of the population. An alternative approach with residual effect is proposed by Koboré (2004) and based on the approach of Datt and Ravillion (1992) for the decomposition of the "growth effects" and "redistribution effect" on the sectoral decomposition of Ravillion and Huppi (1991).

3. Data sources

The sample of our study consists of the cities or departments of Benin. The observation period extends from 2006 to 2011. For all the cities, we have the same years of observations, which leads to a cylindrical panel. The data are extracted from the Integrated Modular Surveys on Living Conditions of Households carried out by the National Institute of Statistics and Economic Analysis (NISEA) 2006 and in 2011. Our analysis considers the variables related to geographic characteristics (place of residence, department, etc.) and those relating to household characteristics (head of household gender, household size, head of household industry, level of education etc.). The household classification variable is food expenditure as advocated by the World Bank in most works. The steps followed in this research are as follows: (i) the analysis of the household transition begins with an objective assessment of a transition matrix, (ii) in the literature, the mobility indices deduced from a matrix Transitions are considered as the best indices that measure relative mobility and show no mobility if the changes observed in the standard of living indicator do not generate any movement between the defined classes.

In practice, the classification of households is based on the FGT indices proposed by Foster, Greer and Thorbecke (1984). Two indices are commonly used: the incidence or index of severity of poverty. The first is simply the proportion of the population classified as poor while the second is supposed to consider the inequality of the distribution of the consumption expenditure of the poor. For the analysis of chronic poverty, the severity index is preferred to the impact (iii) In practice, we distinguish on the two periods four household categories namely: poor households who stayed poor (PP) the poor have become non-poor (PNP), the non-poor have become poorer (NPP) and the non-poor who remained non-poor (NPNP). Such a classification will answer the question concerning the assessment of resources and conditions that enabled some households to break away from poverty or impoverishment suffered by households that fell into poverty, (iv) the transition matrix generated will give the relative proportion of each household category. In terms of mobility, households will find themselves on the diagonal of the matrix and would therefore not shake vis-à-vis their initial states in relation to poverty. They are considered sedentary (stayers). The others are mobile. We talk about "movers". From this point of view, probabilities outside the main diagonal are transition probabilities that can also be used as an indicator of mobility. The higher the transition probabilities, the greater the mobility. Such mobility indicators depend not only on the number of defined poverty classes, but also on the size of each class.

4. Results of the approaches

4.1 Movements in and out of poverty

The transition matrix of household food poverty is given in Table 1. The dynamics among the poor are characterized by the fact that 55.63% of poor households in 2006 remained poor in 2011 while only 44.77% were able to cross the poverty line to become non-poor in 2011. The evolution of food well-being between 2006 and 2011 in the non-poor is characterized by the retention of 69.31% of non-poor households in their non-poverty status, while 30.69% households fall there. We also note that nearly 7,116 households changed status, i.e 40.37% of households. In summary, between 2006 and 2011, 6937 households did not change status or remained in poverty. In other words, in the above-mentioned period, 55.63% of "chronic poor" households were identified. In addition, 7,116 households changed status in the study period. That is 40.37% of "transient poor" households. The food poverty line increased from 292FCFA, 143 in 2011 to 123,317FCFA in 2006, reflecting significant mobility around the poverty line.

There is a clear increase in the threshold reflecting the effectiveness of government decisions or reduction strategies for poverty. The Benin state has made this a priority, especially when we know that poverty can cause drifts in production activity and in political stability.

		2011				TOTAL	
		Poor		Not Poor			
2006		Number	%	Number	%	Number	%
	Poor	6937	55.63	5534	44.37	12471	70.75
	Not Poor	1582	30.69	3573	69.31	5155	29.25
TOTAL	8519	48.33	9107	51.67	17626	100	

Source our results from EMICoV data, 2006 and 2011

4.2 Analysis of the determinants of transition

The results of the logit model of determinants of entry, exit and persistence movements in poverty are given in Table 2 in Annex 1. The persistence of households in a situation of poverty between 2006 and 2011 is favored by factors such as the size of the household; the sex of the head of the household; the graduation; branches of activity. However, several other factors can contribute to poverty reduction in Benin. We can note the climate, cultivated lands and especially those reserved for cotton growing. Factors such as the place of residence of the household may also promote the exit from poverty. The selected variables are recorded in the annals of the MDGs in the fight against poverty in Benin and in the poverty assessment report in Benin. It is found that almost all informal households enter or remain in poverty. There are generally motor taxi drivers or "Zemijang" and some underemployed traders. It is important to distinguish between transient poverty and chronic poverty. Also, study the determinants of each type of poverty in the development of anti-poverty policies (Finnie and Sweetman 2003, Baulch and Hoddinott 2002). If in the second case the improvement of the human and social capital endowment programs is often necessary to fight against poverty, in the first case, supplementary resources or one-off support in the form of social transfers are enough to help the poor out of their situation (Weinberg 1999, Jalan et al 2000). Baul and al (2002) point out that the Poverty Reduction Strategy Papers did not consider such considerations probably because of the narrowness of the data over a long period.

Datt and al. (1999), in their work, distinguish two approaches⁴ in the analysis of the determinants of poverty. Indirect approaches use the standard of living as a dependent variable and look for the socio-economic variables that explain it. Direct approaches, on the other hand, categorize standard of living according to poverty and lead to qualitative dependent variables. In this perspective, other authors believe that it is legitimate to examine the explanatory factors of the "poverty status" or "depth of poverty": Gaiha (1988); Grootaert (1996); Thompson and McDowell (1994); Padilla (1997); Ghazouani and al (2001). Our work is in the second category of approaches. In fact, the factors of "transient poverty" and "chronic poverty" use econometric models with limited dependent variables described in the literature as causes of evolution of poverty (Buccanfuso and Kabore 2004). The results of the Logit model of "chronic" and "transient" determinants of poverty are reported in Tables 3 and 4 in Appendix 2. It should be noted that the chronic maintenance of farm households in food poverty between 2006 and 2011 is significantly favored by factors such as household size, clustered activity, and head of household sex that have positive marginal effects. Indeed, the probability of being poor increases with the female household head. In other words, food poverty in Benin increases with the sex of the head of the household. The food poverty of a household headed by a woman is 0.56 while that of a household headed by a man is 0.51. Similarly, the probability of being poor decreases when working in an industry. Food poverty increases with household size. With a probability of 0.65.

Entry and exit movements are mainly favored by household size, age in the household, clustered industries except for the energy sector, transportation, communications, banking and insurance.

5. Conclusion and Implications of Food Poverty Reduction Policies in Benin

The movements of entry and exit from food poverty are important and concern at least 40% of the populations located on both sides of the poverty line. Outward movements mainly concern the poor near the poverty line, while the inflow is cyclical. These important movements reflect a fragility of the living conditions of populations around the poverty line.

⁴These two approaches are used in the work of Datt and Jolliffe, 1999 and Geda and al in 2001.

It is noted that the exits from poverty are important and are to the credit of efforts of households and public authorities through poverty reduction strategies (PRS) implemented in Benin since 2000. The effectiveness of these successes are countered by major relapses of the population into poverty for mainly cyclical reasons. PRSs should address the issue of household livelihood vulnerability more specifically by targeting populations around poverty lines.

The dynamics of poverty in Benin is marked by the preponderance of its chronic component. The importance of poverty in Benin is mainly due to its chronic and structural nature especially for large households. An analysis of the determinants of population persistence in poverty shows that the following factors contribute to poverty reduction. It is the volume of areas cultivated with cotton and the situation of very favorable agricultural areas. If migration in favorable agricultural areas cannot be sustainable policy instruments, crop area and crop yields can be addressed by the PRSs. Indeed, poor people are mostly rural and agricultural and are characterized by significant underemployment during the long dry period. Water resource mobilization policies can both reduce underemployment in the dry season through off-season farming, which increases the area under cultivation by doubling the irrigable area.

The contributions of growth and distribution to the variation of poverty are different according to the type of activity and the area of residence. The effect of growth is conducive to reducing poverty everywhere except in the North where there is a decline in per capita food production. The effect of redistribution aggravate poverty in all regions. There is a spatial shift from poverty of food availability to the North. In the cash-crop sector, particularly cotton, growth has had a positive impact on poverty reduction and food availability, with a doubling effect for cotton-producing households. In both sectors, the redistributive effect is negative and contributes to exacerbating poverty. It is observed that a sectoral transfer of poverty and food availability in Benin requires growth support but also through an improvement in redistribution, that has a negative impact on poverty reduction.

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