

Full Length Research Paper

Determinants of household transition into and out of poverty in Benin

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This study tries to determine the differentiated factors of households' transition to poverty in Benin. It was carried out on a sample of 6424 households making up data from the integrated modular survey on household living conditions. Descriptive analysis and econometric modeling as Stata 12 was used. From the results of this study, it appears that the geographical location of households in cotton and rice fields increases their chances to emerge from poverty. That reflects the positive effect of a good agricultural season on household living standard. Increasing the household size increases the household's risk of entering or remaining poor.

Key words: Poverty, differentiated factors, transition, Benin.

INTRODUCTION

According to empirical studies, three groups of factors explain the dynamics of poverty, namely: socio-economic factors (education, employment, vulnerability to shocks), demographic factors (age, household size) and geographical factors (living place).

During the last decades, poverty has enlightened due to unmatched policies with daily realities. Indeed, after their national sovereignty, the constraints related to macroeconomic imbalances of young African economies led most governments to adopt the Structural Adjustment Programs (SAP) in 1980s under Bretton Woods institutions leadership. These measures have made it possible to clean up the macroeconomic framework of African states, particularly through the reduction of public spending, anti-inflationary measures and financial reforms.

However, the SAP is being criticized in Africa. The mixed results of the impacts of SAPs depend on the level

of analysis and macroeconomic dynamics. In fact, the first planning actions related to development in African countries were very centralized and the State ensured optimal sovereignty. But the oil crisis of 1979 and 1993 weakened the expenditure of the States which were heavily indebted to assume their responsibilities. In this national and international context, the proposals of the Bretton Wood institutions and the World Bank have been quickly accepted by these countries as a solution to the crisis. This involved ensuring national autonomy through the balance of payments, improving the terms of trade and creating favorable conditions for increasing local production and consumption. The results of the SAPs on the countries that have applied it remain at the macroeconomic level more positive and at the microeconomic level very negative. Indeed the organizational system, the type of governance and the level of education did not favor the change that should come as support. These

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measures have more contributed in destroying African households living conditions. In fact, the SAPs created new constraints, including the privatization of state-owned enterprises that led to higher unemployment, lower wages, higher prices for goods and services, financial reforms and anti-inflationary measures which have increased interest rates, limiting the access of small producers to credit. Faced with this new degrading situation, the World Bank and the International Monetary Fund (IMF) have proposed a Poverty Reduction Strategy by supporting developing countries to produce and implement documents and strategies for poverty reduction. Benin complied with these reforms in the year 2003 with the document of growth strategies for the reduction of poverty. These strategies are today in their third generation.

The first generation of these PRSs was implemented for the period 2003 to 2005 and made progress, but the gain in terms of poverty reduction was not significant since poverty still affected many Beninenses (R Benin, 2007). To correct the situation, the Government of Benin implemented two more generations of PRSs that proposed poverty reduction strategies which aimed in achieving inclusive economic growth (PRSP II for 2007-2009 and PRSP III for the period 2011-2015). For that purpose, several actions have been implemented including the Micro-Credit Program for the Most Poor (MCP) which aims to promote the creation of small income-generating activities and empower women and the poorest.

These strategies have certainly made significant progress in the economic field, illustrated in particular for the period from 2007 to 2015, by an average growth of 5.2%, a control of inflation within the limits set by the Pact of WAEMU Convergence Framework (World Bank, 2015). Despite these recorded performances, the phenomenon of poverty has remained insensitive to development efforts. According to INSAE (2015), 40.1% of Beninenses were poor in 2015 compared to 37.5, 35.2 and 36.2% respectively in 2006, 2009 and 2011. These statistics show the acuity of the phenomenon in the daily life of Beninense households. Moreover, poverty is a transitory phenomenon because 41.2% of individuals are in temporary poverty (22.3% entering and 18.9% leaving) against 15.5% in permanent poverty. By the time the government is making the improvement of people's living conditions its priority, it's therefore critical to understand why households enter poverty, why did they leave it and why did they remain in. This would help to redirect existing policies or develop more effective anti-poverty policies.

Also, the decentralization programs adopted since 2003 are part of the same order of ideas with the integration, this time, of the local communities in the process of development. These decentralization programs were reinforced by imposing on the various municipalities to have a Communal Development Plan (PDC) that would

reflect the development vision of the communal authorities in consultation with the central government.

Despite all these efforts, poverty remains Benin's household's daily realities. Indeed according to INSAE (2014), poverty affected 40.1% of Beninenses in 2015 against 37.5, 35.2 and 36.2% respectively in 2006, 2009 and 2011. Moreover poverty is similar to a transitory phenomenon because 41.2% of individuals are in temporary poverty (22.3% incoming and 18.9% out) against 15.5% in permanent poverty in 2009 (INSAE, 2014). These statistics thus testify of the sensitivity of households' living standard at certain events. Given this fact, it is important to determine the events at which households' living standard is sensitive in order to understand how they affect the transition made by households in poverty. What is the effect of the geographical location of a household in a cotton producing department on the level of poverty? What is the effect of the geographical location of a household in a department with low potential for rice production on the transition made by it in poverty? What is the influence of the increase in household size on the transition made by the household?

Considering that socio-economic, demographic and geographical factors influence poverty, the following assumptions have been made:

H1: The likelihood of household performing positive transitions (exit) increases when living in a cotton-producing department.

H2: The probability of household making a negative transition (entry or stay) increases when it lives in a department with low potential for rice production.

H3: Increasing the size of a household increases the likelihood of the household making negative transitions.

LITERATURE REVIEW

The poverty studies focused on the determinants of the dynamics of poverty over a year or several years and very little on the aspect raised by this work. This paper first analyzes the dynamics of poverty and then the mobility of households (entry, exit, stay) in poverty between two periods.

Analysis of the concept of poverty

According to Aho et al. (1997), poverty is defined as a state of long-term deprivation of well-being deemed inadequate to live decently. This may take the form of a lack of monetary resources, a lack of education and health, or lack of freedom, difficulties in accessing infrastructure, inability to participate in a community or the lack of a sense of belonging to a given society. It is

the multiple facets of this state of deficiency that explain its multi dimensionality and grouped in monetary and non-monetary dimensions.

The monetary dimension of poverty is addressed by the dominant theory for more than two centuries of Welfarist. Well-being is exclusively on the notion of utility, where monetary resources determine its level. Poverty is defined as "a socially unacceptable level of income". Monetary poverty expresses an aspect of standard of living and is the result of insufficient economic resources to live decently; resulting in insufficient consumption. It is the expression of a level of well-being that is too low. It is based either on income or on consumption translated into monetary value. This approach is dominant and most used by international institutions, notably the World Bank. The theory of well-being is the reference for the analysis of monetary poverty. In practice, economic well-being is not directly quantifiable because economic agents have different preferences; it is by virtue of this that the monetary approach to poverty is based on the use of income or consumer spending as a measure of well-being. Thus, a person is considered to be poor when living below a monetary threshold of well-being, that is, when its income or consumption expenditure is below the monetary threshold adopted by the community. For developing countries, this threshold set by the World Bank is around \$ 1.25 a day (World Bank, 1990).

However, not all dimensions of poverty can be assessed by a monetary measure: for example, what price should be allocated to the consumption of public goods, the intensity of social relations or, more generally, the quality of life? It is probably to overcome these difficulties that a number of measures of poverty are based on non-monetary criteria.

Non-monetary dimension of poverty takes into account conditions of existence; including the nature of housing, access to health and education, the enjoyment of capital (physical, human, and social, etc.) (Fraisse-D'Olimpio, 2009; Organisation de Coopération et de Développement Economique, 2001; Guillard, 2010). This new dimension, which appears as a more qualitative view of poverty, is called a non-monetary approach. In this case, a person who does not have decent housing, or / and who does not have access to basic services and / or infrastructure (Rawls poverty) not fully of his human capacities (handicapped) or/and who suffers social exclusions because of his conditions of existence (poverty in the sense of Sen). It was supported by the Rawls School of First Needs and the Sen School of Capabilities (1987).

i) Poverty approach through basic needs

Rawls (1971) identified needs common to all human beings needed to achieve a certain quality of life. These needs are basic need such as education, health, hygiene, sanitation, drinking water, housing, etc. Indeed, according

to the author, a person is considered poor when he does not meet his basic needs in relation to a certain standard of living. One of the weaknesses of this analysis is the relativity linked to the notion of basic needs like that of the notion of poverty.

ii) The capacity approach

Since poverty is understood to be a state of deficiency or lack, Sen (1987) admits that the missing "thing" is not necessity or basic needs, but the human abilities or abilities able to attain a certain standard of living. According to him, well-being is not the possession of goods, but it is the fact of being well nourished, well-educated, healthy, and participating in collective life, etc. This set of factors determines the value of life. Sen (1987) states that the value of an individual's life depends on a set of ways of doing and being that it groups together under the term "functioning."

An individual's capacities are determined by his or her potentialities, which correspond to social capital endowments, human capital, physical capital and economic capital (Rousseau, 2001), as well as its opportunities, which are conditional on the environment, specific to the individual and which will determine his possible choices, that is to say the constraints of functioning.

Whether monetary or not, each of the preceding approaches can be declined according to whether one adopts an absolute or relative poverty line.

Absolute poverty and relative poverty

Some measures of poverty define it in absolute terms, that is, the inability to meet basic needs, while other measures define it in relative terms, as an unacceptable deviation from community standards. The approach to relative poverty approaches the concept of inequality in that it focuses on the relative differences between people in the same society. Here, an individual is considered poor compared to another individual in the community, by comparison; which refers to the notion of discrepancy, and hence of inequalities.

Regarding the analysis of absolute poverty, it identifies a number of basic needs that must be met in order to avoid poverty: food, clothing, housing, etc. Thus, people who are deprived of these basic needs, who are the same wherever they are, are considered to be absolutely poor, even if the manner of satisfying them varies from one country to another according to the culture and the economic situation.

The search for the determinants of poverty has greatly fostered the work of authors who have been interested in the analysis of poverty. Aho et al. (1997) formalized the sanitation, drinking water, housing, etc. Indeed, according

determinants of poverty into three categories: factor endowment, individual choice, access to opportunity.

In terms of factor inputs, Andersson et al. (2006) showed that in Vietnam the area of irrigated land, irrigated land area, livestock numbers, education of household members, the technology used in agriculture in the household has a significant effect on household consumption expenditure. The study found that in Vietnam, possession of a large area of irrigated land and livestock and a level of education have a positive effect on household consumption expenditure.

Long before them, Grootaert (1996) was already insisting on the effect of human capital on changing living standards over time. Indeed, through the construction of a household education index, it has shown that in Ivorian urban areas, a household with a high level of education has a high chance of getting out of poverty. Thus, a household whose members have a low level of education is more exposed to negative transitions in poverty. By assimilating the level of general education of the household to that of its head, Gacko et al. (2015) in Mali and Razafindrakoto and Roubaud (2010) in urban Malagasy confirmed the significant effect of education on the level of a household. The results of their work show that a household headed by a chief with a primary level or less has a high probability of experiencing poverty.

Addressing the second cause of poverty, the World Bank (2005) finds that the structure of consumer spending on poverty can justify the poverty situation of households: This position is explained by the fact that it is in terms of the allocation of time between leisure and work, between consumption and savings, or in the choice of consumer goods, between, for example, children or alcohol consumption, people would be responsible for inequalities because they freely choose to allocate their individual resources and suffer the positive or negative consequences as well as their families "(Aho et al., 1997, p16).

This position of the WB was supported by the work of Attanasso (2011), which showed, for example, that households investing in education will be able in the long term to improve their living conditions.

In addition to the structure of household consumption expenditure, the number of hours worked per month may be related to individual choices and may explain household poverty. To this end, Geda et al. (2005) showed that for a household where the number of hours worked per member is low, the likelihood of experiencing poverty is high. They also point out that marital status is a factor explaining poverty in Kenya. Indeed, according to their work, a polygamous household is more prone to poverty than a monogamous family. This can be explained by the fact that the size of the household is greater in polygamy and will therefore put pressure on household resources. It is for this reason that Woolard et al. (2004) consider the size of the household as a shock variable that may explain the level of poverty in South

Africa. According to these authors, the variation in the size of a household is a factor explaining the transition from one state to another (transition). Hodonou et al. et al. (2010) agree that an increase in the size of the household reduces the standard of living in Benin. This result will be confirmed by the work of the INSAE (2014), which showed that births increase the share of inactive persons of the dependent age.

Concerning the third cause of poverty, "unequal access to opportunities to escape can be measured by access to essential services (health, basic education, drinking water, electricity), access to economic opportunities such as the market, microcredit or simply non-discriminatory policies towards the poorest groups "(Aho et al. 1997, p17). It is in this context that the World Bank (2005) suggests that indicators of access to electricity and health services should be included in the list of poverty variables in developing countries. This suggestion is well founded, as the work of Andersson et al (2006) has shown that the poor in Vietnam have limited access to basic services. Hodonou et al. et al. (2010) point in the same direction and insist on the economic aspect of inequality by showing that the most notable determinants of poverty besides those related to the demographic characteristics of households are the rate of access to credit, economic accessibility to health and the level of economic accessibility to communication.

In order to better understand the problem of access to the chances of escaping, some authors have considered integrating geographical variables, variables indicating caste membership, an ethnic group, and sex variables.

Concerning geographic variables, Hodonou et al. (2010) and INSAE (2014) have shown that the residence environment (Rural or Urban) favors the occurrence of poverty. INSAE (2014) justifies this situation by the fact that in rural areas populations are more biophysical shocks (flooding, drought) that can cause marked changes in household income.

As for the variables indicating membership of a social caste, Lachaud (1998) showed that belonging to a certain ethnic group of Burkinabe society increases the probability of being poor. A similar result was obtained by Gang et al. (2002) who showed the relationship between caste, ethnicity and poverty in rural India.

Finally, a flow of studies has shown that the sex of the head of a household can determine the poverty level of a household. However, the meaning of the relationship between the sex of the HOH and poverty is not unanimous. Razafindrakoto and Roubaud (2010) have shown that a woman-headed household is more prone to poverty, while N'Diaye (2005) has proved the opposite in rural Senegal.

In Benin, ATTANASO (2005) used panel data (ELAM 96 and 99) to estimate using a binary logistic regression a model explaining the poverty of women in Benin. The dependent variable is poverty with two modalities: poor ($y = 0$) and non-poor ($y = 1$). The same holds for MEDEDJI

(2006) who adopted a multinomial logistic model using panel data from EMICOV 2006 to analyze the transition in poverty and the determinants of household belonging to identified households. These two authors have used such a model because of the qualitative polytomic nature of the variable to be explained. Hodonou et al. (2010) have adopted a Markov model using the transition matrix associated with the Markov chain, reinforced by the use of a logit model (Quelque soit le type de ménage, la variable dépendante est le bien être) to determine the factors explaining the transitions between the different states of well-being distinguished. Thus, qualitative regression models (logit and probit) are generally used to identify the determinants of poverty.

In the light of these different studies on the determinants of poverty, we consider as factors explaining the transition in poverty: geographical factors (household place of residence), socio-economic factors (education, employment, capital physical, accessibility to basic services) and demographic factors (household size, age structure, dependency ratio).

From a theoretical point of view, classical approaches, from contemporary to neo-classical approaches, have explored the different causes of poverty in economic thought.

Poverty and classics

Adam Smith, founder of political economy (1723-1790) began the analysis of the causes of poverty by studying the division of labor. Through his famous work on "the nature and causes of the riches of nations," he relates "general opulence" to the division of labor. According to him, there is no place for poverty or even poverty in the division of labor and therefore the absence of the latter is at the root of poverty. It justifies its position by the fact that the division of labor will lead to economic growth, the fruits of which will be the rise of wages. This will lead to an improvement in the living conditions of the workers. Smith sees in the absence of work the origin of poverty. To this end he asserts that an individual is "rich or poor according to the amount of labor he will be able to command or that he will be able to buy" (Jean, 1999)

Without rejecting Smith's conclusions, Malthus finds that the growth achieved through the division of labor will come up against an important limit: population growth. Indeed, in the statement of the "law of the population," Malthus sees the latter increase spontaneously according to a geometric progression while the means of subsistence grow only according to an arithmetical progression. The growth of the population will end up with a constraint of available means of subsistence. Thus, he sees in the growth of the population the cause of the observed poverty. It should be noted, therefore, that the growth of the population is the responsibility of the individual, and he advocates to the poor to stop growing if

they want to keep the means of subsistence available. (Ravallion, 1995; Bertin, 2007)

Inspired by the conclusions of these predecessors, Ricardo bases his analysis on the laws of capitalism. He finds that anything which increases wages necessarily diminishes the profit. Thus, producers and rentiers will seek to reduce wages to a level that will allow them to maximize their profits. When this level is below the natural price of labor, the worker's condition will deteriorate. At Ricardo, poverty is the result of the low wages paid to workers. And it advocates as a means of fighting against poverty the abolition of all laws that would prevent the labor market from regulating itself through the law of supply and demand (Lallement, 2012).

In short, although the analyzes differ, we note that for the classics poverty is rooted in the relationship between man and work. The effort that the individual provides when he works is rewarded by an accumulation of wealth that will enable him to meet his needs. (Bertin, 2007)

Walras and poverty

Walras, author of the neoclassical theory of general equilibrium, is illustrated in the debate on the causes of poverty by developing the theory of justice. It defines justice as the principle that society must organize the initial distribution of wealth among individuals. Through this theory, Walras attempts to explain the poverty of people by the inequality in the initial distribution of wealth. By reducing wealth to land, he finds that the state ownership of land and individual ownership of his work define the just distribution of wealth among individuals. At Walras, the structural cause of poverty is the initial unfair distribution of wealth among individuals. He bases his analysis on the fact that, with a fair initial distribution, inequalities between individuals will have to be considered just because they result from individual choices, to work more or less, to consume or to save. To this end, it advocates that land management should be entrusted to the State which represents the entire population (Lallement, 2012).

Causes of poverty according to some contemporary theories

1) The causes of poverty according to the theory of human capital

Human capital, developed by Schultz (1961) and Becker (1964, 1975), refers to all the skills, abilities and other abilities (know-how, experiences, etc.) possessed by an individual for productive purposes (Veronique, 2003). These capacities, which can be either innate, or acquired during a school or university course, or during a professional experience. It is these skills that he offers in

the labor market in return for salary. Thus, the lower the human capital stock, the higher the income of individuals will be.

ii) The causes of poverty according to life cycle theory

The life-cycle theory is a theory developed by Modigliani (1960) explaining how an economic agent chooses his level of consumption and his savings during his life. According to this theory, age determines both the individual's income and his wealth. Thus the variations in the incomes of individuals are due to their age (Ando and Modigliani, 1963). Life cycle theory suggests an increase in income during periods of intense activity and a decline during the period of retirement.

iii) Food production in relation to the living conditions of the households

EBELA 2017 has shown that the merchant food could contribute to the reduction of poverty in rural households in Cameroon, in the department of MVILA. According to the author, income from the merchantable food remains a source of income because of the dependence on cocoa farming, the decline of rural households around the marketing of food and the lack of modernization of the productive apparatus and commercial food crops. In this context, the fight against poverty through the food market remains one of the solutions to improve the living conditions of households. Similarly, the World Bank 2008 notes that the growth of agriculture is on average twice as effective as that of other sectors in the fight against poverty because it brings together nearly 75% of the world's poor population living in poverty rural area. This reduction is achieved through the creation of employment, the decline of food prices and the increase of farmers' incomes. Poverty reduction is thus directly related to household food production and could be an effective struggle.

METHODOLOGY

This is to present the Data Source, the variables used, the tools and the analysis model.

Data source and study population

This study is based on data from Integrated Modular Surveys on Household Living Conditions (EMICoV) conducted by the National Institute of Statistics and Economic Analysis (INSAE). The survey is designed to provide the Government, policymakers, researchers and development partners with the opportunity to have a large socio-demographic and economic database, including up-to-date indicators for assessing and monitoring development programs and policies, namely indicators on poverty, employment and

unemployment, access to micro-finance and participation in savings, food security, land conflicts, human security, governance and democracy. These data have the advantage of providing information on the characteristics of individuals and households and the household consumption expenditure needed to estimate the level of monetary and non-monetary poverty and the factors that influence these levels. This is a repeated survey (4 passages of three months with a month of flapping) by direct interview and covers a national sample of 17982 representative households in the 77 communes of Benin, at the level of the middle residence (urban / rural). It is distributed in 7438 households in urban areas and 10544 in rural areas. The sample is areolar, stratified and drawn at two degrees. In the first stage, 750 enumeration areas (EAs) are drawn proportionally to their size in households enumerated in the 2002 General Population and Housing Census. An enumeration of households in each of these EAs provided a list of households from which 24 households are drawn. The availability of data on the same households in 2006 and 2009 made it possible to build a panel of 6424 households.

Specification of the variables

Dependent variable: transition

It was obtained by comparing the level of poverty in 2009 to that of 2006. The dependent variable in the context of our study is a polytomous variable with three modalities. The different modalities of this variable represent the two transition groups that can be achieved by households: Negative transition (entry or stay in poverty) and positive transitions (never poor or out of poverty) with as a reference modality the "never poor" modality. . So we have the variable "Transition" which is specified as follow:

$$\text{Transition} = \begin{cases} 0 & \text{Never poor} \\ 1 & \text{Entered or persisted in poverty} \\ 2 & \text{Exit from poverty} \end{cases}$$

Independent variables

The specificity of this study is that it takes into account geographical factors different from those identified in the literature to explain the transition into poverty. Here, the focus has been on cash-producing areas and cereal crop production in order to measure the effect of the location of households in these areas on their living conditions. The variable rice zone

The coding of the variable "Rice_zone" was in relation to the potential of the area of residence in rice production. Here, three levels of potential have been selected according to the potentialities of the departments in the lowlands. These include weak potentialities, high and very high potentialities.

The following table presents the different variables used to explain the transition of households as well as the theoretical or empirical bases justifying their choice.

Thus, when the potential in the lowlands is less than 10.000 ha, the department is described as a low potential department, and when the potential is between 10.000 and 50.000 ha, the department is considered a high potential department, while it is designated as a very high potential department when the potential is greater than 55.000.

The variable Cotton_zone

The coding of the variable "Cotton_prod" was done by considering

the cotton producing departments or not. The existing variable named "department" has been recoded as follows: 0 for non-cotton producing departments, and 1 for producing departments.

The national cotton production coming from more than 70% of the large cotton producing departments (borgou and Alibori) (INSAE), only these departments were considered as a cotton producing department, in order to appreciate the influence of the "big producers" of cotton on household transition.

Tools and analysis model

Analysis tools

The study will be based on a descriptive approach coupled with an analysis of the determinants of the transition of households into poverty in order to verify our hypotheses.

The descriptive approach is based initially on the presentation of the structure of the studied population in order to verify the representativeness of our sample then the distribution of the population between the different modalities of the explanatory variables of interest. In a second step, a cross between the dependent variable and the explanatory variables of interest is made in order to verify the meaning of the relationship between them. A previous chi-square test is done to verify the correlation between the explanatory variables and the dependent variable. This analysis is done using tables and graphs obtained using the Excel software.

The explanatory approach is based on an unordered multinomial logistic regression using the STATA software (version 12).

The analysis of the results of this type of econometric model is done by means of the sign of the coefficients, their significance, the odds-ratio calculation and the marginal effects.

The sign of the parameters indicates, in case of significance of the parameter, whether the associated variable influences the dependent variable positively or negatively. The odd-ratio or odds ratio, as its name suggests, is a statistical measure that allows the degree of dependence between the modalities of the explanatory variable and those of the dependent variable to be expressed relatively. Marginal effects give an idea of the sensitivity of the probability of the reference event with respect to unitary explanatory variations.

The significance of the model is appreciated through the LR-test. The decision rule of this test states that when the probability associated with the log likelihood ratio is less than 5%, we accept the hypothesis H1 that the model is globally significant.

Analysis model

The study made estimates using multinomial logit models that are models in which the explained variable is qualitative multinomial; that is, it can take more than two modalities. This choice is justified firstly by the polytomic nature of our dependent variable but also and above all by the simplicity of the calculation of the coefficients and their interpretation. Moreover, this model is widely used in the study of the mobility of households in poverty and according to Bocquier (1996), the use of logistic models is common in the analysis of biographies (events that occur during the life of the individual). However, there are two types of multinomial logit: ordered and unordered. As specified, the dependent variable does not allow us to use an ordered multinomial logit. The use of an unordered multinomial logit is therefore necessary. Formally the multinomial model is written as follows:

$$\ln \frac{\Pr(\text{Transition}=m/X)}{\Pr(\text{Transition}=j/X)} = X\beta_{m/j} \quad \text{for } m = 0, 1, 2 \text{ and } j = 0, 1, 2 : j \neq m$$

Where, X represents the matrix formed by the explanatory variables; j represents the reference modality (which makes it possible to compare the groups of individuals) and β denotes the vector of the estimated coefficients.

Thus, the non-ordered multinomial model makes it possible to model the probability of realization of the event m relative to the probability of realization of the event j.

The parameters are estimated by the maximization algorithm of the log likelihood.

More specifically, the analysis model is written:

$$\text{Transition}_i = \alpha_0 + \alpha_1 \text{Cotton_zone}_i + \alpha_2 \text{Rice_zone}_i + \alpha_3 \text{Var_Size}_i + \alpha X_i + \varepsilon_i$$

Transition_i: refers to the transition made by the household i

Cotton_zone_i: refers to the location of the household in relation to cotton production areas

Rice_zone_i: refers to the location of the household in relation to areas with potential for rice production

Var_Size_i: is the change in household size

a: designates the parameters to estimate

X_i: denotes the matrix of the remaining K-4 variables, K > 4

ε_i: means the error term that follows a distribution function F (.).

By imposing the logistic law on this distribution function, it becomes:

$$F(X) = \frac{e^x}{1 + e^x}$$

PRESENTATION AND ANALYSIS OF THE RESULTS

Descriptive analysis

Descriptive statistic of the sample

The representativeness of the sample is well reflected in Table 2. Indeed, it can be seen that all departments are present and in proportions that corroborate the density of the population in each of them. The most populated departments - the Atlantic, the Borgou, the Ouémé and the Zou - are each more than 8%, while the least populated Donga and Plateau are each represented with at most 6% of the population sample size. We can also see that in the sample, as one would expect, the proportion of households in rural areas (66%) is greater than in urban areas (34%).

As a result, more than three-quarters of households are headed by men. This result reflects that in Benin household heads are often men. Half of households are headed by individuals who are 41 years old, 29.8% are by individuals under 35 years of age versus 44.9% by individuals aged 44 or over.

In addition, a high proportion of households are headed by individuals who have not received formal education or have only received informal education (61.7%), while only 14.5% have at least one secondary level.

Unified analysis of variables of interest

Distribution of households following the transition

The percentage distribution of households following the

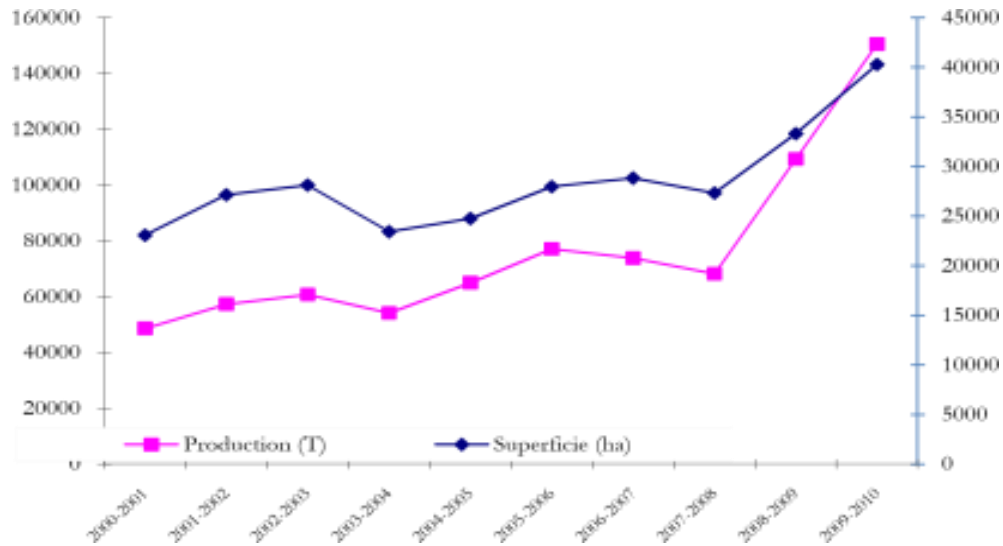


Figure 1. Rice production between 2000-2010.
Source: Authors 2011.

transition is shown in Figure 1.

The analysis in Figure 1 reveals that the proportion of households that have made negative transitions is higher (32%) than that of households that emerged from poverty (19%) between 2006 and 2009.

Distribution of households by geographical location

According to the geographical distribution of households, 17% are located in the cotton production departments (Figure 2).

Graph 1 in appendix shows that households living in departments with high or very high potential for rice production dominate the study population (48% in high potential departments and 34% in highly potential departments). Households living in low potential departments represent only 18% of the study population.

Bi-varied analysis between transition and variables of interest

Cross analysis of transition variables and cotton production zone

The Graph 2 shows the Crossover between Cotton Production Zone and Transition.

As shown in Graph 3, households living in cotton-producing departments made more positive transitions (outflow) than those living in non-producing departments. In fact, 24.1% of households living in the cotton-producing departments came out of poverty compared to 18.7% for households living in non-producing departments. Also, households living in non-producing

departments have made more negative transitions (entry or stay) than those living in producing departments (32.7% for non-producer departments versus 26.8% for producing departments). Through this result, it can be guessed that there is a positive relationship between living in a cotton producing department and a positive transition.

Cross between areas with potential for rice production and Transition

The graph 5 shows the crossover between transition and areas with potential for rice production. Rice production could improve the entry and exit of household from poverty. In a zone of high potential for rice production, 21.35% of households emerge more quickly from poverty and return or persist less in poverty 29.55%. On the other hand, in areas with very high potential or low potential for rice production, households are hard-pressed to leave 17.86% and 18.12% and return more easily or persist more in poverty respectively 34.18% and 32.86% than in previous areas. In conclusion, the production route of food crops such as rice in this case by households is a way out of poverty.

Cross analysis of transition variables and size variation

Graph 5 shows the crossover between transition and « var_size »

As depicted in Figure 6, the increase in the size of the household favors entry and keeps it in poverty 42.05% versus 23.8% for the decrease. Similarly, this variable

Table 1 . Summary of the bi-varied analysis.

Parameter		Transition		
		Never poor	Entry or stay	Exit
Cotton_Prod	Non-producing department	48.6	32.7	18.7
	Producing department	49.1	26.8	24.1
HOH_Sector	Formal	67.4	16.5	16.1
	Informal	50.2	30.8	19
HOH_Branch	Other	61.6	20.9	17.5
	Agriculture	45.7	34.9	19.4
Deputy emplou_HOH	No	53.6	27.6	18.8
	Yes	48.8	32.9	18.3
Vul_choc	Did not suffer a shock	54.3	26.4	19.3
	Suffered a shock	51.5	30.2	18.3
Inc_input_price	Did not increase	52.6	29.1	18.3
	Has undergone an increase	48.6	27.4	24
Active_Death	Did not lose an asset	52.5	29.1	18.4
	Lost an asset	48.9	22.6	28.6
Var_Size	Decrease	48.8	23.8	27.4
	Increasing	48.5	40	11.5
HOH_Sex	Man	50.5	30.7	18.8
	Wife	60.2	21.9	17.9
	No level	45.3	32.9	21.8
HOH_Education	Primary level	50.1	32.3	17.6
	Secondary level	58.4	27.8	13.8
	Higher level	84.4	8.9	6.7
HOH_Age	Under 35 years	55.3	30.4	14.4
	35 to 44 years	46.1	34	19.9
	45 to 54 years	51.3	28.3	20.3
	55 years old and over	56.1	22.9	21.1
Household_Credit	Yes	60.8	23.2	16
	No	47.8	32.3	19.9
Household_Size	less 4 people	75.9	15.4	8.7
	4 to 5 people	52.3	29.2	18.5
	6 to 7 people	40.8	36.9	22.3
	8 and over	32	39.4	28.6
Rice_Zone	Low	49	32.9	18.1
	High	49.1	29.5	21.3

Source: Authors' calculations based on EMICoV data 2006-2009.

does not facilitate the exit of household from poverty 11.41% versus 27.36% for the decrease in household sizes. However, the rate of households that have never experienced transition into poverty remains almost equal in both groups (See Annex Table 1).

The bi-varied analysis between the transition variable and the explanatory variables of interest provided a first glimpse of the relationship between them (Table 1). Econometric analysis will provide a clearer and more precise idea of the meaning of the relationship between

Table 2. Estimated result with odds-ratios and marginal effects.

Model	Variable	Sign of the coefficients	Ratio of relative risk	P-Value	Marginal effects (%)
Model 1	HOH_education (reference: One level)				
	Primary	Negative	0.86	0.111*	1
	Secondary and more	Negative	0.75	0.024	2
	HOH_Branch (référence: secteur secondaire ou tertiaire)				
	Primary sector	Positive	1.81	0.00	11
	Credibility_access (reference: no)				
	Yes	Negative	0.54	0.00	9
	Cotton_Zone (reference: non-producing department)				
	producer department	Negative	0.55	0.00	10
	Rice_zone (reference: weak potentiality)				
	strong potentiality	Negative	0.58	0.00	9
very strong potentiality	Negative	0.59	0.00	7	
Var_Size (reference: decrease)					
Increase	Positive	3.77	0.00	27	
Model 2	HOH_education (reference: No level)				
	Primary	Negative	0.89	0.323*	3
	Secondary and more	Negative	0.66	0.017	8
	HOH_Branch (reference: secondary or tertiary sector)				
	Primary sector	Negative	0.56	0.00	3
	Access_Credit (reference: no)				
	Yes	Positive	1.28	0.227*	2
	Cotton_zone (reference: non-producing department)				
	producer department	Positive	1.76	0.00	3
	Rice_zone (reference: weak potentiality)				
	strong potentiality	Positive	1.34	0.037	0.20
very strong potentiality	Positive	1.08	0.576*	3	
growth	Negative	0.2	0.00	12	

* not significant

Source: Authors from EMICoV data (2006, 2009).

these variables.

Econometric analysis

Presentation and interpretations of results

In the context of econometric analysis, two types of estimations were made, by variation of the reference category, based on an unordered multinomial logistic regression. The results of these estimates are recorded in Table 3.

As the model statistics show, the likelihood of the log likelihood of chi-square being less than 5%, the model is statistically validated. Thus the model has at least one variable explaining the transition into poverty. We can therefore switch to interpretations of the results.

Effect of variables of interest on negative transitions

The significance at the 1% threshold of the coefficient associated with the variable "Cotton_zone" and its sign show us that the probability of entering or remaining poor is lower for a household living in a cotton-producing department compared to that of a household living in a non-producing department. Indeed, all things being equal, there is 0.55 times less risk for a household living in a cotton producing department to make a negative transition than for a household living in a non-cotton producing department. In addition, when one moves from a household living in a non-cotton producing department to a household living in a cotton producing department, the risk of making negative transitions decreases by 10%. This result seems to confirm the results of the descriptive analysis, but does not yet allow us to accept the first

Table 3. Estimate with all variables.

Transition	Coef	Std.Err.	Z	P IZI	95%Conf	Interval
Never poor						
Entered or persisted in poverty						
Sex CM	-0.09526	0.111441	0.85		-0.31368	
Instruction_CM	-0.15376	0.060517	-2.54	0.393	-0.27237	
branch_cm	-0.58798	0.088496	6.64	0.011	0.414531	0.123156
acredit	-0.62314	0.160473	-3.88	0	-0.93766	0.035151
Vul_choc	-0.10805	0.082255	-1.31	0	-0.26927	0.761427
Household_under_employment	-0.3627	0.078235	4.64	0.189	0.209357	-0.30862
Actif_death	-0.41026	0.298509	1.37	0	-0.99533	0.053164
Incr_price	-0.25139	0.170487	-1.47	0.169	-0.58554	0.516034
Household_size	-0.80311	0.043527	18.45	0.14	0.717803	0.174805
Var_size	1.322048	0.093446	14.15	0	1.138897	0.08276
Sector_CM	1.253731	0.2309	5.43	0	0.801176	0.888424
Prod_cotton	-0.80409	0.113472	-7.09	0	-1.02649	1.505199
Prod_rice	2087356	0.056736	-3.68	0	-0.31994	1.706286
Age_CM	-0.14562	0.036534	-3.99	0	-0.21723	-0.58168
_cons	-.3.265418	0.271321	-12.04	0	-3.7972	-0.09753
				0		-0.07402
						-2.73364
Exit from poverty or persisted						
Sex CM	0.02919	1208738	0.24	0.809	-0.20772	0.266099
nstruction_CM	-0.30654	0.07145	-4.29	0	-0.44658	0.633455
Branch_cm	0.015807	0.097472	0.16	0.871	-0.17524	-0.1665
acredit	-0.35731	0.179687	-1.99	0.047	-0.70949	0.206849
Vul_choc	-0.03878	0.093646	-0.41	0.679	-0.22233	-0.00513
Household_under_employment	0.143664	0.089361	1.61	0.108	-0.03148	0.14476
Actif_death	0.104131	0.270068	-0.39	0.7	-0.42519	0.318808
Incr_price	0.310799	0.171305	1.81	0.07	-0.02495	0.633455
Household_size	0.618641	0.047373	13.06	0	0.525792	0.646551
Var_size	-0.28012	0.105563	-2.65	0.008	-0.48702	0.711489
Sector_CM	0.885319	0.235222	3.76	0	0.424292	-0.07322
Prod_cotton	-0.05894	0.117669	-0.5	0.616	-0.28957	1.346345
Prod_rice	-0.22267	0.064696	-3.44	0.001	-0.34947	0.171687
Age_CM	-0.07436	0.04098	-1.81	0.07	-0.15468	-0.09587
_cons	-2.12122	0.281751	-7.53	0	-2.67344	0.005958
						-1.569

hypothesis associated with the variable "Cotton_zone".

As for the variable "Rice_zone", the significance at the 1% threshold of both modalities and their negative signs show that the risk of making negative transitions decreases when the household lives in a department with high or very high potential rice production. Indeed, all other things being equal, households living in these types of departments are respectively 0.58 and 0.59 times less likely to make negative transitions than households in low-potential departments; this allows us to accept our hypothesis 2, according to which "The probability of a household to make a negative transition (entry or stay) increases when it lives in a department whose potential for rice production is low".

Finally, the 1% significance of the coefficient associated with the variable "Var_Size" and its sign indicate that the increase in household size has a positive effect on the probability of entering or remaining in poverty. In fact, a household whose size has increased is 3.77 times more likely to make a negative transition than a household whose size has decreased. As well, when moving from a smaller household to a larger household, the risk of negative transitions increases by 27% (see Graph 4 in the Appendix). Those results confirm the outcomes of the descriptive analysis and allow us to accept hypothesis H3 according to which "the increase of the size of a household increases the probability for this last one to make negative transitions".

Effect of variables of interest on positive transitions

Significance at the 1% level and its sign show that the probability of making positive transitions for a household living in a cotton producing department is higher than the probability for a household living in a non-cotton producing department. Indeed, all things being equal, this probability is 1.76 times higher than for a household living in a non-producing department. This also confirms the results of the descriptive analysis, and allows us to validate hypothesis H1 according to which "The probability of a household to make positive transitions (exit) increases when living in a cotton producing department"

Moreover, the significance at the 5% threshold of the "high potential" modality of the variable and its sign allow us to affirm that a household living in a high potential department is more likely to emerge from poverty than a household living in a low potential department.

Finally, the significance of the variable "Var_Size" at the 1% threshold, and its negative sign show that a household whose size has increased is less likely to emerge from poverty than a household whose size has decreased. Indeed, this chance is 0.20 times lower in a household whose size has increased, all things being equal.

The effects of the other variables on the transition will be observed in the tables in the appendix (Appendix Tables 2 to 4). However, the variables "HOH sex", "Death of an active member", "vulnerability to biophysical shocks", "Increase in input prices" do not have a significant effect on the nature of the household transition (annex) and were not taken into account in the final estimates.

Results interpretation

In this paragraph, the results previously presented will be clarified and evidences capable to justify them in the Beninese context will be pointed out.

As a first step, it is important to summarize the verification or not of research hypotheses. Thus, with regard to the effect of the geographic location of households on the nature of the transition made by them, as expected to live in a cotton producing department increases the probability of making positive transitions (H1). Similarly living in a department with high or very high potential in rice production decreases the probability of carrying out negative transitions (H2) on the other hand, making negative transitions, is positively affected by the increase in the size of the household (H3). So all our hypotheses are validated and are not rejected.

In light of the results of the econometric analysis, it is noted that the location of households in cotton production areas has a positive effect on outputs. This situation can be explained by the increased income of cotton producers¹ between 2006 and 2009 following a good

cotton season (INSAE, 2014). Indeed, if it is assumed that households in these areas are almost all seed cotton producers, then the positive effect of this location on the outings can be interpreted as the result of a good cotton season on the level of household life.

Regarding the location in potential areas (high or very high) in rice production, the negative effect of this location on negative transitions can be explained by the upward trend that began to take rice production in the past. Benin in 2008 (see Figure 1 in the appendix). This increase would have the effect of improving the incomes of the households that live from this production and thus to keep them above the line of poverty considered.

Finally, the positive effect of the increase in household size on negative transitions is easily explained by the Malthusian theory that population growth is a source of significant pressure on the resources of the population. In the case of Benin, new births would constitute a new burden for households that do not already have a fairly stable living standard.

Conclusion

The objective of this study was to determine the explanatory factors of household transitions in Benin's poverty, the households that come out of them and to highlight the variables related to those who remain poor or enter poverty. At the end of this work, the various descriptive analysis and the multinomial logistic regression, tools of verification of the hypotheses, made it possible to validate the various hypotheses. The results show that the probability of making positive transitions (outflow) increases when the household lives in a cotton producing department. At the same time, the probability of making negative transitions decreases when the household lives in a department with a potential (strong or very strong) in rice production while it increases when the household increases in size.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest.

REFERENCES

- Aho G, Lariviere S, Martin F (1997). Manuel d'analyse de la pauvreté : Applications au Bénin. Cotonou/Québec/New York, Université nationale du Bénin/ Université Laval/Pnud. 370 p
- Andersson M, Engvall A, Kokko A (2006). Determinants of Poverty in LAO PDR. Working Paper 223, March 2006.
- Becker G (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. New York, Columbia University Press.
- Bertin A (2007). Pauvreté monétaire, Pauvreté non monétaire : une analyse des interactions appliquée à la Guinée. Thèse de Doctorat, Université Montesquieu-Bordeaux IV.
- Bocquier P (1996). Analysis of biographical surveys using STATA software. <http://www.documentation.ird.fr/hor/fdi:010007142>

- Fraisse-D'Impio S (2009) les fondements théoriques du concept de capital humain. <http://ses.ens-lyon.fr/articles/les-fondements-theoriques-du-concept-de-capital-humain-partie-1--68302>
- Gacko I, Dembele D, Traore M (2015). Les déterminants de la pauvreté monétaire et non monétaire au Mali en 2011. Document d'Etude et d'Analyse Economique N°01, Mai 2015.
- Geda A, de Jong N, Kimenyi MS, Mwabu G (2005). Determinants of Poverty in Kenya: A Household Level Analysis. Economics Working Papers, Paper 200544.
- Guillard A (2010). Le capital humain en gestion des ressources humaine: éclairage sur le succès d'un concept N° 31 Janvier 2010 Revue management et avenir. <http://www.managementetavenir.net/la-revue/les-numeros/90-Management--avenir---N%C2%B031.html>
- Hodonou A, Mededji D, Gninanfon A, Totin A (2010). Dynamique de la pauvreté au Bénin : Approche par l'analyse des processus stochastiques de type markoviens. PEP, Janvier 2010. https://www.academia.edu/3434206/Dynamique_de_la_pauvrete%C3%A9_au_B%C3%A9nin_approche_par_le_processus
- Jean B (1999). Problématique de la pauvreté et bidonvillisation en Haiti, Le cas de Shada au Cap-Haitien. Mémoire, Université d'Etat d'Haiti. <https://www.memoireonline.com/02/09/1956/Problematique-pauvrete-bidonvillisation-haiti-cas-de-shada.html>
- Lachaud JP (1998). Modélisation des déterminants de la pauvreté et marché du travail en Afrique : Le cas du Burkina Faso. Centre d'économie du développement, Université Montesquieu Bordeaux IV France, Document de travail n°32.
- Lallement J (2012). Les économistes et les pauvres, de Smith à Walras. Université Paris-Descartes. <https://www.cairn.info/revue-l-economie-politique-2012-3-page-43.htm>
- National Institute of Statistics and Economic Analysis (INSAE) (2014). Final report of multiple indicator cluster survey. <https://www.insae-bj.org/images/docs/insae-statistiques/enquetes-recensements/Autres-Enquetes/Autres/RAPPORT%20FINAL%20DE%20L'ENQUETE%20MICS%202014%20AU%20BENIN.pdf>
- National Institute of Statistics and Economic Analysis (INSAE) (2015). Final report on poverty in Benin. Institut National de la Statistique et de l'Analyse Economique, 2015, Enquete Modulaire Integree sur les Conditions de Vie des Menages. Octobre.
- Organisation de Coopération et de Développement Economique (OCDE) (2001). Du bien être des nations: le rôle du capital humain et social 140 p.
- Ravallion M (1995). Decomposing social indicators using distributional data policy research. Working paper 1487.
- Razafindrakoto M, Roubaud F (2010). La pauvreté en milieu urbain: dynamique, déterminants et politiques. http://horizon.documentation.ird.fr/exl-doc/pleins_textes/divers12-09/010051327.pdf
- Rousseau DM (2001). Schema, Promise and Mutuality The Building Blocks of the Psychological Contract. Journal of Occupational and Organizational Psychology 74:511-542.
- Sen A (1987). Freedom of Choice: Concept and Content. European Economic Review 32:269-294.
- World Bank (1990). World development report: Poverty. <https://openknowledge.worldbank.org/handle/10986/5973>
- World Bank (2005). The World Bank annual report: year in review. Volume 1. <https://openknowledge.worldbank.org/handle/10986/7537>
- World Bank (2008). The World Bank annual report: year in report. <http://documents.worldbank.org/curated/en/452391468323718231/The-World-Bank-annual-report-2008-year-in-review>

Appendix

Table 1. Potentiality in lowlands estimated by department.

Department	Estimated potentialitie (ha)
Atacora-Donga	56,000
Borgou-Alibori	33,000
Zou-Collines	65,000
Mono-Couffo	17,000
Ouémé-Plateau	19,000
Atlantique	15,000

Source: Author, 2017.

Table 2. Variable description.

S/N	Variable	Description	Source	Expected effect
1	Cotton_Prod	0 for non-producing department * 1 for production department	Indicates if the household lives in a cotton producing department	Recorded variable -
2	HoH_Sector	0 for formal * 1 for informal	Indicates HOH business sector	INSAE (2014) -
3	HoH_Branch	0 for others * 1 for agriculture	Indicates the industry of HOH	INSAE (2014) and Hodonou et al. et al. (2010) -
4	Under employment_HoH	0 for no * 1 for yes	Indicates the quality of HOH employment	David Ricardo -
5	VuI_choc	0 for absence of shock * 1 for shock	Indicates the household's status in the face of biophysical shocks	INSAE (2014) and Hodonou et al. (2010) -
6	Input-price-increase	0 for no increase * 1 for increase	Indicates if the household has experienced an increase in input prices	INSAE (2014) -
7	Active_Death	0 for no death of an active member * 1 for death of an active member	Indicates if the household experienced a death of an active member	Walras -
8	Var_Size	0 to decrease the size * 1 to increase the size	Indicates the status of the household in relation to its size	Thomas Malthus -
9	HOH_Sexe	0 for men * 1 for women	Indicates the sex of HOH	INSAE (2014) and Hodonou et al. (2010) +
10	HOH_Degree	0 for no degree * 1 for primary level 2 for secondary level 3 for higher level	Indicates HOH's degree of education	Human Capital Theory and Sen's Approach - +
11	HOH_Age	0 for less than 35 years *	Indicates the age of HOH	Life cycle theory +

Table 2. Contd.

		1 for 35 to 44 years			+
		2 for 45 to 54 years			-
		3 for 55 and over			-
12	Household_credit	Yes*	Indicates whether the household has access to credit		
		No			
13	Household_Size	less than 4 people *	Indicates the initial size of the household	Malthusian theory and INSAE (2014)	+
		4 to 5 people			-
		6 to 7 people			-
		8 and above			-
14	Zone_Riz	Weak*	Indicates the potential of the area of residence of the household in the lowlands	Recoded variable	
		High			+
		Very high			+

* Reference modality.
Source: Authors (2017).

Table 3. Characteristics of the sample.

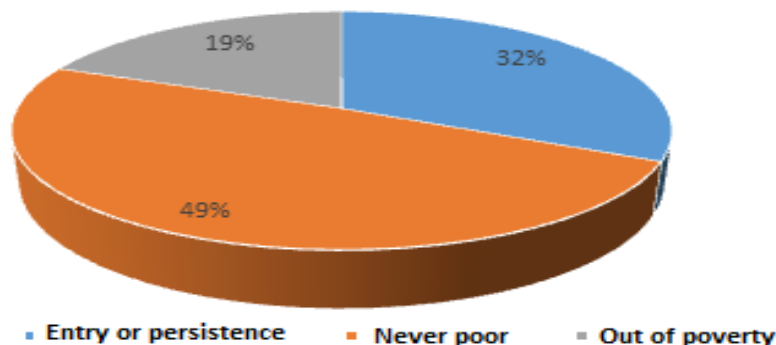
Variable	Categories	Percentage/age
Sexe of HOH	Man	80.20%
	Woman	19.80%
Living zone	Urban	34%
	Rural	66%
Age	Mean	44 years old
	Median	41 years old
	Maximum	96 years old
	Less than 35 years old	29.80%
	35-44 years old	25.20%
	45-54 years old	19.20%
	55 years old and more	25.70%
Department	Alibori	6.70%
	Atacora	9.70%
	Atlantique	13.30%
	Borgou	8.60%
	Collines	7.80%
	Couffo	8.60%
	Donga	4.00%
	Littoral	6.30%
	Mono	7.50%
	Ouémé	9.20%
	Plateau	5.50%
Zou	12.90%	
Education	No level	61.70%
	Primary level	23.80%
	Secondary level and more	14.50%

Source: Authors (2017).

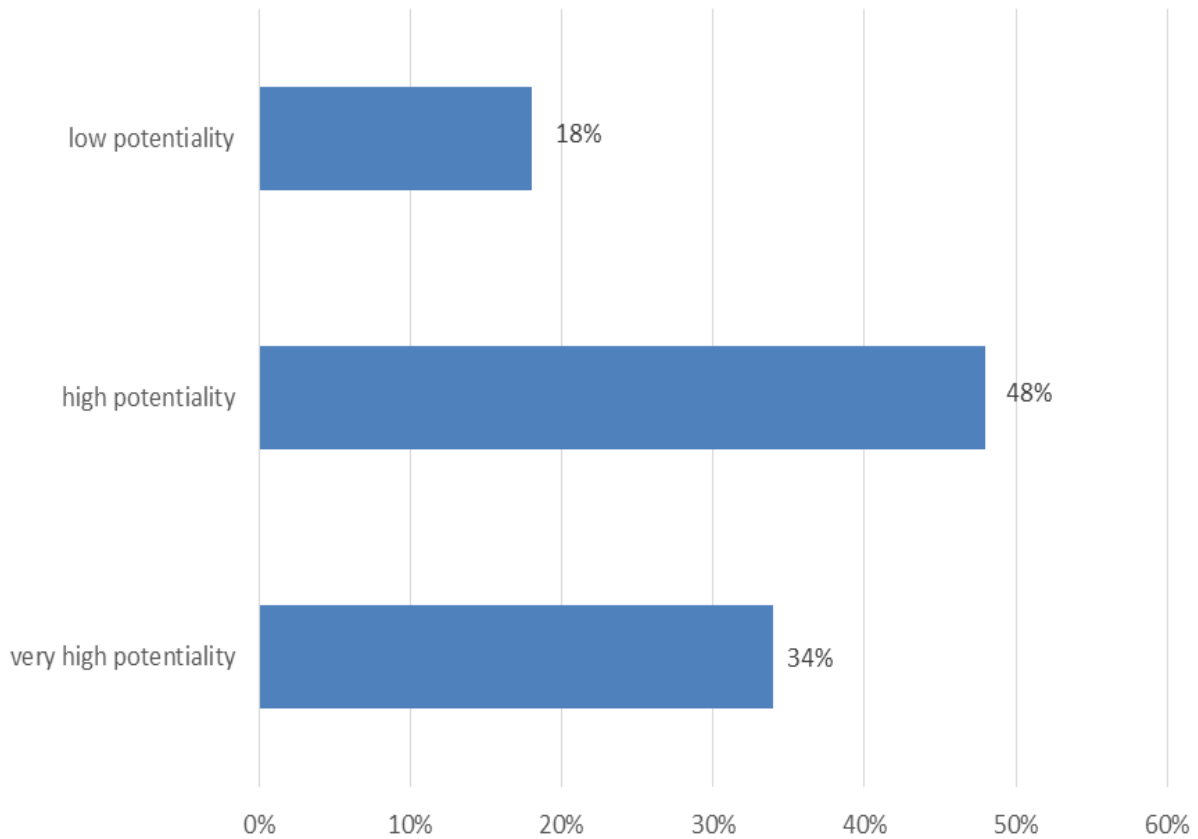
Table 4. Econometric analysis.

Parameter	Model 1: Transition (base: never poor)		Model 2: Transition (base: entry or stay)	
	Entry or stay	Exist	Never poor	Exist
	Coef		Coef	
Instruction_HOH				
Primary (1)	-0.15	-0.26**	0.15	-0.11
Secondary and more (2)	-0.29**	-0.7***	0.29**	-0.41**
Branch_HOH				
Primary (1)	0.59***	0.02	-0.59***	-0.57***
Credit_Access				
yes(1)	-0.62***	-0.37**	0.62***	0.25
Household_underemployment				
yes(1)	0.35***	0.15	-0.35***	-0.21**
Household size				
4 to 5 (1)	0.94***	1.02**	-0.94***	0.08
6 to 7 (2)	1.75***	1.44**	-1.75***	-0.3*
8 and more (3)	2.42***	1.97**	-2.42***	-0.45***
Size variation				
Increase (1)	1.33***	-0.28**	-1.33***	-1.61***
HOH_Sector				
Informal	1.27***	0.84**	-1.27***	0.43
Cotton_Zone				
production department (1)	-0.59***	-0.03	0.59***	0.57***
Rice_Zone				
high (1)	-0.55***	0.25*	0.55***	0.29**
very high (2)	-0.53***	0.45**	0.53***	0.08
Age_HOH				
35 to 44 years old (1)	-0.11	0.11	0.11	0.22
45 to 54 years old (2)	-0.36***	-0.13	0.36***	0.23
55 years old and more	-0.41***	-0.13	0.41***	0.28
Constant	-3.27***	-2.33*	3.27***	0.94
Number of valid observations	4378			4378
LR chi2(32)			996.42	
Prob > chi2	0.00***			0.00***
Maximum likelihood log	-4028.58			-4028.58
Nickname R2	0.1101			0.1101

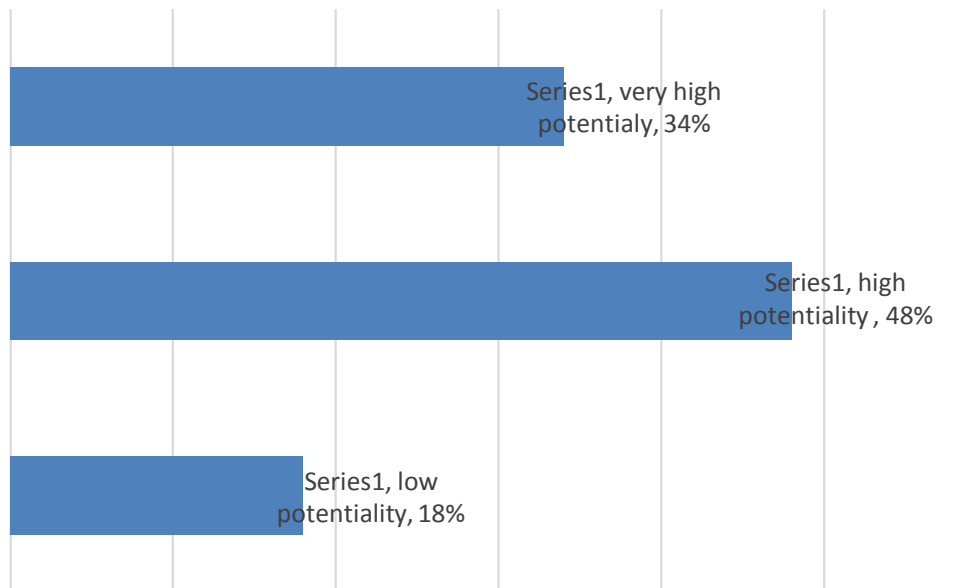
*Significant at the 10% threshold; ** significant at the 5% level; *** significant at the 1% level.
 Source: Authors from EMICoV data (2006, 2009).



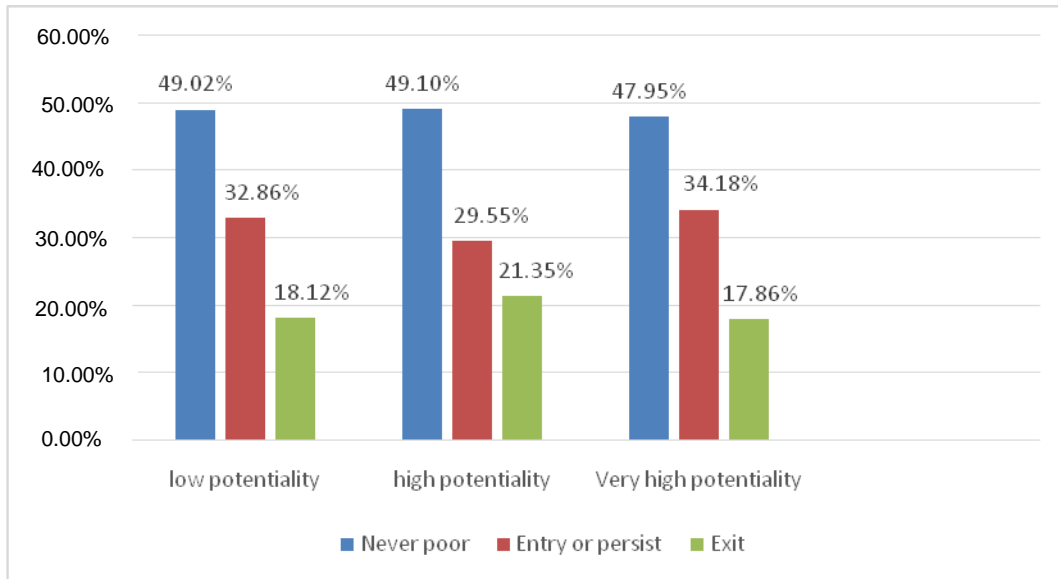
Graph 1. Household distribution (in percentage) according to the transition.
 Source: EMICoV (2006,2009).



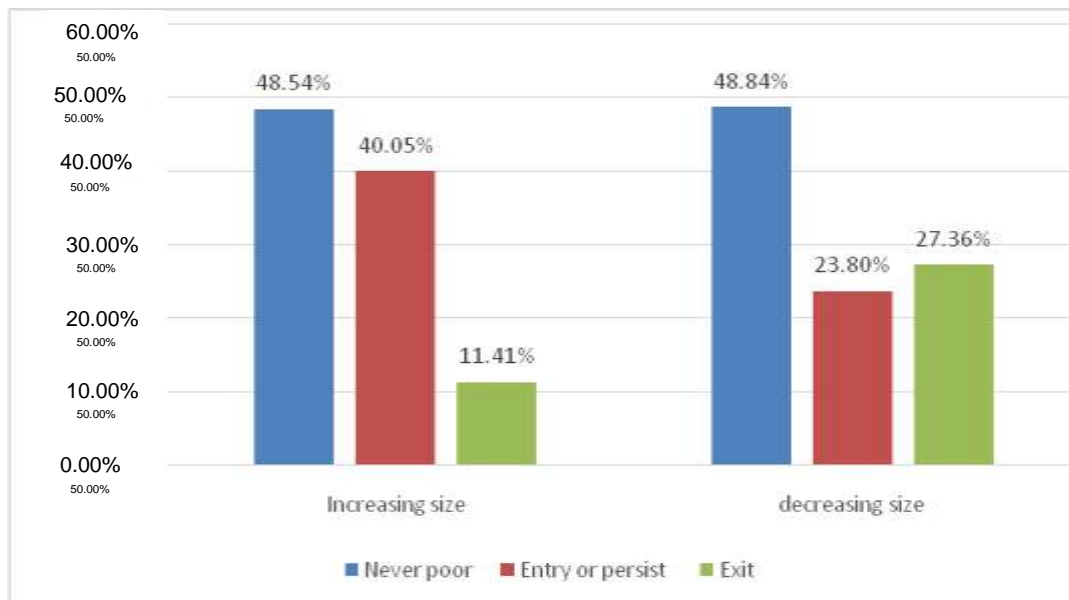
Graph 2. Household distribution according to department potentiality in rice production.
Source: authors 2017 from Emicov data base (2006, 2009)



Graph 3. Crossover between cotton production area and transition
Source: EMICoV Data base (2006, 2009).



Graph 4. Crossover between zone of cotton production and transition.
 Source: EMICoV data base (2006, 2009).



Graph 5. Crossing between transition and rice's potentiability zone.
 Source: EMICoV Data base (2006,2009).