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The Determinants of Poverty by Cohort of Households: Evidence from Rural Tunisia

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Abstract. Any effective poverty reduction policy depends on a good targeting of the poor and their characteristics. The aim of this paper is to present an alternative method for targeting the poor. The method is based on the analysis of the determinants of poverty for each cohort of households with a common selected characteristic. For each cohort, a conditional econometric model explaining the poverty index is estimated. Empirical validation for the Tunisian case shows that the determinants of poverty are different from one group to another. Thus, poverty lightening policies can limit the action plans in favor of each group of households separately while remaining effective.

Keywords: Poverty, targeting, cohort, econometric model, Tunisia,

1. Introduction

The effectiveness of any policy of fight against poverty depends on the good comprehension of the phenomenon and the operational means which will make it possible to identify and locate the poor households. However, the diversity, the complexity and the abstract character of poverty make the targeting rather complicated. In addition, on the practical level, the technical and financial constraints often impose limits on the strategic choices of the targeting plan.

In Tunisia, several poverty studies were made (M. Ayadi, M.S. Matoussi and V. Feser(2001), S. Bibi (1998, 2000), C. Muller and S. Bibi (2006), J. Ben Rejeb (2008), M. Ayadi, A. Lahgha and N. Chtioui (2007)). One tried at each end to refine the estimation methods of the poverty lines, the measurements of the proportion, the intensity and the severity of poverty without sufficiently paying particular attention to the determinants of poverty and the characteristics of the population which should be targeted. Only Gazouani and Goaied (2001) analyzed some of the contributory causes of poverty in Tunisia in the urban and rural areas at the household level.

Nowadays, in the case of Tunisia and even in the general case, it has become essential to seek the means that make it possible to refine the targeting of the poor and simplify the action plans to guarantee the effectiveness of any policy to fight against poverty.

To that end, this paper aims to present an alternative method for refining the targeting of the poor and minimizing the action plans while being effective. In the second section, we present the utility and the suggested methodology of analysing the determinants of poverty by cohort of households. Then, in Section 3, we present the main results of an empirical validation using Tunisian data. Section 4 concludes.

2. Poverty Analysis by Cohort : Utility and Methodology

An example of a classic study of the determinants of poverty was presented by Ravallion (1996) and applied in the Tunisian case by Gazouani and Goaied (2001), consists in regressing the poverty index on explanatory variables which indicate the various possible causes of poverty for all the observed population. One generally doesn't take into account the specific characteristics of the different category of poor people and one estimates an econometric model of the form:

$$P_h = X_h'\beta + u_h \quad (1)$$

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Where P_h is the poverty index of household *h, X* is a vector of observed explanatory variables; β is a vector of unknown parameters and u_h are the model residual.

Although this method is useful for targeting the poor, it suffers from serious limitations. Indeed, the complexity and the abstract character of poverty make the characteristics of poverty different from one group to another. Thus, a general study without particular precautions of the specification of each household categories can be fallacious. In addition, it is no longer sufficient nowadays to study and seek the means to understand poverty, rather is essential to seek the means of refining the targeting of the poor and simplifying the action plans to guarantee the effectiveness of the anti-poverty policy.

For this, we suggest an alternative method to studying the determinants of poverty. This method is based on analysing the fact that although households have a common characteristic, there are ones which are poor and others which are not.

The suggested method consists in first selecting household characteristics, for example, large household size. Then, we construct cohorts of households. Each cohort is specific to a selected characteristic.ie the households having common characteristic X^k form a cohort called C^k. *U*sing only data from C^k, we estimate an econometric model which regresses the poverty index P_h on all the selected characteristics except X^k.

Let *N* exogenous selected characteristics *X*. Thus, there will be *N* models to estimate. For estimating the model M^k, reference of X^k, we use data only from C^k to estimate a conditional model of the form:

$$P_h|X^k = \begin{cases} P_h^*|X^k & if \quad P_h^*|X^k > 0 \\ 0 & otherwise \end{cases} \tag{2}$$

Where $P_h^*|X^k$ is a latent variable which takes the following form:

$$P_h^*|X_h^k = a_0 + a_1 X_h^1 + \cdots + a_{k-1} X_h^{k-1} + a_{k+1} X_h^{k+1} + \cdots a_N X_h^N + u_h. \tag{3}$$

P_h is the poverty index of household *h*, X_{ih} (i=1...N) are the selected household characteristics, a_i (i=1...N) are unknown parameters and uh are the model residual.

According to this models specification, the interpretation of the estimation results of each one will be specific to the households which form the corresponding cohort. The variables having a statistically significant effect in the model M^k indicate the factors which make the difference between the households of cohort C^k.ie having the same characteristic X^k. Thus, additional information enable to refine the targeting of the poor and direct alternative anti-poverty strategies specific to each group.

Let us note that we will study the probable effect of the explanatory variables on poverty. For this, we use the Logit model and we regard poverty as discrete state. The poverty indicator P_h is thus binary which takes value 1 if the well being indicator (expenditure) of the household h is less than the poverty line.

$$P_h = \begin{cases} 1 & if \ Y_h < Z \\ 0 & otherwise \end{cases} \tag{4}$$

Where Y_h is the household total expenditure and Z is the poverty line.

The method pretends not to observe Y's acting as if only *P* and a vector of characteristics *X* is observed (Ravallion (1996)). The probability that a household will be poor is defined by the following expression:

$$p(P_h = 1) = F(X'\delta) \tag{5}$$

Where $F(.)$ is the cumulative function specified for the error term u_h, *X* is the vector of the observed explanatory variables and δ is the vector of unknown parameters.

3. Empirical validation

3.1. Data and selected household characteristics

The author uses data for empirical validation from the 1990 Tunisian consumption survey conducted by the National Statistical Institute of Tunisia (INS). The survey provides information on expenditure for 3257 rural households, as well as many other dimensions of household's characteristics, such as geographic residence, demographic information, education …

Fifteen characteristics are selected (see Appendix (1)). Each defines a dummy variable on the basis of which we form fifteen cohorts of households. The choice of these characteristics is based on the utility of analyzing the factors which make the difference between the households of each of these cohorts, and

understanding why there are those who can escape poverty while others cannot despite having a common characteristic.

3.2. Estimation results

Let us note that in order to improve the quality of the poverty estimation in an econometric model it is recommended to inflate the poverty line (J. Jalin and M. Ravallion (2000)). So, we have used 1.5 times the poverty line as our ”new” poverty line and thus, we have taken into account the vulnerable population in the field of application.

In order to show the utility of analysing the determinants of poverty by cohort of households, we compare the estimation result of the model (1) using the total sample (classical method) with the estimation results of the 15 conditional models (2), presented in Appendix (2).

The estimated model (1) show that the large household size and the low education level of the household head (illiterate or primary school level) increase the probability of being poor, while households having more than two schooled child or an old head decreases it. The socio-professional categories of the household head seem to generate significant effect on poverty except the Boss and Craftsmen. According to the zone of residence, only the district of Tunis and the Middle East are statistically proven as factors which decrease the probability of being poor.

However, the analysis of the determinants of poverty for each selected cohort separately shows important differences. For larger households (more than 6 members), the head has an important role. Indeed, a low educational level, being employed or working in the agricultural sector increases the risk of being poor. In addition, large size households who live in West North of Tunisia suffer the most from the risk of poverty, as opposed to those who live in the Middle East or the South East.

Among Households with older head (over 60 years), a larger household and the schooling of the children increase the risk of being poor. The effects of the socio-professional category and the location of residence seem to be not significant.

The large household size and the education of the children are factors which make significant difference between the poor and the non-poor among the households with a head having a low education level (illiterate or primary school level). Moreover, if in addition the household head of this cohort is employed or working in the agricultural sector, the risk of being poor increases.

For households with more than two schooling children, they are subject to the risk of poverty if they have large household size and a head with a low educational level. Also, the education of children seems to generate a significant handicap especially in the Northwest and Middle-West of Tunisia.

If we study the determinants of poverty according to the socio-professional category of the household head, we deduce that the larger households are the more affected by poverty whatever the job of the household head is. Moreover, households with a head employed in the non-agricultural sector and having low educational level increases the risk of being poor whatever the residence they belong to, except the district of Tunis (the capital) which does not have a significant effect on poverty on this cohort.

Households with a head working in the agricultural sector are less subjected to the risk of poverty if they are old. However, the education of children and the zone of residence effect (except households living in the Middle East of Tunisia) increase the probability of being poor.

The study of the determinants of poverty according to the zone of residence shows that factors such as the large household size and the low educational level of the household head increase the risk of being poor in Northern East and Middle East. Poverty in the Northern West is also influenced by the same factors and in addition, by all the socio-professional categories of the household head except the Boss and the Craftsmen. For the Middle East which is characterized by a random climate, the determinants of poverty are significantly different. Indeed, the children’s education and the fact that the household head is employed in the non-agricultural sector increase the risk of being poor.

Poverty in the South West, which is characterized by a desert climate, is determined by the large size of the household, the children’s education and the fact of having a household head employed or working in the agricultural sector. In the southern East, which is a desert but littoral area, the large household size, the low

educational level and working in the agricultural sector by the household head are the factors which increase the risk of being poor.

4. Conclusion

The aim of this paper was to present an alternative method which allows a finer targeting of the poor. The suggested method is based on the study of the determinants of poverty for each group of households having a common characteristic.

Empirical validation for the Tunisian case showed clearly the divergence of the determinants of poverty of one group to another. An anti-poverty policy specific to each group seems to be more effective.

In addition, the suggested method can give solutions to the countries which cannot devote great means in favour of the poor. They will have the possibility of limiting their action plans while remaining effective.

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Appendix 1

Definition of the 15 selected dummy variables

• H size: Large household size, takes value 1 if the household size exceeds 6 members and 0 otherwise.
• HH Age: Older household head, takes value 1 if the age of the household head is over 60 years and 0 otherwise.
• HH Edu: education level of household head, takes value 1 if illiterate or primary level and 0 otherwise..
• Ch Edu: takes value 1 if the household have more than two children at school and 0 otherwise.
• SPC: Socio-Professional Categories of the household head. Each variable takes value 1 if is observed and 0 otherwise:
– SPC1: Employed in Non-agricultural sector – SPC2: Boss and Craftsmen – SPC3: Agricultural workman;
– SPC4: Reprocessed and Support abroad;
• The Tunisian geography has diverse characteristics with various climates (Littoral, forester and deserter). We use the geographic decomposition carried out by the Tunisian National Institute of Statistics and we define 8 binary variables specific to the selected geographical areas:
– Z 1 : District of Tunis (capital) – Z 2 : North East (littoral) – Z 3 : North West (forester);
– Z 4 : Middle West (rather dry climate) – Z 5 : Middle East(littoral with rather dry climate);
– Z 6 : South West (deserter) – Z 7 : South East (deserter and littoral).

Table : Estimation results of model (1) and conditional models (2) by Logit

Var	Model (1)	Model (2)														
	P	P| H size	P| HH Age	P| HH Edu	P| Ch Edu	P| SPC1	P| SPC2	P| SPC3	P| SPC4	P| Z1	P| Z2	P| Z3	P| Z4	P| Z5	P| Z6	P| Z7
H size	0.67* (7.91)	-	0.18* (3.43)	0.22* (10.71)	0.24* (9.91)	0.13 (0.87)	0.27* (6.52)	0.27* (3.75)	0.20* (6.62)	0.16 (1.65)	0.21* (3.68)	0.20* (5.13)	0.23* (5.13)	0.02 (0.30)	0.22* (2.72)	0.38* (5.14)
HH Age	-0.18* (-2.07)	-0.05 (-1.42)	-	-0.01 (-0.83)	-0.02 (-1.11)		0.10 (1.55)	0.06 (0.70)	-0.10* (-3.29)	0.11 (0.97)	-0.06 (-0.97)	-0.05 (-1.19)	-0.04 (-0.89)	0.12 (1.59)	-0.05 (-0.60)	0.14 (1.57)
HH Edu	1.71* (5.28)	0.39* (4.68)	-	-	0.37* (8.11)	-0.03 (-0.24)	0.39* (5.49)	0.29 (1.87)	0.45* (7.0)		0.31* (2.85)	0.49* (5.58)	0.41* (4.07)		-0.01 (-0.04)	0.12 (0.59)
Ch Edu	-0.33* (-3.36)	0.02 (0.87)	0.16* (2.32)	0.05* (2.05)	-	0.33 (1.35)	0.02 (0.49)	0.01 (0.21)	0.08* (2.35)	0.17 (1.55)	-0.01 (-0.14)	-0.02 (-0.38)	-0.04 (-0.84)	0.28* (3.62)	0.04 (0.39)	0.29* (3.43)
SPC1	1.74* (3.7)	-0.27 (-1.86)	-	-0.36* (-3.82)	-	-	-	-	-	0.139 (0.41)	-	-	-	-	-	-
SPC2	1.33 (1.45)	0.11* (2.31	-	0.11* (3.02)	0.61* (5.00)	-	-	-	-	-0.07 (-0.31)	0.37 (1.52)	0.01 (0.24)	0.01 (0.17)	0.28* (2.31)	0.004 (0.03)	0.45* (3.37)
SPC3	1.69* (3.6)	-	-0.16 (-1.72)	-	0.49* (5.07)	-	-	-	-	-	0.30 (1.24)	-0.14 (-1.85)	-	-	-0.19 (-1.10	0.22 (1.15)
SPC4	1.67* (3.5)	0.13* (2.74)	-0.16* (-2.18)	0.13* (3.78)	0.65* (4.47)	-	-	-	-	0.32 (1.50)	0.38 (1.52)	0.006 (0.12)	-0.01 (-0.11)	0.16 (1.40)	0.08 (0.67)	0.52* (3.30)
Z1	-0.48* (-2.2)	-0.085 (-0.99)	-	-0.08 (-1.54)	-	-	-	-0.08 (-0.32)	-	-	-	-	-	-	-	-
Z2	-0.31 (-1.76)	-0.07 (-1.07)	-0.11 (-1.12)	-0.05 (-1.17)	0.07 (1.33)	-0.06 (-0.37)	0.31* (4.35)	0.08 (0.51)	-0.12 (-1.80)	-	-	-	-	-	-	-
Z3	0.24 (1.48)	0.08 (1.34)	0.05 (0.51)	0.09* (2.27)	0.22* (4.36)	-	0.42* (6.72)	0.13 (0.80)	0.04 (0.76)	-	-	-	-	-	-	-
Z4	-0.058 (-0.34)	0.008 (0.12)	-0.01 (-0.18)	0.01 (0.31)	0.14* (2.71)	-	0.37* (5.75)	0.21 (1.29)	-0.03 (-0.59)	-	-	-	-	-	-	-
Z5	-0.66* (-3.44)	-0.19* (-2.52)	-0.09 (-0.83)	-0.14* (-3.09)	-0.06 (-1.04)	-	0.24* (3.09)	-0.12 (-0.69)	-0.19* (-2.85)	-	-	-	-	-	-	-
Z6	-0.00 (-0.02)	-	-0.06 (-0.53)	-	0.12* (1.96)	-	0.31* (4.62)	0.003 (0.02)	0003 (0.00)	-	-	-	-	-	-	-
Z7	-0.25 (-1.38)	0.15* (2.34)	-0.05 (-0.48)	-0.01 (-0.32)	0.03 (0.61)	-0.09 (-0.57)	0.31* (4.56)	-	0.01 (0.23)	-	-	-	-	-	-	-

Notes: - * indicates that the coefficient is statistically different from zero at the 5% level.
- Values between parentheses are the Z-statistic.