THE DETERMINATES OF URBAN AND RURAL POVERTY IN TUNISIA

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Abstract

The aim of this study is to identify the determinants of poverty in Tunisia, both urban and rural, taking into account the distinction between them. The objective is to determine the potential factors that determine poverty and to evaluate their impact on the level of the household's welfare. A particular interest is given to econometric methodology which is concerned with the analysis of panel data with limited dependent variable models. The nature of the available statistical information (survey data) prompted the adoption of random effects Logit and Probit models where the double dimension was applied for the observation of individuals grouped into clusters. This allows the dissociation of a uniform behavior from the specific effects of the clusters, to identify possible differences at the level of standards of living between the households of different clusters.

I. Introduction

The pursuit of a more efficient allocation of relatively scarce resources has led public decision makers in developing countries (DCs) to a global reconsideration of public expenditure priorities. In this context, the analysis of poverty has always aroused the interest of researchers, public authorities and international organizations (UNO, World Bank[1], NGOs, and so forth). The aim was to elaborate adequate strategies and to establish the necessary means in order to eradicate this problem. In all economies of the contemporary world, the serious objectives and priorities of public decision makers are to fight against poverty, to improve the conditions of life for people and to reduce the gap between the social strata.

The specificities of DCs in this domain and the chronic, often alarming, nature of this problem lead to the necessity of adopting proper strategies in every context, taking into consideration the constraints (social and budgetary), the available means to create the global objectives of growth and of economic and social development. To achieve sustained growth constitutes a considerable challenge and means increasing incomes and, consequently, reducing poverty. Combined with targeted actions, growth offers the possibility of supplementary gains for the most underprivileged strata. The objective is to eradicate poverty, or at least to reduce perceptibly the signs of poverty (incidence and severity), or to increase its threshold[2]. Lipton and Ravallion [1993] concentrate these actions, principally, around taking charge of those unable to profit appropriately from the fruits of growth (direct transfers) and from the guaranties that all underprivileged social strata have access and can benefit, without difficulty, from the basic public infrastructures (education, healthcare, public services, and so forth).

In DCs, where the dualism of urban and rural areas is still present and distinctive, a sharp distinction appears, likewise, in the analysis of poverty according to each area. It is stated that rural households are mostly affected by poverty. Indeed, it is in rural areas that poverty is mostly pronounced with multidimensional aspects (economic, social demographic, and so forth). We can admit that poverty in rural areas is not only of chronic, but also structural nature, for it found expression in mediocre socio-demographic characteristics (high fertility rates, high infant mortality, lack or absence of schooling, deplorable sanitary conditions, and so forth). These characteristics engender a weakness of incomes and, even, an absence of steady sources of income.

Facing this critical situation, the classical response of the rural population facing poverty manifests itself in an exodus, often anarchic and massive, towards urban areas. Spirited by the hope of income opportunities, the migrants become victims of a different poverty with other characteristics (marginalization, delinquency, exploitation in informal employment, unsanitary housing, and so forth). In this respect, there are those who support the argument that urban poverty is closely linked to rural poverty insofar as the dynamic of urbanization is fully governed by the effects of rural exodus (rise of anarchic urban areas that are not structured). In this case, poverty is a mobile phenomenon that changes form and consequences from one environment to another.

In the fight against poverty, the efforts deployed by the Tunisian authorities are praiseworthy and acknowledged as efficient by the international community (World Bank 1995). The statistical indicators that reflect the conditions of life and social welfare, are quite positive compared to those of the majority of African countries, and they are not too far from those observed in the countries of South Europe (Spain, Greece, Portugal). According to the official figures (11.2 percent in 1985 and 7.4 percent in 1990 and less than 5 percent in 2000), poverty seems to have been overcome, since the poor population declined from 40 percent in the 1960s to about 4 percent at the present time. Such a large scale decrease in poverty is the outcome of many actions characterized by: first, a continuous and sustained national effort in the social expenditures of the State (18 percent of GDP in 1990[3]). Second, increasing education levels and a successful family planning program which has played a role in lowering fertility rates and slowing the rate of population growth. Third, a better distribution of

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[1] The World Bank report on development in the world in the year 2000 is reserved to the question of poverty. This tradition became decennial since the reports of 1980 and 1990 on the same subject (see World Bank 2001). Despite a perceptible decline of poverty during the previous decade, it persists in certain areas with a worrying acuteness. Thus, the international community is prompted to deploy more efforts in the fight against poverty.

[2] About concepts of identification of poverty and analysis of the policies of targeted public interventions, an excellent survey is proposed by Lipton and Ravallion (1993).

[3] World Bank [1995].

incomes increasing, mainly, the average incomes and reducing the inequalities at the level of incomes. Fourth, more efficient and targeted transfers (subsidies for consumption, free healthcare, direct transfers). Finally, particular and specific actions in favor of the rural population. These changes would be considered by many to indicate a successful process of economic development. The Tunisian government describes its development goals as encompassing the three broader objectives of growth, equity and stability. It is the effect of development on equity that is a pressing policy concern today.

Nevertheless, these appreciable performances at the global scale can hide the sensitive differences between the situations in the rural and the urban areas. The statistical indicators show that 2/3 of the 7 percent poor live in the rural areas, that poverty in these areas rose to 13.1 percent (somewhat less than the double of the national average), and that the socio-demography of the rural areas shows feeble indicators. Rural households (notably poor households) are often characterized by a larger household size which is above the national average, a very low schooling rate, a very high independent rate and a low level of the instruction of family support. These characteristics have a direct incidence on the level of the household's income.

This established fact prompted Tunisian authorities, during the last decade, to increase the efforts and vigilance in order to control and stabilize at least this rate of 7 percent. However, we also understood that this could not be done unless with a better targeting of the poor within a wide program of emancipation and development integrated in the most deprived rural areas (called shade zones). These actions concern investment in the basic infrastructure (roads, electricity, drinking water, schools, basic healthcare, and so forth) in order to improve the minimum conditions of life. They are concerned with the creation of adequate employment in order to stabilize these populations around generative activities of incomes (principally agricultural activities and small trades).

This study stresses the identification of the principal determinants of poverty in Tunisia taking into consideration the clear distinction that must appear in the analysis of poverty as well as during the adoption of appropriate economic policies. If effective policies to alleviate poverty are to be formulated and carried out, more knowledge about the determinants of

poverty is crucial.[4] Poverty is fundamentally a phenomenon arising at the level of households. So its measurement and characterization ideally require the use of household budget surveys. During the last two decades, the availability of such data sets in DCs has resulted in a number of relevant studies, particularly in the MENA region (Cohen and House 1994) in Sudan, (Coulombe and McKay 1996) in Mauritania, (Ayadi et al. 1998), and (Bibi 2000) in Tunisia, in Egypt and Jordan (Adams 2000)). With the presence of precise and reliable statistics related to a *"survey on budget-consumption of the households"* in 1990, it becomes possible to evaluate the association of poverty with the principal socio-demographic variables characterizing the households in Tunisia. This offers decision makers a real picture on which to base optimal targeting.

The objectives of the paper are to identify some of the key contributory causes of poverty in Tunisia in urban and rural areas at the household level. Such analysis provides important general information about the determinants of urban and rural poverty in Tunisia, which is of value in working out at least some of the key priorities of any poverty alleviation scheme. Basically, we will investigate whether female headship is an appropriate targeting criterion for focused policy intervention in Tunisia. The econometric methodology used here is based on the analysis of panel data with limited dependent variable models. A nice feature of the methodology is that the approach recognizes and exploits the clustering of observations within the sample. It combines discrete choice models with specifications relative to a panel data framework. The econometric analysis resorts to Logit and Probit models with random effects. This research is organized as follows: Section 2 presents a detailed account of the econometric specifications. Section 3 describes the statistical facts used from a *"survey on budget-consumption of households"* carried out by the *Institut National de la Statistique (INS)* in 1990. The estimation results and tests appear in Section 4 with an attempt to place the models used in the context of an analysis of economic policy. Finally, Section 5 summarizes the main results.

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[4] Rodriguez and Smith [1994] talk about characteristics and correlates of poverty which may not be determinants. That is, they may not be causes of poverty but may be consequences of poverty or caused by the same factors that cause poverty. Determinants must be exogeneous in order to make policy recommendations. We thank Dennis Ahlburg for this clarification.

II. The Determinants of Poverty: The Econometric Model

The methodology developed for this study is inspired by Deaton's approach [1987], [1990] with the use of panel data analysis from a household budget survey. The empirical method lends itself perfectly to the information content of the data collected in many household budget surveys of DCs[5]. The major data requirement is that households are geographically clustered within the sample. The clustering is important because it means that households within each cluster can be assumed to face the same prices for market goods. Geographical differences in prices that households face are common in DCs. They result from imperfect markets, high transport and commercialization costs and other information problems (Muller 2000b). Besides, the understanding of the geographical correlation between price level and living standards matters for social policy.

There are important analogies between the econometric techniques used here and the methods of estimation routinely used for panel data. In a panel data, we typically have a short time series on a large cross-section of individuals. Error structures are specified that allow either fixed or random effects for each individual. In the application here, the role of the individuals is taken by the clusters in the survey, and repeat time series observations are replaced by the individual households within each cluster[6].

Our main focus here is to look at the structural determinants of poverty related to the demographic characteristics of households. An increasing common practice is to construct the poverty profile in the form of a regression of the individual poverty measure against a variety of household characteristics. This can be made by formulating a functional relationship between a state (in the present case, the fact of being poor) and a group of characteristics proper to a household as well as to its socio-economic environment (conditions of life, place of residence, prices, and so forth). In this context, the resort to the family of discrete choice models proves to be considerable. We will use the Logit and Probit specifications.

According to basic principles of discrete choice models, econometric modeling consists in confronting two alternative and mutually exclusive situations, being considered as poor or not. Indeed, the observed sample is composed of two categories of households: on the one hand, those considered as poor according to certain criterion, and on the other those who are not. The poverty line, noted down as z[7], is the selection criterion generally used in the studies on poverty. According to this criterion, we can breakdown our observed sample into two distinct categories: First, the households who record an income per head inferior to the poverty line z[8] are considered as poor. Second, those who record an income per head superior to z present a respectable level of living and are consequently not poor.

For a household h in cluster c, one postulates that:

$$y_{ch}^* = \mu_c + X_{ch}'\beta + \varepsilon_{ch} \quad c = 1,\cdots,C ; h = 1,\cdots,H_c \qquad (1)$$

where y_{ch}^* is an observed latent variable, X a vector of household characteristics, β a vector of parameters and ε_{ch} an error term. The remaining term μ_c is a cluster fixed or random effect. H_c is the number of households in cluster c. One then defines the binary variable (being poor or not) as follows:

$$y_{ch} = \begin{cases} 1 & si \quad y_{ch}^* = (z - x_{ch}) > 0 \\ 0 & si \quad y_{ch}^* \le 0 \end{cases} \quad c = 1,\cdots,C ; h = 1,\cdots,H_c \quad (2)$$

where x_{ch} is the household total expenditure. The method pretends not to observe x_{ch}'s acting as if only Y and a vector of characteristics X is observed (Ravallion, 1996a).

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[5] It is the case of surveys on the budget of households carried out in Tunisia, Morocco, Côte d'Ivoire, Pakistan and India among others.

[6] When the clusters do not include the same number of households (which is the case in this application), it is a question of the incomplete panel data. We note that each cluster includes about a dozen households.

[7] Some constructive discussions about this concept are presented in Kanbur (1987), Lipton and Ravallion (1993), and Ravallion (1996a), (1998).

[8] We suppose the non existence of scale economies within the household. If it is not the case, one must estimate the scales of equivalence in order to deflate the income (total expenditure) by the number of individuals in adult equivalents.

The probability that a household will be poor is defined by the following expression:

$$P(y_{ch} = 1) = P(y^*_{ch} > 0) = F(\mu_c + X'_{ch}\beta) \tag{3}$$

where $F(.)$ is the cumulative function specified for the error terms ε_{ch}. As for classical discrete choice models, associating to errors a normal distribution or a Weibull distribution allows to derive, respectively, a Probit model or a Logit model in the context of panel data analysis.

Now, keeping within this latter context, we can consider two types of specifications: The fixed effects model or the random effects model. In the first type of models, the parameters μ_c and β are to be estimated. But this specification is unsuitable because it is not pertinent and poses problems of statistical efficiency in the case of non linear models. Indeed, bearing in mind that the number of parameters μ_c increases quickly with the number of clusters C, and that H_c is finished (classical case in panel data analysis), these specific effects cannot be considered in a convergent manner. In addition, the estimation of the parameters μ_c and β is not carried out in a separate manner when we have a non linear relationship. Consequently, the problem of the non convergence of the estimators $\hat{\mu}_c$ can induce a non convergent estimation of the vector of parameters β. To circumvent this problem, Chamberlain [1980] suggested maximizing a concentrated likelihood function (conditionally to μ_c). In this respect, he shows that the variable $\sum_{h=1}^{H_c} y_{ch}$ is a minimal and sufficient statistic. Moreover, by concentrating the likelihood function in relation to $\sum_{h=1}^{H_c} y_{ch}$, it is possible to maximize the concentrated likelihood function in relation to the vector of parameters β using the classical procedures of maximizing a likelihood function.

At the practical level, the specification with fixed effects suffers from two shortages. The first is that the impact of the invariable variables in the cluster (regions, month of the survey, and so forth) cannot be identified. The second concerns the possible loss of information in the estimation of the vector of parameters β, which can be the result of the invariability of the value of y (0 or 1) within the same cluster group[9]. Hence, modeling with component errors proves more appropriate. This needs the treatment of the term μ_c as being a random variable to which case we must associate a distribution of probability.

The principal constructions relative to Logit and Probit models in the context of panel data analysis are those which were developed by Chamberlain (1980), Heckman (1983), Conway (1990), and Guilkey and Murphy (1993). In relation to the model defined by expression (2) above, the error term is $\eta_{ch} = \mu_c + \varepsilon_{ch}$. The specific term μ_c is supposed to be random and independent from the explicative variables (vector X) and from the residual terms ε_{ch}. It is normally distributed $(\mu_c \rightarrow N(0, \sigma^2_\mu))$. Moreover, and according to the associated distribution of the residual terms ε_{ch}, we can deduce a Probit version when ε_{ch} follow a normal distribution or Logit version in the presence of a Weibull distribution. In order to simplify the presentation, only the procedure of estimation of the Probit specification will be considered here. So we suppose that the residual terms ε_{ch} are normally distributed $(\varepsilon_{ch} \rightarrow N(0, \sigma^2_\varepsilon))$.

In this new context, the probability that a household will be poor is written down as follows:

$$P(y_{ch} = 1/\mu_c) = \Phi\left(\frac{X'_{ch}\beta}{\sigma_\varepsilon} + \frac{\mu_c}{\sigma_\mu}\left(\frac{\rho}{1-\rho}\right)^{1/2}\right) \tag{4}$$

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[9] Knowing that the households of the same cluster are supposed to be geographically close, it is quite possible that, for certain clusters, the value of the binary variable would be null for all households of the cluster or equal to one. Consequently, these clusters are eliminated during the estimation procedure. In our application, this means an important loss of clusters which compelled us to detain only the specifications with random specific effects.

$\Phi(.)$ is the cumulative function of a standardized normal distribution. $\rho = \dfrac{\sigma_\mu^2}{\sigma_\mu^2 + \sigma_\varepsilon^2}$, with $\rho < 1$, is the coefficient of correlation between the residual terms relative to two households within the same cluster[10].

For the whole of the sample, the likelihood function is expressed according to the following form:

$$L = \prod_{c=1}^{C} \int_{-\infty}^{+\infty} \prod_{h=1}^{H_c} \Phi\left(\left(\frac{X'_{ch}\beta}{\sigma_\varepsilon} + \frac{\mu_c}{\sigma_\mu}\left(\frac{\rho}{1-\rho}\right)^{1/2}\right)(2y_{ch}-1)\right)\phi\left(\frac{\mu_c}{\sigma_\mu}\right)d\left(\frac{\mu_c}{\sigma_\mu}\right) \quad (5)$$

$\phi(.)$ is the density function of a standardized normal distribution[11]. The estimation of this likelihood function is generally cumbersome. That is why Butler and Moffitt (1982) proposed (for the Probit case) an efficient and convergent procedure of estimation of the vector of parameters β using the formula of Hermite integration. This latter is an approximation formula of the integral which translates an evaluation in various points of the domain of the random variable μ_c[12]. Consequently, the likelihood function L is approximated by the following function:

$$L \approx \prod_{c=1}^{C} \frac{1}{\sqrt{\pi}}\left(\sum_{j=1}^{J}\omega_j \prod_{h=1}^{H_c} \Phi\left(\left(\frac{X'_{ch}\beta}{\sigma_\varepsilon} + \frac{\mu_c^j}{\sigma_\mu^j}\left(\frac{\rho}{2(1-\rho)}\right)^{1/2}\right)(2y_{ch}-1)\right)\right) \quad (6)$$

A likelihood ratio test allows to compare statistically the versions with random effects and the simple versions. The latter constitute particular cases of the first ones when $\rho = 0$. The statistic of this test is written down as follows:

$$LR = 2(\log L_{NC} - \log L_C) \rightarrow \chi^2_{(1)} \quad (7)$$

L_{NC} represents the likelihood of the random effects model and L_C represents that of the constrained model (simple Logit or Probit version). In this case, there is one constraint ($\rho = 0$) which indicates the number of restrictions under the null hypothesis H_0. Another specification test is carried out using a Wald statistic. According to this test, all parameters, except the constant, are equal to zero under the null hypothesis H_0. The statistic of this test is written down as follows:

$$W = \hat{\beta}'\left(\hat{V}(\hat{\beta})\right)^{-1}\hat{\beta} \rightarrow \chi^2_{(k-1)} \quad (8)$$

$\hat{V}(\hat{\beta})$ is the estimated variance-covariance matrix of the estimated vector $\hat{\beta}$.

III. Data Description

The data used in the present study come from a national household survey carried out in 1990 by the *Institut National de Statistique (INS)*. The sample contained 7734 households where urban areas accounted for 57.8%. There are respectively 4477 households and 390 clusters in urban areas, and 3257 households and 276 clusters in rural areas. The number of households in clusters is mostly 12.

Considering two distinct samples according to each area is dictated by the dualism that characterizes DCs. The disparities pronounced in the socio-

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[10] When $\rho = 0$, we find the particular case of the simple Probit model or, in other words, the case of the absence of specific individual effects for the clusters.

[11] The complete developments explaining the passage from equation (4) to equation (5) are especially presented in Heckman (1983). See also Guilkey and Murphy (1993).

[12] In general, the approximation formula is written down as follows:

$$\int_{-\infty}^{+\infty} e^{-x^2} f(x)dx \approx \sum_{j=1}^{J}\omega_j f(x_j)$$

J is the number of discrete points where the evaluation of the function f (a number chosen arbitrarily) is developed. ω_j are the weights assigned to every point j.

demographic characteristics, in the way of life, in the habits of consumption (perception of the needs and their hierarchy) are disclosed in both environments without talking about the constraints and the difficulties faced by households with low incomes. Indeed, the regional and environmental (rural and urban) disparities translate into serious inequalities at the level of incomes. In addition, households in rural areas – notably the most underprivileged – are characterized by a size above the national average and which is, often, too high, a high number of infants of young age, a high dependence rate, a low schooling rate and a very low level of instruction of the household. Hence, these characteristics give rise to tremendous difficulties in order to profit from better job opportunities generating better income.

Table 1 shows the entire group of detained variables used in the econometric modeling. The majority of the explanatory variables define socio-economic variables of the households as well as the principal characteristics of the head of the household. Precisely, we use variables related to female headship, human capital (education of the head), occupational characteristics of the family head (head employed, ratio of female and male employees in the household, socio-professional category of the head), family composition (child dependency ratio, size of the household according to the age), family residence, quarters and regional dummies, etc.

In the empirical analysis, the poverty line is set arbitrarily at 50% of the median per capita expenditure[13]. This corresponds to a per capita expenditure equal to 278.6 DT. According to this poverty line, 16 percent of the households are considered poor in 1990. The decomposition of poverty according to urban and rural areas shows that poverty is a predominantly rural phenomenon in Tunisia. That is, although 42 percent of the population was residing in rural areas, 72 percent of all poor were located there. This finding (poverty is greater in rural than in urban areas) is in line with the findings of other empirical studies in Tunisia using several approaches for an absolute measure of poverty.

Concerning the variables indicating the characteristics of the head of the household, some arrangements were necessary[14]. At first, the too feeble number of rural households whose head has reached the superior level (only 15 households) has affected the significance and the statistical pertinence of the estimated results. That is why it is judicious to reconsider the cutting out of this variable by regrouping together the variables *inst3* and *inst4*. Consequently, we will have three dummy variables, for the rural area, which are noted down respectively as *inst1*, *inst2* and *inst34*. The first two variables are defined in the same manner as for the urban area. However, the third one (*inst34*) takes the value one when the head of the household possesses the secondary level – professional or superior – and zero otherwise. Next, some modification has concerned the cutting out of the variable that indicates the socio-professional category of the head of the household. Taking into account the specificity of the rural area in this domain, the cutting out of the variable *CSP* is as presented in table 2.

As regional disparities in the identification of poverty are preponderant, a geographic cutting out according to the place of residence of the households proves to be indispensable. We adopted the finest available administrative cutting out which indicates the localization by local governments[15]. The variable *gouvi*, $i = 1, \cdots, 23$ allows to situate each household in relation to its place of residence and to highlight a relative differentiation of poverty by local governments, even by regions. It is acknowledged that, in Tunisia, poverty is mostly pronounced in interior local governments (in opposition to those situated in the coastal regions), and more precisely those situated in the North-West, and then the Central-West. Table 3 presents this cutting out

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[13] The estimation of the poverty line is beyond the scope of the present study. Nevertheless, experimentation with several poverty lines suggest that although the results of the paper which are related to the measurement of poverty depend crucially on the selection of the poverty line, the results of poverty determinants are rather insensitive to changes in it.

[14] Table 1 presents the nomenclature of variables as built for the sample relative the urban area. The modifications in the rural area concerned the variables relative to the level of instruction, to the socio-professional category and to the geographic localization of the household.

[15] This administrative cutting out is spread all over the national territory in 23 local governments. These are entities quite similar to departments in France from an institutional and jurisdictional point of view. A more aggregate cutting out regroups these entities in seven regions. Contrary to the empirical studies which adopt – in many other fields – rather the regional cutting out, we have discovered in our study that a finer cutting out allows a better differentiation in the behaviour with statistically pertinent results.

in the rising order of the variable *gouvi*, $i = 1, \cdots, 23$. However, we must underline the fact that the local governments of Tunis (*gouv1*) and Monastir (*gouv15*) are exclusively composed of urban communes. Hence, the variables (*gouv1*) and (*gouv15*) will not figure in the models specific to the rural area. Still with the rural area and for the sake of getting better results, the local governments of Ariana and Ben Arous are merged into one[16]. And the same thing occurs for the local governments of Tozeur and Kébili[17,18].

IV.1. Determinants of Poverty in Tunisia.

The estimation of Probit and Logit specifications was carried out using maximum likelihood procedure from STATA software. The control of the heterogeneity of clusters in the household survey in the form of a cluster random effect is validated by the empirical experimentation (see tables 5 and 6). Indeed, even if previous studies agree on the fact that poverty in Tunisia is a rural phenomenon, one purpose of this paper is to use cluster data in the household survey to stress that within each area, there can exist significant differences of the standard of living of households belonging to various clusters. So cluster effects could control for differences in geographical prices met by the households in the estimation process of the determinants of poverty in Tunisia.

The results presented in tables 5 and 6 show that in both urban and rural areas the main factors which discriminate against poverty include head's education, child dependency ratio, ratio of male and female employees in the household, socio-professional category of the head, family residence and regional dummies.[19] The results show that more education by the head

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[16] The variables gouv2 and gouv3 of the urban area are regrouped into one variable noted down gouv32 for the rural area.

[17] The variables gouv19 and gouv20 for the urban area are regrouped into one variable noted down gouv1920 for the rural area.

[18] These two regroupings never affect the coherence relative to this statistical information for the local governments regrouped in that way belong to the same regions according to the aggregate cutting out (see table 3).

[19] The fact that some of the explanatory variables may be endogenous, that is, determined by the income level of the household and, hence implicitly by the poverty status, will lead to biased and inconsistent estimates. To circumvent this problem, one can perform instrumental variables using GMM procedure, see M. Foster (1997).

and a greater ratio of male and female employees in the household and an increase of children in secondary education reduce the likelihood of poverty. Human capital development as well as the participation of women in the labor market can reduce the intensity of poverty within the household. Concerning the proportion of active males and females, we note that the differences in the weights associated to these variables are more pronounced in the rural areas where the principal source of income for the active males is the agricultural salaried work.

The relative difference of the poverty determinants between urban and rural households was also examined. In rural areas we note that, according to the socio-professional category of the head of the household, the head being unemployed or being an agricultural worker increases the likelihood of poverty. Indeed, the salaried agricultural work constitutes a precarious source of income, taking into account the seasonal character of the agricultural activities which are strongly associated with rain conditions. The finding that employment in agriculture increases the likelihood of poverty in rural areas shows a continuing need for an effort to develop irrigated crop agriculture in Tunisia. Further, the results indicate that the economic disadvantages of female headship are mainly an urban phenomenon, where a female-headed household is significantly associated with a higher likelihood of poverty. We note also, that the intensity of poverty in urban and rural areas is significantly different according to regions. Compared to the reference household that is located in the governorate of "Ariana", the results of tables 5 and 6 indicate in urban areas that the probability of being poor is more pronounced when the household is located in the governorate of Beja and Le Kef. However, this probability decreases when the household is located in the governorates of Tunis, Nabeul, Monastir, Mahdia and Kebili. The differential between the intensity of poverty among regions is also relevant in rural areas. Indeed, in comparison to the reference household that is located in the governorate of Ariana-Ben Arous, the probability of being poor seems to be higher for the rural households that are located in the governorates of Zaghouan, Bizerte, Beja, Jendouba, Le Kef, Siliana and Kairouan.

IV.2. Sensitivity Analysis and Policy Implications

The present study has thus uncovered relationships between poverty and several of its determinants in urban and rural areas in Tunisia, based on

cluster data analysis from a national household survey. If policy actions were to be undertaken that would change key determinants, what effects could be expected on the likelihood of the poverty of households in Tunisia? Is female headship found to be associated with a higher incidence of poverty?

The sensitivity analysis is intended to provide this information by examining the differential effects that changes in selected variables have on the probability of poverty. Probability of poverty, presented in table 7, has been computed under different scenarios of family composition, education of the head, head's employment condition, female headship, round of the survey, regions and other determinant factors.

A major finding is the strong correlation between the intensity of poverty and the cereal expenses of households. An urban household allowing more than 25 percent of its food budget share to cereal products has a 19 percent probability of being poor (33 percent in rural areas). Hence, the results indicate that the food budget share devoted to cereal products is a good indicator of poverty. Indeed, cereal products constitute a strategic commodity for the poor population in Tunisia. The main components in cereals such as transformed hard wheat products (pastry, semolina and couscous) or soft wheat products (flour and bread) are subsidized by the government. Although these subsidies are not selective, and benefit all social layers without discrimination, these indirect transfers remain a judicious means of fighting against poverty.

The results underline equally the fact that poverty is multifaceted and several prolonged approaches are needed. Having fewer children reduces the probability of being poor, but the reductions are generally much less than from increasing education. Indeed, raising the level of a head's education has a clear effect on reducing the probability of poverty in the two areas. The probability of poverty drops by increasingly larger percentages as the level of education rises from one level to the next. This effect is more pronounced in the urban areas where the percentage drop in the probability of poverty is about 70 percent if the head obtains a primary

education.[20] Obtaining a secondary education or university degree reduces the probability of poverty in the two areas more than 50 percent. Hence, the necessity of engaging a program of fight against the phenomenon of illiteracy constitutes one of the priorities that have to be considered by the public decision makers in a poverty alleviation scheme in Tunisia. On the other hand, trends toward smaller families should help future poverty levels and may also be allowed by the indirect effect of education (basically for women) on poverty that would be through the impact on the child dependency ratio.

The results do not indicate a positive correlation between demographic aging (defined as an increase in the percentage of a population aged 65 years old and over) and the incidence of poverty. One of the main reasons behind such unexpected conclusions appears to be the fact that the aged are a heterogeneous group. Finally, We can observe that female headship is found to be associated with a higher probability of poverty in urban areas while this result is not confirmed in rural areas. Based on this finding we cannot argue that "headship" could seriously be considered as a potentially useful criterion for targeting antipoverty interventions in Tunisia. In fact, effective policies must begin with the recognition that FHHs constitute also a heterogeneous group of households and the empirical studies concerning the association of FHH and poverty must take these differences into account.

Finally, table 7 show also that the intensity of poverty in urban and rural areas is significantly different according to regions. This suggests that the geographically targeted policies would be more efficient if they proceed in a finer selection process within each area according to regions in order to fight poverty. Figures 1 and 2, in the appendix, contain cluster means distribution of the probability of being poor by region in each area[21]. The regional differences in the intensity of poverty, shown in the figures, may be explained by the differences in the real standard of living of households

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[20] $\dfrac{0.066 - 0.092}{0.068} = -0.705$

[21] The line in the middle of the box represents the median of the mean cluster probability of being poor. The box extends from the first to the third quartile, the so-called interquartile range.

belonging to different regions and attributed to spatial differences of prices as well as regional disparities observed in the level of development. This finding underlines the interest of proceeding in a "vertical" geographically targeted policy allowing the reduction of disparities that can exist within each area between the different regions.

V. Conclusion

This paper has explored a range of policy concerns relating to the determinants of poverty in Tunisia on the basis of the household budget survey carried out in 1990 by the Institute of National Statistics. The objectives of the paper are to identify some of the key determinants of Poverty in Tunisia in urban and rural areas at the household level.

The empirical methodology developed in the present study is inspired from Deaton's (1987,1990) approach with the use of cluster data set that allows us to use econometric panel data procedures with logistic and probit models.

The results show that in both urban and rural areas the main factors which discriminate against poverty include the household head's education, child dependency ratio, ratio of male and female employees in the household, socio-professional category of the head, family residence, type of housing, the share of food budget designated to cereal products and regional dummies.

An increase in the food budget for cereal products increases the likelihood of poverty, while more education and a greater ratio of male and female employees in the household and an increase of children in secondary education reduce the likelihood of poverty. Human capital development as well as the participation of women in the labor market can reduce the intensity of poverty within the household. Concerning the proportion of active males and females, we note that the differences in the weights associated with these variables are more pronounced in rural areas where the principal source of income for the active males is agricultural salaried work.

The relative difference of the poverty determinants between urban and rural households was also examined. In rural areas we note that, according to the socio-professional category of the head of the household, the head being an agricultural worker increases the likelihood of poverty. Indeed, salaried agricultural work is a precarious source of income, taking into account the seasonal character of agricultural activities which are strongly associated with rain conditions. The finding that employment in agriculture increases the likelihood of poverty in rural areas shows a need to develop irrigated crop agriculture in Tunisia. Furthermore, the results indicate that the economic disadvantages of female headship are mainly an urban phenomenon, where a female-headed household is associated significantly with a higher likelihood of poverty.

The result indicates that food subsidies concerning cereal products, and basically hard wheat products, have valuable implications within the context of poverty alleviation. They underline equally the fact that poverty is multifaceted and several prolonged approaches are needed. Having fewer children reduces the probability of being poor, but the reductions are generally much less than from increasing education. Hence, the necessity of engaging in a program against illiteracy is one of the priorities that have to be considered by the public decision makers in a poverty alleviation scheme in Tunisia. On the other hand, trends toward smaller families should help future poverty levels and may also occur through the indirect effect of education (basically for women) on poverty through the impact on the child dependency ratio.

The results do not indicate a positive correlation between demographic aging and the incidence of poverty. One of the main reasons behind such an unexpected conclusion appears to be the fact that the aged are a heterogeneous group. Finally, we can observe that female headship is found to be associated with a higher probability of poverty in urban areas while this result is not confirmed in the rural area. Effective policies must begin with the recognition that FHHs constitute also a heterogeneous group of households and the empirical studies concerning the association of FHH and poverty must take these differences into account.

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Table 1: List of Variables

Variables	Wording
	Characteristics of the household
pactiff	Proportion of active females in the household
pactifm	Proportion of active males in the household
pscolpr	Proportion of infants in primary cycle of education
pscolse	Proportion of infants in secondary cycle of education
pscolst	Proportion of infants in higher cycle of education
pne06	Proportion of infants aged less than six years
pne65p	Proportion of individuals aged more than 65 years
tai	Size of the household
	Characteristics of the head of the household
inst1	=1 if the head of the household is without instruction
	=0 otherwise
inst2	=1 for the primary level
	=0 otherwise
inst3	=1 for the secondary or professional level
	=0 otherwise
inst4	=1 for the higher level
	=0 otherwise
CSP1	=1 if the head of the household is unemployed
	=0 otherwise
CSP2	=1 if the head of the household is a working man
	=0 otherwise
CSP3	=1 if the head of the household is professional man (independent)
	=0 otherwise
CSP4	=1 if the head of the household is a manager (senior executive) or an average staff
	=0 otherwise
CSP5	=1 if the head of the household is inactive
	=0 otherwise
female	=1 if the head of the household is female
	= 0 otherwise
age	age of the head of the household
	The household's place of residence
gouvi. $i = 1,\cdots,23$	=1 if the household resides in the local government i
	=0 otherwise
	Period of the survey
tr1	=1 if the household is surveyed during the first quarter
	=0 otherwise
tr2	=1 if the household is surveyed during the second quarter
	=0 otherwise
tr3	=1 if the household is surveyed during the third quarter
	=0 otherwise
tr4	=1 if the household is surveyed during the fourth quarter
	=0 otherwise

Table 2: Variable CSP Specific to Rural Area

Variables	Wording
CSP1	=1 if the head of the household is unemployed
	=0 otherwise
CSP21	=1 if the head of the household is a working man
	=0 otherwise
CSP22	=1 if the head of the household is an agricultural worker
	=0 otherwise
CSP3	=1 if the head of the household is employed. a staff or independent
	=0 otherwise
CSP4	=1 if the head of the household is inactive
	=0 otherwise
CSP5	=1 if the head of the household is a farmer
	=0 otherwise

Table 3: Administrative Cutting Out in Local Governments and Regions

Variables	Local government	Variables	Local government
gouv1	Tunis	**4- Central-West**	
gouv2	Ariana	gouv14	Sousse
gouv3	Ben Arous	gouv15	Monastir
1- District of Tunis		gouv16	Mahdia
gouv4	Nabeul	gouv17	Sfax
gouv5	Zaghouan	**5- Central-East**	
gouv6	Bizerte	gouv18	Gafsa
2- North-East		gouv19	Tozeur
gouv7	Béja	gouv20	Kébili
gouv8	Jendouba	**6- South-West**	
gouv9	Kef	gouv21	Gabès
gouv10	Siliana	gouv22	Mednine
3- North-West		gouv23	Tataouine
gouv11	Kairouan	**7- South-East**	
gouv12	Kasserine		
gouv13	Sidi Bouzid		

Table 4: Descriptive Statistics

	Urban Area		Rural Area	
Variables	Means	Standard Deviations	Means	Standard Deviations
tai	5.574	2.204	60.245	2.6
actifm	1.17	0.838	1.233	0.893
actiff	0.31	0.584	0.236	0.617
pactifm	0.219	0.151	0.218	0.156
pactiff	0.0598	0.121	0.0439	0.119
pscolpr	0.161	0.179	0.15	0.168
pscolse	0.0899	0.147	0.045	0.1
pscolst	0.0096	0.0481	0.00264	0.0222
pne06	0.151	0.179	0.173	0.193
pne65p	0.0702	0.166	0.0873	0.187
inst1	0.367	0.482	0.68	0.466
inst2	0.301	0.459	0.25	0.433
inst3	0.275	0.446	-	-
inst4	0.058	0.339	-	-
inst34	-	-	0.0696	0.254
CSP1	0.0107	0.103	0.0196	0.138
CSP2	0.392	0.488	-	-
CSP3	0.188	0.39	-	-
CSP4	0.272	0.445	-	-
CSP5	0.137	0.344	-	-
CSP21 (rural)	-	-	0.233	0.423
CSP22 (rural)	-	-	0.193	0.395
CSP3 (rural)	-	-	0.201	0.4
CSP4 (rural)	-	-	0.081	0.272
CSP5 (rural)	-	-	0.271	0.444
age	47.506	13.423	49.234	14.193
tr1	0.26	0.438	0.236	0.424
tr2	0.232	0.422	0.301	0.459
tr3	0.235	0.424	0.229	0.42
tr4	0.271	0.444	0.231	0.422

Notes: tai: size of the household; actifm: number of active males in the household; actiff: number of active females in the household.

Table 5: Panel Random Effects Probit Estimates of Poverty Determinants Among Urban and Rural Households

Variables	Urban area		Rural area	
	Coefficient	t-Student	Coefficient	t-Student
pactifm	-30.645	-7.03	-2.591	-8.732
pactiff	-1.67	-3.729	-0.855	-2.705
pscolpr	0.643	2.562	0.729	3.57
pscolse	-1.579	-4.24	-1.746	-4.916
pscolst	-10.338	-0.836	-0.372	-0.273
pne06	10.124	3.594	0.61	3.118
pne65p	0.508	1.676	-0.122	-0.516
tai	0.116	6.352	0.0976	7.53
female	0.422	2.855	0.14	1.003
inst2	-0.435	-4.555	-0.34	-4.447
inst3	-0.788	-5.623	-	-
inst4	-1.001	-2.623	-	-
inst34	-	-	-0.79	-5.517
CSP1	0.389	1.576	0.381	1.945
CSP3	-0.408	-3.895	-	-
CSP4	-0.707	-4.868	-	-
CSP5	-0.756	-4.691	-	-
CSP22 (rural)	-	-	0.391	4.486
CSP3 (rural)	-	-	-0.495	-5.242
CSP4 (rural)	-	-	-0.104	-0.729
CSP5 (rural)	-	-	-0.0897	-0.999
age	-0.00171	-0.082	-0.00729	-0.465
age²	0.0000649	0.32	-0.00000376	-0.024
tr1	-0.275	-2.272	-0.12	-0.979
tr2	-0.332	-2.643	0.0159	0.138
tr3	0.00879	0.077	-0.113	-0.946
gouv1	-1.195	-4.808	-	-
gouv3	-0.399	-1.559	-	-
gouv4	-0.894	-3.052	-0.165	-0.577
gouv5	-0.5	-1.207	0.791	2.835
gouv6	-0.322	-1.377	0.747	2.736
gouv7	0.672	2.909	0.961	3.833
gouv8	0.0596	0.234	0.562	2.286
gouv9	0.612	2.722	1.165	4.422
gouv10	-0.0703	-0.242	0.91	3.641
gouv11	0.178	0.81	0.834	3.472

Table 5: Contd.

Variables	Urban area		Rural area	
	Coefficient	t-Student	Coefficient	t-Student
gouv12	-0.0784	-0.332	0.262	0.995
gouv13	0.142	0.548	0.71	2.779
gouv14	-0.435	-1.91	0.226	0.821
gouv15	-1.148	-3.531	-	-
gouv16	-0.723	-2.535	0.0573	0.197
gouv17	-0.418	-1.853	0.737	2.867
gouv18	-0.048	-0.223	0.78	2.572
gouv19	0.316	1.228	-	-
gouv20	-0.555	-1.802	-	-
gouv1920	-	-	0.166	0.565
gouv21	-0.258	-1.123	-0.185	-0.608
gouv22	-0.75	-2.437	0.372	1.333
gouv23	0.0868	0.314	0.0648	0.198
intercept	-10.187	-1.752	-0.872	-1.84
Log L	-832.279		-1.524.621	
Variance σ_μ^2	0.373		0.501	
Coefficient ρ	0.122		0.2	
Statistic LR	18.536		103.02	
Statistic W	381.03		476.71	
Nb.observations	4477		3257	
Nb.clusters	390		276	

Notes: In urban areas, the reference household is located in the local governorate of Ariana and is surveyed during the fourth quarter. The head of the household is a male without education and is a working man. In rural areas, the reference household is located in the local governorate of Ariana-Ben Arous and is surveyed during the fourth quarter. The head of the household is a male without education and is a working man.

Table 6: Panel Random Effects Logit Estimates of Poverty Determinants Among Urban and Rural Households

Variables	Urban Area Coefficient	Urban Area t-Student	Rural Area Coefficient	Rural Area t-Student
pactifm	-60.138	-6.758	-4.679	-8.778
pactiff	-30.447	-3.488	-1.643	-2.878
pscolpr	1.304	2.726	1.218	3.481
pscolse	-3.142	-4.277	-30.529	-4.811
pscolst	-2.823	-1.019	-0.668	-0.276
pne06	1.944	3.618	10.288	3.057
pne65p	0.818	1.366	-0.231	-0.547
tai	0.218	6.332	0.171	7.546
female	0.807	2.911	0.272	1.115
inst2	-0.796	-4.484	-0.589	-4.441
inst3	-1.498	-5.467	-	-
inst4	-1.899	-2.419	-	-
inst34	-	-	-1.347	-5.342
CSP1	0.689	1.542	0.656	1.965
CSP3	-0.751	-3.735	-	-
CSP4	-1.36	-4.722	-	-
CSP5	-1.431	-4.638	-	-
CSP22 (rural)	-	-	0.683	4.552
CSP3 (rural)	-	-	-0.854	-5.176
CSP4 (rural)	-	-	-0.214	-0.868
CSP5 (rural)	-	-	-0.144	-0.929
age	-0.0124	-0.314	-0.0168	-0.615
age²	0.000207	0.535	0.0000325	0.121
tr1	-0.507	-2.208	-0.192	-0.899
tr2	-0.686	-2.845	0.0296	0.147
tr3	0.0627	0.293	-0.203	-0.969
gouv1	-2.397	-4.622	-	-
gouv3	-0.706	-1.453	-	-
gouv4	-1.654	-2.875	-0.314	-0.618
gouv5	-0.974	-1.135	1.32	2.704
gouv6	-0.641	-1.435	1.287	2.71
gouv7	1.288	3.015	1.648	3.763
gouv8	0.0354	0.073	0.937	2.179
gouv9	1.143	2.755	1.98	4.291
gouv10	-0.0374	-0.07	1.541	3.533
gouv11	0.321	0.786	1.415	3.375

Table 6: Contd.

Variables	Urban Area Coefficient	Urban Area t-Student	Rural Area Coefficient	Rural Area t-Student
gouv12	-0.209	-0.474	0.353	0.76
gouv13	0.294	0.614	1.206	2.704
gouv14	-0.896	-2.016	0.381	0.787
gouv15	-2.245	-3.287	-	-
gouv16	-1.306	-2.357	0.047	0.091
gouv17	-0.744	-1.715	1.256	2.794
gouv18	-0.0763	-0.191	1.311	2.486
gouv19	0.589	1.254	-	-
gouv20	-0.975	-1.696	-	-
gouv1920	-	-	0.26	0.506
gouv21	-0.41	-0.956	-0.336	-0.627
gouv22	-1.316	-2.217	0.644	1.323
gouv23	0.238	0.474	0.103	0.181
intercept	-1.556	-1.406	-1.332	-1.611
Log L	-831.987		-1.524.549	
Variance σ_μ^2	0.678		0.871	
Coefficient ρ	0.314		0.431	
Statistic LR	17.592		104.71	
Statistic W	372.86		426.84	
Nb.observations	4477		3257	
Nb.clusters	390		276	

Notes: In urban area, the reference household is located in the local governorate of Ariana and is surveyed during the fourth quarter. The head of the household is a male without education and is a working man. While, in rural area, the reference household is locted in the local governorate of Ariana-Ben Arous and is surveyed during the fourth quarter. The head of the household is a male without education and is a working man.

Table 7: Estimated Probabilities of Poverty of a Household Under Alternative Socio-economic Conditions, 1990, Cluster Random Effects Logistic Model

	Urban Mean	Rural Mean
1- Sex of Head		
Male	0.066	0.262
Female	0.092	0.268
2-Education of Head		
No Education	0.114	0.283
Primary/Koranic education	0.066	0.247
Secondary education	0.022	0.114
University degree	0.009	-
3-Ramadan		
Ramadan	0.06	0.25
Other period	0.07	0.263
4-Cereal expenses as % of food budget share		
Less than 25%	0.055	0.227
More than 25%	0.19	0.33
5-Family composition		
No children (aged below 6 years)	0.038	0.162
One fewer children	0.068	0.281
Two fewer children	0.103	0.34
Three fewer children	0.162	0.416
More than three children	0.256	0.45
6-Ageing		
No member in HH aged over 65	0.065	0.282
One member in HH aged over 65	0.076	0.224
Two or more members in HH aged over 65	0.081	0.187
7-Region		
1-Tunis	0.035	0.143
2-North-East	0.035	0.23
3-North-West	0.134	0.34
4-Central-West	0.14	0.30
5-Central-East	0.033	0.212
6-South-West	0.126	0.258
7-South-East	0.069	0.18