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# Composition of families and subjective economic well-being: An application to Italian context

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## Abstract

Using Italian data on Income and Living Conditions for the year 2005, the paper explores empirically whether the determinants of subjective economic well-being (SEW) differ (or not) in four representative typologies of households. By means of a Partial Proportional Ordered Logit Model the subjective economic well-being – proxied by the capacity of households to make ends meet – has been explored. Results highlight the variables acting on SEW, common to each typology, are related both to economic status (specifically, the capacity to pay taxes and to afford housing, clothes and holiday expenditures) and to socio-demographic status (specifically, the work-status and the highest level of education). A more in depth analysis, by level of education, shows the economic precariousness of some specific typologies, namely families with one person, with two or more children, and those whose respondent has a very low level of education.

**Keywords:** Economic Well-being, Subjective Approach, Ordered Logit Model

**JEL Classification:**

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## 1. Introduction

In the last two decades the concept of well-being and its measurement have become a relevant and actual topic in the social, economic and psychological literature, that led to a proliferation of theoretical and empirical articles on this issue.

According to the subjective approach, in our paper, we focus on household feeling relating to its economic satisfaction in terms of ability to make ends meet. We call it *Subjective Economic Well-being* (SEW). In particular, we analyze SEW for four Italian typologies of households; viz. households with only one component (H1); households with no children (H2); households with one child (H3), and households with two or more children (H4).

There are several reasons to investigate the economic well-being of different typologies of households. Generally, the perceived economic well-being by households reflects partially the distribution of income among them, and therefore, the assessing of economic well-being is an important issue to evaluate the economic security of households and their poverty risk. This concern provides useful insights to policy makers in order to undertake specific actions for different typologies of families.

Related to Italian situation, it is worth to mention the recent debate on “household impoverishment”, and on its “increased economic vulnerability”.

Using some subjective indicators on economic conditions from the European Community Household Panel data, Boeri and Brandolini (2004) showed Italy – in contrast to the others EU partners – is the only country where the economic conditions of households worsened in the period 1996-2001.

More recently, Pisano and Tedeschi (2007) highlighted that – notwithstanding a stability in the personal distribution of income – the perception of diminished well-being and an increasing precariousness of Italian households has growing acute.

The worsening of economic conditions would have partly contribute to a significant change of household’s structure; as a matter of fact it has been a decreasing of traditional typologies and an increasing of post-modern ones (Istat, 2009).

The number of couples with more than one child has decreased dramatically, while those households with one person, with no children, and with only one child have increased and this changing has regarded all Italian regions. This concern has led us to focus on the main representative typologies above mentioned.

We presume households with only one person and with two or more children will have lower levels of economic well-being than families with no children and with one child. Furthermore, we guess among family typologies the determinants affect differently SEW.

Actually, the traditional families have a more solid financial situation as woman can count on income of her husband and *vice versa*; on the other hand, households with more children experiment higher maintenance costs especially when all children are financially dependent.

For our aim, we use the *European Survey on Income and Living Conditions* (EU-SILC) by EUROSTAT; it provides a homogeneous information across the European countries on income and living conditions, and represents a wide database on qualitative and quantitative information relating to individuals, households and regions. In particular, in this paper we use the Italian dataset for the year 2005.

At our knowledge this is the first time that an analysis on household typologies has been done to explore the Italian subjective economic well-being. The main recurring fields of research have up to now been concerned with the objective approach to evaluate the regional or social classes disparities (Ferrari, 2004; Quintano et al. 2009).

Recently, Ferrari and Maltagliati (2009) made a comparison among Italian families along the subjective approach considering five geographical macro area and five types of households defined by the number of components. Their analysis is mainly focused on the ranking of households within each macro area.

According to this stream of literature, our study aims to investigate the determinants of SEW and to explore the differences, if any, among the main representative typologies of Italian families. Using a Partial Proportional Ordered Logit Model (PPOLM), we analyse the relationship between SEW and some aspects of the economic and social status of households.

The paper is organized as follows. Section 2 presents a short review on well-being concept; in Section 3 model and data will be presented. Finally, Section 4 and 5 report some empirical findings and concluding remarks.

## **2. A Short Review on Well-being**

As said above, in the last years the study of well-being has received an increasing interest, and the different results achieved in the empirical analyses have drew out the need to shift attention from income or consumption to non-monetary variables able to catch the multi-faceted characteristics of well-being. In particular, income is often a biased measure due to the reticence of respondents and to systematic errors on fluctuations of self-employed incomes; definitely, income (or GDP at macro level) does not capture all aspects of human life. All that, leads to consider a variety of non-monetary indicators that can take into account better than income different aspects of living conditions.

Yet today, an open matter is the absence of an objective criteria in order to identify the various dimensions of well-being and its connected variables.

Generally, well-being may be described along at least three distinct dimensions: material, immaterial and emotional attributes. In the literature on development, the first dimension is often referred to as access to resources; relating to the second one, the literature usually refers to objective social aspects of life, such as health, education and vocational training, labour market conditions, public safety and crime, social security, environment, equal justice etc. The emotional dimension refers to the subjective well-being in terms of individual feelings about satisfaction with the life as a whole or some specific aspects of life (i.e. family life, job, accommodation, health, social life, education, living standards).

Regarding to the methodological aspects, the analysis of well-being follows two different and complementary approaches, viz. the objective and subjective approach.

Along the objective approach, the problem relating to the identification of relevant dimensions has generally resolved according to Sen's theory, which conceives well-being in terms of what individual is able to do or to be. The objective approach assesses well-being by means of cardinal or ordinal measures following two different paths, that is the *non-aggregative strategy* and the *aggregative strategy*.

The *non-aggregative strategy* considers the entire vector of dimensions, and in order to manage the multiple information different techniques – based on the idea of latent variable – can be used (see e.g. Naga and Bolzani, 2008). Along the *aggregative strategy*, all information is collapsed to derive an aggregate indicator of overall well-being or poverty, according for example to Information Theory Approach (Lugo and Maasouni, 2008), and to Axiomatic Approach (Chakravarty and Silber, 2008); while according to Fuzzy Set Approach (Betti et al., 2008) the information provided by distinct sets of elementary indicators – related to different dimensions – is used to derive one synthetic measure for each dimension of well-being (or poverty).

The subjective approach to the analysis of well-being refers to the evaluation of people regarding to the life as a whole or to specific aspects of it like financial condition, health, working condition, life environment, crime and security, social cohesion, etc. (Van Praag and Ferrer-i-Carbonell, 2008).

According to the subjective approach well-being (SWB) is “*a broad category of phenomena that includes people's emotional responses, domain satisfaction, and global judgements of life satisfaction*” (Diener et al. 1999, p. 277). In this sense, SWB does not have a theoretical background rather it is conceptualized through one or more answers of people about questions concerning his/her life. In spite of this “*SWB is able to capture people actual experiences in a direct manner and [...] this, in turn, matters because what is experienced does not have to coincide with objective conditions*” (Van Hoorn, 2007, p.7).

Due to the breath of SWB concept, the economic debate has recently renewed by numerous contributions on some specific well-being domains, and on the relationship between a person's life satisfaction and his/her satisfaction in different areas of life (see e.g. Rojas, 2006; Van Praag et al. 2003). So that, respondents of survey are not only asked how satisfied they are with their life in general, but also how satisfied they are about their health, social life, accommodation, present job and standard of living.

Along this line, the First European Quality of Life Survey promoted by European Foundation for the Improvement of Living and Work Conditions, and the European Survey on Income and Living Conditions have to be mentioned.

In particular, the first one is focused on satisfaction with the major areas of life ranging from material to social aspects, and with the functional explanation of the general life satisfaction through these different areas. Instead, the second survey is mainly focused on social exclusion and living conditions; the questions about the life satisfaction are limited to the economic aspects and health situation of individuals.

Finally, a new stream of literature exploring the subjective well-being of specific clusters of people like older adults (see e.g. Cheli et al., 2002), women (see e.g. Malone et al. 2009), children (Addabbo et al., 2004; Di Tommaso, 2007) has to be mentioned.

According to the above theoretical background and the availability of data, we focus on a specific area of SWB; that is the subjective economic well-being explained by the economic and socio-demographic status. Indeed, in order to overcome the above criticisms linked to income, we consider a proxy of it, i.e. the economic status, represented by several variables related to financial domain, the housing conditions and the possession of durables.

In Section 3 our theoretical hypothesis and statistical models will be presented.

### **3. Model and data**

Our idea is to describe SEW through the economic and socio-demographic status of households.

The dependent variable is the assessment of household respondent on the level of difficulty experienced by the household in making ends meet; it has been assumed as a proxy of the SEW. According to recent literature, this variable pertains to those one not directly linked to income question rather to self-rated perception of economic satisfaction (see e.g. Pradhan and Ravallion, 2000). The evaluation by the respondents was based on an ordinal 3-point scale: 1 (with great difficulty), 2 (with

some difficulty), 3 (easily)<sup>1</sup>.

We hypothesize these three different point scale correspond to three different levels of subjective economic well-being; viz. point scale 1, 2 and 3 represent a very unsatisfying, an unsatisfying, and very satisfying level of SEW, respectively.

The nature of our dependent variable let us to employ an ordered logit model which the general formulation is the following:

$$SEW^* = \beta X + \varepsilon \quad (1)$$

$$SEW = \begin{cases} 1 & \text{if } \vartheta_0 < SEW^* \leq \vartheta_1 \\ 2 & \text{if } \vartheta_1 < SEW^* \leq \vartheta_2 \\ 3 & \text{if } \vartheta_2 < SEW^* \leq \vartheta_3 \end{cases} \quad (2)$$

In Eq. 1  $SEW^*$  is a latent phenomenon that is linked to the observed outcome, SEW, represented by the response to the question on the ability to make ends meet.  $X$  is the matrix of explanatory variables relating to the economic and socio-demographic status of household, and  $\varepsilon$  is the error term. Finally, we observe  $SEW$  which takes the discrete values  $m = 1, 2, 3$ , where the cut-off points ( $\vartheta_m$ ) need to be estimated.

Regarding to the explanatory variables, it is worth to mention the economic status has been considered as ‘capabilities’, be it financial equilibrium, housing conditions, and durable goods (see e.g. Ferro-Luzzi et al., 2008) or simply the best proxy of income. Indeed, the possession of durable goods and living conditions “...suffer fewer reporting errors than do income or expenditure...[but]...they still are subject to measurement errors” (Kolenikov and Angeles, 2009, p. 129). According to these authors, in order to overcome measurement errors it is preferable to use a considerable number of income proxies rather than only one.

In the light of that, we consider four domains related to the economic status of household; viz. financial equilibrium (FE), housing conditions (HC), possession of durable goods (DUR), and quality of the residence place (RP).

The social and demographic status (SD) of households pertains to the characteristics of households members; viz. age, gender, level of education, work status. These variables could capture for example discrimination in the labour market, social exclusion, and also attitudes towards life.

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<sup>1</sup> The original evaluation by the respondents was based on ordinal 6-point scale; for statistical reasons the variables has been reclassified in 3 ordered outcomes.

Finally, a geographic variable to cluster (AREA) (viz. the cluster of Northern, Middle, and Southern regions) has been used in order to take into account the different conditions of living in the geographical areas.

So that, our empirical model is the following:

$$P(Y_i > m) = \frac{\exp(\alpha_m + \beta FE_i + \beta HC_i + \beta DUR_i + \beta SD_i + \beta RP_i + \beta AREA_i + \Delta_i \gamma_m)}{1 + \{\exp(\alpha_m + \beta FE_i + \beta HC_i + \beta DUR_i + \beta SD_i + \beta RP_i + \beta AREA_i + \Delta_i \gamma_m)\}} \quad (3)$$

As proxies of financial equilibrium (FE) the following variables have been included: arrears on utility bills, financial burden of the total housing cost, capacity to afford a meal with meat, chicken, fish every second day, capacity to afford paying for one week annual holiday away from home, incapacity to afford clothes' expenditures in the last 12 months, incapacity to afford health expenditures in the last 12 months, incapacity to afford educational expenditures in the last 12 months, incapacity to pay taxes in the last 12 months, payment of rubbish tax, taking out a short-term loan.

The housing conditions (HC) involves: number of rooms available to the household; ability to keep home adequately warm, total housing cost, tenure status of accommodation, problems with the dwelling regarding leaking roof, damp ceilings, dampness in the walls, floors or foundation or rot in window frames and doors, problems with the dwelling (i.e. too dark, not enough light, etc).

The possession of durable goods (DUR) concerns the availability of households about some durable goods like connection to internet, video recorder, parabolic aerial<sup>2</sup>.

Furthermore, as proxies of environmental quality of residence place of household (RP) we consider all the available variables; viz. the respondent feeling of noise from neighbours or from street, pollution, grime or other environmental problems, and crime violence or vandalism in the area (see Table 1 for the detailed description of variables).

<< Table 1 about here >>

Moreover, in Eq. 3, that represents the Gamma parameterization of a Partial Proportional Ordered Logit Model (PPOLM),  $\Delta_i$  is a matrix containing the values of a subset of explanatory variables for which proportional assumption is violated, and  $\gamma_m$  is a vector of regression coefficients (see, for details, Appendix A).

In order to represent more efficiently the household behaviour, we assume the regressors' effect is not homogeneous on three levels of SEW. For this reason, we use a more suitable model, i.e. PPOLM, by which some  $\beta$  coefficients could differ among the categories of the dependent variable.

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<sup>2</sup> On the basis of some descriptive statistics, these durable goods appear better to discriminate Italian households.



Eq. 3 has been estimated for the sample of 19,963 Italian households, and for four sub-groups: *i*) households with only one component (5,526 obs.); *ii*) households with no children (9,054 obs.); *iii*) households with one child (2,351 obs.); *iv*) households with two or more children (3,032 obs.).

In the next Section the results of our empirical models will be illustrated.

## 4. Empirical Findings

### 4.1. PPOLM Estimates

Table 2 reports PPOLM estimates<sup>3</sup>. It presents two boxes, the first one contains the  $\beta$ 's and the second one reports the  $\gamma$  coefficients. In particular, according to the gamma parameterization, in the first box we have for each explanatory variable one  $\beta$  coefficient concerning the first category of the dependent variable (i.e. with great difficulty) versus the second and the third one (i.e. with some difficulty and easily). The  $\beta$  coefficients related to the first and second category versus the third one are the same to the previous ones, except for those variables for which the parallel-lines assumption is violated. Regarding to these latter variables, in the bottom box one  $\gamma$  coefficient is reported for each variable; it is equal to the difference between the  $\beta_2$  (viz. the coefficient related to the first and the second category of dependent variable versus the third one) and  $\beta_1$  (viz. the coefficient related to the first category of dependent variable versus the second and the third one).

<< Table 2 about here >>

The estimated models achieved a good fit, and the coefficients of variables – estimated by the Maximum Likelihood method – possessed the expected signs and effects on the explanation of SEW.

The estimates of the model related to all households and each typology of households show SEW is positively supported by variables related to the financial equilibrium (e.g. FBHC, HOL, CLOE, TAXE) and to some socio-demographic variables, viz. work status (WORK\_S) and level of education of respondent (EDUL). In other words estimates show households with no financial burden of the total housing cost, with a good capacity to afford paying for one week annual holiday away from home, without problems to afford clothes' expenditures in the last 12 months, and to pay taxes have more

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<sup>3</sup> To check the parallel-lines constraint the *autofit* option of *gologit* procedure of STATA software was followed. This STATA procedure does a series of Wald tests on each variable to see whether its coefficients differ across equations, e.g., whether the variable meets the parallel-lines assumption. If the Wald test is statistically insignificant for one or more variables, the variable with the least significant value on the Wald test is constrained to have equal effects across equations. A global Wald test is also done of the final model with constraints versus the original unconstrained model; a statistically insignificant test indicates that the final model does not violate the parallel-lines assumption.

chances to experiment a higher level of SEW; that is they are very likely satisfied of their economic situation.

It is worth noticed, a not very necessary need, as the capacity of households to get an holiday, has positive and strongly significant effect on SEW for all typologies of families. In other words, the capacity to afford one annual week holiday has become, within the budget of Italian families, a basic need.

In particular, as hypothesized, HOL does not always respect the parallel-lines assumption, and as the positive sign of  $\gamma$  coefficient shows, its effect changes when one pass from the lower category of SEW to the higher. Moreover,  $\gamma$  coefficient is higher for households with at least one child (see Table 2, columns 5 and 6).

Further, housing conditions, possession of durable goods and environmental quality of residence act fairly differently on SEW of four typologies. Only the  $\beta$  coefficient of TSA, relating to both owner and beneficial owner conditions, and that one of PARAB are strongly statistically significant for each typology. On the contrary, the coefficients of some other variables, are statistically significant only for some typology (for example, VIDREC for H2; CRIME for H2 and H3) indicating the weak response of SEW to these variables.

An important issue regards the territorial differences; in other words, the area where household lives is important only for typologies H2 and H3, indicating households resident in the North of the country have more chances to experiment a higher level of subjective economic well-being than the households resident in the Centre-southern area<sup>4</sup>.

Regarding to the aspects of socio-demographic status, with the exception of GENDER, all variables are positively related to SEW. With reference to AGE, the  $\beta$  coefficients are significant for the third and fourth age-class (i.e. 51-65 years old, and equal to or more 65 years old), in particular for H1 and H2 typologies.

Among the other socio-demographic variables, the effect of work status and education level is particularly interesting. Specifically, the highest level of education and the condition of self-employed worker represent the most important conditions to have a satisfying SEW, and this aspect regards all typologies.

#### *4.2. What Kind of Relationship between SEW and Socio-demographic variables does exist?*

How are work status and education level related to SEW? In order to better explore this relationship, we have calculated the average of predicted probability to be very unsatisfying and very satisfying for

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<sup>4</sup> We explored the effect of regional location by using different aggregation of data; for example North, Centre, South; North-Centre and South; and North and Middle-South, but only the coefficient related to the last aggregation was always statistically different from zero.

each category of work status and level of education, respectively. In table 3, the shape of such probabilities has been reported.

<< Table 3 about here >>

As expected, with respect to work status, all typologies of households present an U-shaped and an inverted U-shaped relationship to SEW for the first and third category of SEW, respectively. In particular, the self-employed status is a breaking-point; i.e. for all typology of families the probability to make ends meet with greater difficulty decreases when the family respondent passes from the unemployed status to the self-employed one; the probability increases again when the family respondent retires from market labour. While, for the third level of SEW (i.e. very satisfying), the average probability for all groups of families is inverted U-shaped; viz. the probability to achieve higher level of SEW increases when one passes from unemployed to the self-employed status; while retired people have a lower probability to have a satisfying level of SEW.

Relating to the level of education, for all typologies of households the average probability to achieve an unsatisfying level of SEW decreases for higher level of education. *Vice versa*, the average probability of a very satisfying level of SEW increases for higher level of education (i.e. Degree, and Master or PhD).

#### *4.3. Level of Education and SEW: the Easterlin Considerations*

To get some insights on the relation between SEW and level of education we follow the Easterlin considerations (Easterlin, 2001). He argued, material aspirations rise with increasing level of education; and low or high levels of education channel likely people into different paths, viz. low income and high income path. So that, he also stated that people with more education and consequential high level of income have a higher subjective well-being than those with a lower level of education.

Moreover, it is reasonable to hypothesize people having different levels of education shape their living standards around different feelings, values, wishes, etc. due to psychological and emotional differences.

In order to explore the presence of subjective and objective differences among household typologies, we divide each group of households in two education status groups characterized by low and high education status (viz. LES and HES), respectively. Within each household typology, LES and HES identify those families whose respondent has a level of education lower or equal to secondary education certificate; and degree at least, respectively.

For each typology of household, we compare the average values of predicted probability to be very

satisfied for low and high education status; we call these average predicted probabilities Prob\_LES and Prob\_HES, respectively. While, we call Prob\_VS, the predicted average probability to be very satisfied for each typology neglecting the education status.

<< Table 4 about here >>

Prob\_VS varies slightly among household typologies (see Tab. 4, column 1); this similarity disappears if we consider the Prob\_LES and Prob\_HES. With respect to LES group (Tab. 4, column 2), all households present a Prob\_LES ranging from 0.14 to 0.24, for H4 and H2, respectively. While, Prob\_HES (Tab. 4 column 5) is greater and ranges from 0.34 to 0.44, for H4 and H2, respectively.

For each typology of household, Table 4 highlights significant subjective differences on SEW feeling; in fact, the average value of predicted probability to be very satisfied for HES group is twice that of LES one. Actually, people with a lower education level have a lower feeling of their SEW, and *vice versa*. Moreover, Table 4 shows objective differences exist among households with respect to the two education status. On average, households belonging to low education status group have a lower absolute and relative income than the high education status group.

Finally, within each education status group significant differences in terms of average probability can be appreciated among households; in particular with respect to HES, the highest Prob\_HES concerns households with no children (H2) and with one child (H3); viz. 0.44 and 0.42, respectively.

In synthesis, the analysis for education status lets come out objective and subjective differences among household groups; moreover, the crossing reading of education status and average probabilities highlights a different distribution of income inside both each household typology with respect to HES and LES status, and each education status.

## 5. Conclusions

By using a Partial Proportional Ordered Logit Model, the effect of composition of household on the perception of economic well-being has been explored. To this aim, we subdivide the total sample of 19,963 households in four groups, viz. households with only one component, households with no children, households with one child, and households with two or more children. Five PPOLMs were estimated, one for all households and four for the different typologies of households, respectively.

Overall, the results are coherent with the recent literature on the Italian household impoverishment. The estimates generally show households have a very low probability to have satisfying levels of SEW;

that is particular evident for households with only one person and households with two or more children.

In particular, the results give some interesting insights about the relationship between SEW and some relevant aspects of both economic and socio-demographic status. Regarding to the economic status, the estimates show the main dimensions affecting SEW is the financial equilibrium. This result is not surprising, if we consider financial equilibrium is strongly related to income and mirrors the ability of households to afford ordinary necessities. A more in depth look, shows that the more urgent needs shared by each typology indifferently are those related to the capacity to pay taxes and to afford housing, clothes and holydays expenditures, the other ones being differently influential on SEW. So that, a common life style characterizes the four analyzed typologies of families: to satisfy basic needs without forgoing holydays!

Regarding to the socio-demographic status, for all typologies of households the probability to achieve a higher level of SEW increases passing from unemployed status to the self-employed one; and decreases passing from the last one to the retired status. Relating to the level of education, the probability to achieve a very satisfying level of well-being increases for higher level of education (i.e. Degree, and Master or PhD).

In addition, the analysis focused on education status lets us to discover some interesting insights not evident from  $\beta$  coefficients. In particular, households belonging to the higher education status (i.e. degree, and PhD and Master) have, on average, a probability to be very satisfying equal to the double value of those belonging to the low education status. This difference of probability mirrors – within and between each educational status – subjective and objective disparities in terms of feeling of SEW. As a matter of fact, level of education takes inside both objective factors (i.e. income) and personal ones (i.e. feeling or expectation), but also it highlights it is important what people are able to be and not only what he/she can do or can have.

In conclusion, our analysis on SEW shows using non-monetary variables as proxies of economic status reveals appreciable differences among typologies of households, not evident if income had been used; further, a more exhaustive analysis should consider socio-demographic characteristics as explanatory variables in order to detect objective and subjective discriminant factors among homogeneous clusters of households.

Moreover, the typology and education status specific analysis appears much more directly policy-driving. Actually, feasible policies should be defined in order to allow people to achieve a good level of education as it represents a pre-condition to access to resources leading people to attain higher levels of well-being. The relevant influence of the latter leads out subjective economic well-being is mostly related to what people are able to be along his/her life and not only what he/she is able to do, but

unfortunately the current policy of the Italian Government is doing the opposite by dramatically reducing the resources for education.

## Appendix A

In the study of the dependence of a response variable on a set of explanatory variables, the choice of a model is determined by the scale of measurement of the response variable. In this paper, we use an ordered logit model as the dependent variable,  $Y$  – in our case household ability to make ends meet – takes  $m$  ordered values from 1 to  $M$ .

The most general logistic model for dependent categorical variable is the Generalized Logistic Model and can be written as:

$$P(Y_i > m) = g(\mathbf{X}\boldsymbol{\beta}_m) = \frac{\exp(\alpha_m + X_i\boldsymbol{\beta}_m)}{1 + \{\exp(\alpha_m + X_i\boldsymbol{\beta}_m)\}}, \quad m = 1, 2, \dots, M - 1, \quad (\text{A1})$$

where  $M$  is the number of categories of the ordinal dependent variable. From Eq. A1, the probability of  $Y$  to take values from 1 to  $M$  is the following:

$$\begin{aligned} P(Y_i = 1) &= 1 - g(X_i\boldsymbol{\beta}_1), \\ P(Y_i = m) &= g(X_i\boldsymbol{\beta}_{m-1}) - g(X_i\boldsymbol{\beta}_m), \quad m = 2, \dots, M - 1, \\ P(Y_i = M) &= g(X_i\boldsymbol{\beta}_{M-1}) \end{aligned} \quad (\text{A2})$$

This model is not parsimonious because it involves as many  $\alpha$  and  $\beta$  coefficients as the  $M - 1$  number of dependent variable categories.

A more parsimonious model is the Ordered Logit Model that implies the parallel-lines assumption for all explanatory variables<sup>5</sup>, viz. the model presents  $M$  different  $\alpha$  coefficients and the same  $\beta$  coefficients for each category of dependent variable. This model is called also Proportional Odds Model, and represents a special case of the Generalized Ordered Model (Eq. A1). It can be written as:

$$P(Y_i > m) = g(\mathbf{X}\boldsymbol{\beta}) = \frac{\exp(\alpha_m + X_i\boldsymbol{\beta})}{1 + \{\exp(\alpha_m + X_i\boldsymbol{\beta})\}}, \quad m = 1, 2, \dots, M - 1 \quad (\text{A3})$$

As evident, Eq. A3 and Eq. A1, related to the parallel-lines model and the generalized ordered

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<sup>5</sup> The parallel-lines constraint is satisfied if  $\beta_1 = \beta_2 = \dots = \beta_M$ .

model, respectively, are very similar, the only exception being on the  $\beta$ 's, that are the same for all values of  $m$  in Eq. A3. Actually, in the empirical analyses the parallel-lines assumption is often violated (i.e. one or more  $\beta$ 's could differ across values of  $m$  categories).

Therefore, an alternative procedure is to fit a Partial Proportional Ordered Model through which some  $\beta$  coefficients could differ among the categories of the dependent variable; viz. the proportional parallel-lines assumption is not satisfied for some explanatory variables.

For example, if we have four explanatory variables (X1, X2, X3 and X4) and X1 and X2 violate the parallel-lines constraint we will have for X3 and X4 the same  $\beta$  coefficients for all values of  $m$ , while for X1 and X2 the  $\beta$  coefficients are free to differ. In other words:

$$P(Y_i > m) = \frac{\exp(\alpha_m + X1_i\beta_{1m} + X2_i\beta_{2m} + X3_i\beta_3 + X4_i\beta_4)}{1 + \{\exp(\alpha_m + X1_i\beta_{1m} + X2_i\beta_{2m} + X3_i\beta_3 + X4_i\beta_4)\}}, \quad m = 1, 2, \dots, M - 1 \quad (\text{A4})$$

To test the parallel-lines assumption a Brant test could be done (Brant, 1990). If Brant test is significant there will be evidence that the parallel regression assumption has been violated.

Peterson and Harrell (1990), and, recently, Lall *et al.* (2002) proposed an equivalent parameterization of the Generalized Ordered Model called the Unconstrained Partial Proportional Odds Model or Gamma parameterization. Under the Peterson–Harrell parameterization, each explanatory variable has one  $\beta$  coefficient concerning the first category of dependent variable contrasted to the all other ones;  $M-2$   $\gamma$  coefficients that represent the deviation from proportionality; and  $M-1$   $\alpha$  coefficients reflecting the cut-points:

$$P(Y_i > m) = \frac{\exp(\alpha_m + X_i\beta + \Delta_i\gamma_m)}{1 + \{\exp(\alpha_m + X_i\beta + \Delta_i\gamma_m)\}}, \quad m = 1, 2, \dots, M - 1 \quad (\text{A5})$$

where  $\Delta_i$  is a matrix containing the values of a subset of  $q$  explanatory variables ( $q < p$ , where  $p$  are all the variables) for which proportional assumption is violated, and  $\gamma_m$  is a vector of regression coefficients. The test of the proportional assumption, for the  $q$ -covariates, is based on the null hypothesis  $H_0: \gamma_m = 0$  for all  $m$  categories.

There are some advantages to use  $\gamma$  parameterization, it has a more parsimonious layout and provides an easy way to understand the parallel-lines assumption; for example if we have a dependent variable with three categories we will have a  $\beta$  coefficient concerning the first category of the dependent variable contrasted to the other two ones, and one  $\gamma$  coefficient concerning the variables for which the parallel-lines is violated.

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**Table 1** Description of Variables

Variable	Label of Variable	Variable	Label of Variable
<i>Dependent variable</i>			
Ability to make ends meet	SEW	Tenure status of accommodation	TSA
With great difficulty (Very Unsatisfied)	1	Tenant	1
With some difficulty (Not Much Satisfied)	2	Owner	2
Easily (Very Satisfied)	3	Beneficial owner	3
		Accommodation is provided free	4
<i>Financial equilibrium dimension (FE)</i>			
Arrears on utility bills	AUB	Problems with the dwelling: too dark, not enough light, etc	DWEP
Yes	1	Yes	1
No	2	No	2
Financial burden of the total housing cost	FBHC	<i>Possession of durable goods (DUR)</i>	
A heavy burden	1	Do you have an internet connection?	INTER
Somewhat a burden or not burden at all	2	No	1
Capacity to afford a meal with meat chicken, fish every second day	MMCF	Yes	2
No	1	Do you have a video recorder?	VIDREC
Yes	2	No	1
Capacity to afford paying for one week annual holiday away from home	HOL	Yes	2
No	1	Do you have a parabolic aerial?	PARAB
Yes	2	No	1
Incapacity to afford food expenditures in the last 12 months	FOODE	Yes	2
Yes	1	<i>Socio-demographic dimension (SD)</i>	
No	2	Gender of the respondent	GEN
Incapacity to afford clothes' expenditures in the last 12 months	CLOE	Female	1
Yes	1	Male	2
No	2	Age of respondent	AGE
Incapacity to afford health expenditures in the last 12 months	HEALTH	< 35 years old	1
Yes	1	36-50 years old	2
No	2	51-65 years old	3
Incapacity to afford educational expenditures in the last 12 months	EDUE	> 65 years old	4
Yes	1	Level of education of respondent	EDUL
No	2	Elementary school leaving certificate (ESLC)	1
I don't have this type of expenditure	3	Lower secondary education certificate	2
Incapacity to pay taxes in the last 12 months, payment of rubbish tax,	TAXE	Secondary education certificate	3
Yes	1	Degree	4
No	2	Master, PhD, etc	5
Taking out a short-term loan	LOAN	Work status of respondent	WORK_S
Yes	1	Unemployed	1
No	2	Employee	2
		Self-employed worker	3
		Retired	4
		Other	5
<i>Housing dimension (HC)</i>			
Number of rooms available to the household	ROOMH	<i>Quality of the Residence Place (RP)</i>	
1 room	1	Noise from neighbours or from the street	NOISE
2 rooms	2	Yes	1
3 rooms	3	No	2
4 rooms	4	Pollution, grime or other environmental problems	POL
5 rooms	5	Yes	1
6 or more rooms	6	No	2
Ability to keep home adequately warm	WARMH	Crime violence or vandalism in the area	CRIME
No	1	Yes	1
Yes	2	No	2
Problems with the dwelling regarding leaking roof, damp ceilings, dampness	DAMP	<i>Geographic clusters</i>	
in the walls, floors or foundation or rot in window frames and doors		Area	AREA
Yes	1	Middle-southern regions	1
No	2	Northern regions	2

**Table 2** Partial Proportional Ordered Logit Estimates $\gamma =$  SEW (Ability to make ends meet: "With great difficulty" vs "With some difficulty" and "Easily")

	H0	H1	H2	H3	H4
	$\beta$ Coeff.	$\beta$ Coeff.	$\beta$ Coeff.	$\beta$ Coeff.	$\beta$ Coeff.
<i>Financial equilibrium (FE)</i>					
AUB (RG: Yes)	0.365***	0.559***	0.297**	0.345*	0.422***
FBHC (RG: A heavy burden)	1.623***	1.593***	1.643***	1.638***	1.603***
MMCF (RG: No)	0.480***	0.623***	0.435***	0.598*	0.793**
HOL (RG: No)	1.417***	1.386***	1.492***	1.276***	1.341***
CLOE (RG: Yes)	0.782***	0.920***	0.662***	0.835***	0.798***
HEALTH (RG: Yes)	0.568***	0.622***	0.625***	0.076	0.219
EDUE (RG: Yes)	0.066**	-0.053	-0.026	0.144	0.277**
TAXE (RG: Yes)	0.313***	0.239**	0.334***	0.488**	0.320**
LOAN (RG: Yes)	0.206***	0.312***	0.251	0.404***	0.274***
<i>Housing conditions (HC)</i>					
ROOMH	0.139***	0.117***	0.153***	0.193***	0.037
WARMH (RG: No)	0.462***	0.370***	0.423***	0.467*	0.899***
TSA (RG: Tenant)					
Owner	0.472***	0.515***	0.405***	0.667***	0.488***
Beneficial owner, Free Title	0.362***	0.377***	0.334***	0.604***	0.322**
DAMP (RG: Yes)	0.162***	0.154*	0.145**	0.166	0.240**
<i>Possession of durable goods (DUR)</i>					
VIDREC (RG: No)	0.198***	0.079	0.198***	0.235	0.073
INTER (RG: No)	0.073	0.144	0.003	0.331***	0.116
PARAB (RG: No)	0.303***	0.360***	0.262***	0.321***	0.319***
<i>Quality of the residence place (RP)</i>					
NOISE (RG: Yes)	0.079**	0.106	0.114	0.059	0.025
POL (RG: Yes)	0.038	0.009	0.096	0.115	0.109
CRIME (RG: Yes)	0.069	0.029	0.001***	0.348**	0.189
<i>Geographic clusters</i>					
AREA (RG: Middle-southern regions)	0.150***	0.064	0.130**	0.474***	0.158
<i>Socio-demographic aspects (SD)</i>					
WORK_S (RG: Unemployed)					
Employee	0.674***	0.776***	0.445**	0.956**	0.766***
Self-employed worker	1.055***	1.110***	0.856***	1.378***	1.091***
Retired	0.749***	0.757***	0.428**	1.087***	1.318***
Other	0.611***	0.589**	0.299	1.116***	0.893***
EDUL (RG: Elementary school leaving certificate)					
Lower secondary education certificate	0.0631	0.181*	0.066	0.981*	0.227
Secondary education certificate	0.080	0.136	0.002	1.013*	0.160
Degree	0.285***	0.361***	0.294***	1.146**	0.157
Master, PhD, etc	0.858***	0.925***	0.843***	1.682***	1.046**
GENDER (RG: Female)	-0.014	0.038	0.385	0.027	0.114
AGE (RG: < 35 years old)					
36-50 years old	-0.048	0.175*	0.063	0.075	0.175*
51-65 years old	0.151**	0.324***	0.209**	0.38**	0.302
> 65 years old	0.357***	0.518***	0.416***	0.377	0.415
Deviations from proportionality					
	$\gamma$ Coeff.	$\gamma$ Coeff.	$\gamma$ Coeff.	$\gamma$ Coeff.	$\gamma$ Coeff.
<i>Financial equilibrium (FE)</i>					
AUB (RG: Yes)	0.416**	-	0.644**	-	-
MMCF (RG: No)	-	-	-0.415**	-	-
HOL (RG: No)	0.217***	0.282**	-	0.626**	0.621***
HEALTH (RG: No)	-0.271**	-	-	-	-
EDUE (RG: Yes)	-	-0.229**	-	-	-0.479**
LOAN (RG: Yes)	0.193**	-	-	-	-
<i>Housing conditions (HC)</i>					
ROOMH	-	-	-	-	0.198***
<i>Possession of durable goods (DUR)</i>					
VIDREC (RG: No)	-0.138**	-	-	-	-
INTER (RG: No)	0.130**	-	0.243***	-	-
<i>Geographic clusters</i>					
AREA (RG: Middle-southern regions)	0.462***	0.398***	0.477***	-	0.696***
<i>Socio-demographic aspects (SD)</i>					
EDUL (RG: Elementary school leaving certificate)					
Degree	0.165***	-	0.368**	0.413**	-
Master, PhD, etc	0.363***	-	0.579**	0.579**	-
AGE (RG: < 35 years old)	-	-	-	-	-
36-50 years old	-	-	-	-0.435***	-
Pseudo R <sup>2</sup>	0.288	0.288	0.279	0.306	0.326

\*\*\* 1% significant; \*\* 5% significant; \* 10% significant.

RG: Reference Group; H0: All Households; H1: Households with only one component; H2: Households with no children; H3: Households with one child; H4: Households with two or more children.

**Table 3** Relationship between Level of SEW and Socio-demographic Variables

<i>Very Unsatisfying Level of SEW</i>				
	H1	H2	H3	H4
Work Status	U-shaped	U-shaped	U-shaped	U-shaped
Level of education	Descending Line	Descending Line	Descending Line	Descending Line
<i>Very Satisfying Level of SEW</i>				
	H1	H2	H3	H4
Work Status	Inverted U-shaped	Inverted U-shaped	Inverted U-shaped	Inverted U-shaped
Level of education	Ascending Line	Ascending line	Ascending line	Ascending line

H1: Households with only one component; H2: Households with no children; H3: Households with one child, H4: Households with two or more children.

**Table 4** Average Probability to be very satisfying among Low and High educational Status Groups

Household	Average Prob_VS	Low Education Status (LES)			High Education Status (HES)		
		Prob_LES	Absolute Income (€)	Relative Income	Prob_HES	Absolute Income	Relative Income
	<i>Col. 1</i>	<i>Col. 2</i>	<i>Col. 3</i>	<i>Col. 4</i>	<i>Col. 5</i>	<i>Col. 6</i>	<i>Col. 7</i>
H1	0,27	0,20	12.176,00	0,72	0,40	19.951,00	1,19
H2	0,30	0,24	15.600,00	0,93	0,44	24.348,00	1,45
H3	0,31	0,18	14.342,00	0,86	0,42	20.400,00	1,22
H4	0,25	0,14	11.567,00	0,69	0,34	18.083,00	1,08

*Relative Income* is the ratio of the household's absolute income to all households' mean absolute income.