

Abstract

In this paper, we use data for Spain from the Survey of Health, Ageing and Retirement in Europe (SHARE, release 2.3.1) to model the determinants of quality of life of the elderly, paying special attention to their intergenerational relations. We propose to study the CASP12 (a social functional index) and explore the effect of interdependency in terms of the transfers of the resources of time and money that the eldest do to and receive from other members of the family. To do so, we estimate a latent class model to explore the determinants of well-being. This allows us to distinguish the existence of two different subpopulations, whose quality of life is modelled in different ways and that potentially would require different types of public care policies.

JEL codes: D13, I3, J14.

The impact of different types of resource transfers on individual well-being: An analysis of quality of life using CASP12.*

Victoria Ateca-Amestoy[†] Arantza Ugidos[‡]

1 Introduction

Life expectancy has extended in European countries and the ageing process presents new needs for long-term care in order to guarantee the quality of life of an increasing group of the population. Some of those needs may be covered inside the family, but some of them should be considered by public institutions. Actually, any policy targeted at increasing the well-being of the eldest would have to take into account several special features of that age group. In this work, we explicitly account on two of them: the heterogeneity of the demographic group (defined as people 50+), and the relevance of interdependence between different generations of the family. The purpose of this paper is to determine the effect of familiar intergenerational transfers over the quality of life of old people. We will explore the characteristics of intergenerational transfers of time and money, as well as other determinants of quality of life, by using data for Spain derived from the *Survey of Health, Ageing, Retirement in Europe* (SHARE) for the year 2004.

Intergenerational transfers in the family are to be taken into account if we want to understand better the possibly distinct influences of publicly provided care and familiar care over quality of life. We need to take into account the relevance of social relations on well-being, specifically, of intrafamilial transfers of time and money in order to explain quality of life. Those transfers can either be studied by using an unidirectional approach (upstream, i.e. from children to parents, or downstream, i.e. from parents to children), or a bidirectional one (for instance, considering the net result of the transfers done in each direction),

*We would like to acknowledge the invaluable research assistance of Clara Velásquez and the financial support of Ministerio de Trabajo y Asuntos Sociales (IMSERSO) and Ministerio de Ciencia y Tecnología "SEJ 2006/10827", and the Basque Government "IT241-07". All errors are solely ours. This paper uses data from SHARE Wave 1 Release 2.0.1.

[†]Fundamentos del Análisis Económico II. University of the Basque Country. Avda. Lehendakari Aguirre, 83. 48015, Bilbao. victoriamaria.ateca@ehu.es.

[‡]Fundamentos del Análisis Económico II. University of the Basque Country. Avda. Lehendakari Aguirre, 83. 48015, Bilbao. arantza.ugidos@ehu.es.

which is the one that we model. Given that long term care expenditure is forecasted to increase dramatically (around 149% in Spain between 2000 and 2050 in some projections), intrafamilial-intergenerational transfers may have a great influence on public finances. There is no consensus to determine what quality of life consists on, as well as which are the determinants of high living standards. Actually, quality of life and well-being turn out to be complex concepts, built up upon several aspects of a very different nature. They incorporate objective and subjective aspects, as well as societal arrangements and individual characteristics. Researchers that have focused on the particular social group defined by the eldest, have highlighted the changing characteristics of the people included in the "third age" group.

We take benefit of the information recorded in the *Survey of Health, Ageing, Retirement in Europe* (SHARE), to undertake an analysis to describe the intrafamilial structures of transfers and the effect of interdependence on the quality of life of the elderly people. It seems to us a suitable tool, since the survey identifies determinants of well-being that are specific to this age group. We perform the analysis for the 2004 Spanish subsample of release 2.3.1 of the survey. We use a functional indicator of quality of life, the CASP-12, a self-reported index consisting on 12 Likert scale items. This measure has been theoretically developed in a moment in which "changing social, economic and demographic circumstances of people in early old age ... required a rethink of the concept of what is to be "old".[23]. We model the interdependency of our target group in terms of the transfers of the resources of time and money that the eldest do to and receive from other members of the family. In order to do so, we focus on the different time and money transfers that the individual receives from and provides to other members of the family. We propose the concept of a person that is "net donor" or "net recipient" of money transfers, based on the fact of giving more money than he/she receives or viceversa. For time transfers we consider four alternative situations that represent interdependence based on whether a person gives or does not give time to and receives or does not receive time from a member of the family. We study the influence of those intergenerational links on the quality of life of the seniors, as measured by the CASP-12 index,

The structure of the paper goes as follows, next section overviews recent research on elderly's quality of life and its determinants. Section 3 presents the dataset, as well as some descriptive statistics on our dependent variable and on the typology of intergenerational transfers that we use. Section 4 presents the estimation methods: ordered probit regression is taken as benchmark and the alternative of using a finite mixture model is discussed. The results of the estimation of the models is presented in section 5, and section 6 concludes.

2 Literature review and the alternative approaches to the measurement of well-being.

Economic literature has paid increasing attention to subjective well-being (or happiness, or life satisfaction), and has mostly used hedonic measures to characterize the determinant of individual quality of life (either by asking the subject to evaluate her life as a whole, or to evaluate some particular domain of her life). The fact that we can relate closely that approximation to welfare with the economic concept of utility explains partially this blooming literature. Many of those contributions have tried to explain the impact that several socioeconomic factors have over the individual life satisfaction, or over the satisfaction with some life "domain" or even some "subdomain" (financial satisfaction, job satisfaction, satisfaction with job flexibility, and so on). The big socioeconomic surveys on living conditions, such as the *European Community Household Panel* (ECHP), the *British Household Panel Survey* (BHPS), or the *German Socio-Economic Panel* (GSOEP), use hedonic measures to characterize individual quality of life.

Eudaemonic measures has been mostly used in other social disciplines. Eudaemonic well-being is typically measured by means of questions regarding autonomy, determination, interest and fulfillment sense. The sociological literature, for instance, assess that eudaemonic captures functional dimensions of welfare, so it plays a complement role -but different- with respect to the hedonic component of welfare (which is happiness or life satisfaction). The Round 3 of the *European Social Survey* included measures of how people feel (in terms of happiness, satisfaction, pleasure) and included measures of how well that people function [14].

When focusing into the social group that is the object of our analysis, Walter [21] proposes up to eight models of quality of life that he finds particularly suitable to explain the eldest's quality of life. These are the following: (1) objective social indicators on quality of life (mostly referred to income, health, mortality and morbidity); (2) human needs fulfillment (measured as individual subjective satisfaction with the degree of accomplishment of those needs); (3) subjective social indicators as life satisfaction, psychological well-being, and happiness; (4) Social capital in terms of personal resources, social networks, support, participation in activities, and integration in the community; (5) resources of the environment through crime incidence, public services...; (6) health and functionality, specially the physical ability or disability, or the wider approaches to health status; (7) psychological models of cognitive competence and autonomy, control and adaptation; and (8) hermeneutics approximations that highlight the values, the interpretation and perceptions of the individual.

One of the clear benefits of using the SHARE is that it makes available a wide battery of measurements of well-being that relies on many of those different perspectives and approximations. Some of those measures, such as the individual's self-reported health status, rely on directly measured individual as-

assessments and have already been widely used in the social sciences literature. However, some others are well-being measures that have been particularly developed for the eldest and that have to be constructed by means of synthetic indexes that get information from different questions of the survey. As indicated in Gwozdz and Sousa-Poza [12], we can consider broadly two families of domains and models of quality of life: subjective social indicators of life satisfaction and psychological well-being, and health and functioning models. Most of the discussion that follows presents the advantages of using that second type of measures, some of them not incorporated yet to the economic approximation of well-being.

We perform the analysis using an alternative measure to life satisfaction, by using the CASP-12 index, in an attempt to study the effect of the interdependency relationships over quality of life. Some of the previous studies have tried to explain the individual health status by using the subjective self-assessed health status of the individual as an approximation to his/her well-being, whereas some others have used subjective health status as one of the main predictors of quality of life. Gwozdz and Sousa-Poza [12] focus on the people over 75 and combine evidence from the GSOEP and from SHARE. They conclude that "objective" health status measures, such as objective impeding conditions, do not have a great impact on subjective well-being of that group of population, whereas "subjective" health condition, i.e. self-assessed, is significant in determining well-being. They provide several explanations for this puzzle, relying on previous gerontological findings: either (i) those objective health measures could only influence social participation with some lag, so they do not influence straightforward subjective well-being, or (ii) as a matter of low expectations for this age group, defined as the survivors of a group defined by high morbidity and dependency.

For some authors, such as Wiggins, [22], that variable has several drawbacks: since it is subjective and self-assessed, it can be, at most, considered a "proxy" for the real quality of life. The main argument relies on the impossibility of being at the same time both the explanation and the definition of quality of life. For those authors, CASP index has a solid theoretical construction and respects the property by which any measurement of quality of life must be clearly different from the factors that determine quality of life itself. In [22], the authors find out that good predictors of the quality of life of old people are: the quality and density of their social networks, the loss of dearest ones, the lack of retirement benefits that determine a bad financial situation, and living in a degraded neighborhood.

As a first approach, Knesebeck, Hyde, Higgs, Kupfer and Siegrist in [4], chose an eudaemonic index to model the quality of life of our focus group: the CASP-19. They assume that the degree in which each old person can fulfil his/her needs is a measure of his/her quality of life. By using the CASP-19, they take into account that it is specially relevant the degree of fulfilment in the following domains: control (i.e., the capability to have an active performance in the

environment), autonomy (i.e., the right to be free of non-desired interferences), self-fulfilment, and pleasure. Wiggins et al. [23] argue that CASP-19 is "well supported by a strong theoretical argument for the basis measuring quality of life in the context of ageing". SHARE proposes that those four domains should be treated equally (without hierarchies), the information is provided in order to build a reduced version of the index that accounts for 12 ordered variables. The CASP-12 index is therefore build using the information to 12 questions measured in Likert ascending scales, each of which measures the following theoretical dimensions of quality of life: control, autonomy, self-realization and pleasure. We will report below the values for each of the 4 theoretical dimensions of the CASP-12 in the sample that we are going to use for our analysis.

Some previous studies on quality of life have used data derived from the SHARE to construct the CASP index (Knesebeck et al. in [4]). Several geographical patterns have been described, determined by a North-South gradient. There are significant differences between the low levels of Mediterranean countries (Greece, Italy and Spain), and the higher levels recorded for Northern countries (Netherlands and Denmark, notably). That pattern also applies for the study of each of the four different dimensions that are measured in this index. According to those previous studies, although there are negligible and non significant gender differences, there are generational differences. Those differences between the quality of life of the younger and the eldest in this analysis are broader for European Southern countries. It means, thus, that the negative impact of age is more prevalent in Southern Europe, as it is in the case of Spain, as we will discuss in a while (both in the descriptive section, when we will present the distribution of CASP-12 in terms of age groups and in the results section as we will introduce age as an explanatory variable in the two estimated models).

Wahrendorf et al. [20], use the SHARE data to determine the positive effects of social productivity over the well-being of the eldest. Those authors define social productivity in terms of any activity previously agreed and continuous over the time that generate goods or services that are, either socially or economically, valuable to the recipients, even if they are not provided over a formal contract. They consider the relevance of time transfers, just as we do, but in a broader sense. Actually, they consider the possibility of transferring time by means of charity or volunteering activities. Thus, they consider up to 3 types of time-transfers involving activities: (1) voluntary of charity work, (2) care of ill or hampered adults and, (3) the provision of informal help to the family, friends or neighbors. To measure the well-being of the eldest, they use 2 indicators using the dataset: CASP-12 and CES-D. This last measure captures the depressive condition that reflects the reduction over emotional well-being. The authors use some other alternative measures to check the consistency of those measures (for instance, they use the self assessed health status). They do not only investigate the determinants of giving time transfers, since they control for those received by the eldest. The objective of their work is to test the hypothesis of the positive effect of "reciprocity" over well-being. This implies lower levels of well-being for

those people whose social interaction is determined by non-reciprocal exchange, with respect to the people that enjoys a more equilibrated situation between efforts and rewards. They conclude that the "quality" of the interchange is the key variable for well-being. In that way, the relationship between social productivity and well-being is modulated by the reciprocity of the interchange.

An alternative view on the relationship between social participation and health condition is researched in Sirven and Debrand [18]. They also use data derived from the SHARE and explore and quantify the positive contribution of high social participation in the self-reported health status measure. They also find evidence for the country gradient in the efficiency of the production of good health by using social capital as an input.

Also by using this same database, Von dem Knesebeck, Wahrendorf, Hyde and Siegrist [19] analyze the association between the quality of life of the European old people and a battery of socio-economic status indicators for different European countries. Their aim is to determine if the relative importance of socio-economic status changes with age. They study the correlation between this eudaemonic measure of interest, CASP-12, and five measures of relative position that determine socio-economic status: income, education, household tenure status, net wealth and ownership of a car. By multivariate analysis they estimate some models and conclude that even if there are positive correlations, the results vary by country. They also find that the impacts of those factors are different before and after retirement. Overall, the house tenure regime is the one with the less relationship with quality of life.

With English data from the English Longitudinal Study of Aging (ELSA), Nevuteli, Wiggings, Lidon, Montgomery and Blane [17] determine that quality of life is reduced by depression, by the perception of an ill financial situation, by limitations in mobility, in undertaking daily activities, and by impeding chronic diseases. On the other hand, quality of life increases with confidence relations in the family and friends network, with frequent contacts with friends, with living in a good neighborhood and with holding more material properties. They only find slight differences by age groups and by gender. Based on those results, they conclude that any policy aimed to increase the quality of life of the eldest should be targeted to alleviate financial difficulties and the limiting health conditions, and to improve the conditions of aged neighborhoods and to improve the density of the social relationships of the old people.

Another interesting source of information for the measurement and analysis of well-being is the Gallup World Poll, since it contains data for 132 countries. Deaton [9] uses data from the 2006 survey to analyze in a cross-country empirical exercise the relationship between financial situation, ageing, health and well-being (this last is measured as happiness or life satisfaction and as health satisfaction). Average happiness is related with national per-capita income. This effect holds for every society analyzed, and it is an interesting new finding. Improvements in life expectancy determine that a person has more probability of being happy, but the measure of life expectancy has no effect by itself. Age

does not determine a clear and common pattern around the world. For rich countries, it seems that the typical U shape fits; for the old subsamples, there is a positive relation between age and happiness reported. However, for poor countries, there seems to be evidence supporting the opposite.

There is enough evidence in the literature about intergenerational transfers of income and wealth (see [1], [2] and [16], for instance). Less attention has been paid to the transfer of time from one generation to another. Time transfers may have also a big impact over the well-being of the involved agents. They imply that some commodities can be produced inside the family, without having to buy some services in the market. For instance, some generations of European women take care of their grandchildren and/or their parents (for this last case, see for instance the analysis by Crespo and Mira [8]). Bonsang [3] considers the family as the traditional source of provision of care for the frail older individuals. This author states that informal intergenerational care will only lessen long-term expenditure if the informal care provided is an effective substitute for formal care. He concludes that it is indeed a substitute only if the needs of the elderly are low and require unskilled type of care.

Overall, we have found little pieces of research that have considered the effect of interdependence on the well-being of the oldest members of population. Even if Bonsang states that given that transfers between children and parents are important, and they should be considered when evaluating population welfare, very few studies have addressed that question. Katz [15], uses data for people 75+ in 5 countries to determine the effect of different family relations (solidarity, conflict and ambivalence) on three alternative measures of individual well-being (life satisfaction, positive affects and negative affects). This author finds a distinct impact over the three dependent variables, concluding the pertinence of using multiple measures for the outcome variable. All in all, among that scarce literature, there is a common assessment of two facts: (i) the need of longitudinal data in order to fully characterize the impact of any change on the interdependence variables over the evolution of the individual conditions (since by using cross-sectional data, only static situations can be evaluated), and (ii) the relevance of social participation on well-being.

3 Data description

We use data for Spain from the first release of the Survey of Health, Ageing and Retirement in Europe, SHARE, in its 2.3.1 version as coordinated by the Mannheim Research Institute for the Economics of Aging. It is a multidisciplinary dataset that provides detailed information on health conditions, socio-economic status and social and familiar networks of people that are above 50. These data were collected in 2004 for 11 countries.

The data include health variables (for instance, self assessed health status in the European version of the scale, as well as objective gerontological measures of health conditions), psychological variables (such as psychological health, life

satisfaction), economic variables (as labor status, characteristics of the job, job opportunities after retirement, sources and amount of current income, wealth and consumption), social variables (education and housing conditions) and social support variables (such as family support, transfers of income and assets, social networks, charity activities). As well as the variables directly recorded in the survey, the SHARE dataset includes the variables and indicators generated by AMANDA-IDT in the 5th F.P of the European Union. Those variables and indicators include recoded variables, as well as harmonizations (for instance, into EURO by using exchange rate and parities for the year 2004) that enable for international comparisons. All this information is provided under 19 modules. Some of those collect information of the household and of the family that is provided by the person of the family determined to be the reference person of the family. The target population of individuals is defined as "All individuals born in 1954 or earlier, speaking the official language of the country and not living abroad or in an institution such as a prison during the duration of the field work, and their spouses/partners independent of age"

3.1 CASP-12 and quality of life

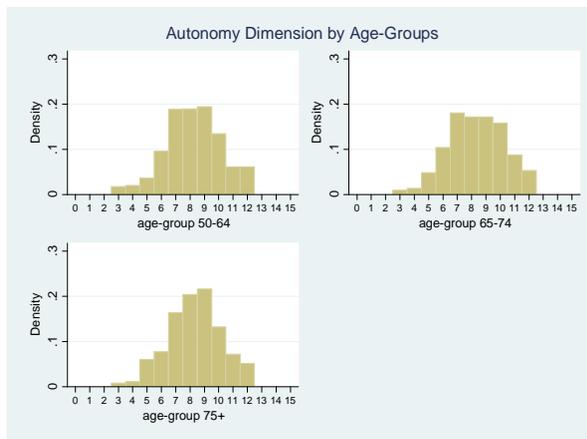
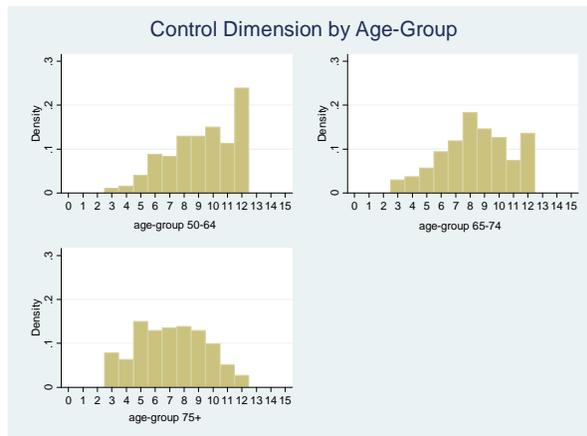
As we have indicated, there is not a clear consensus on the most suitable measure of well-being and of quality of life. SHARE contains several measures of this concept. For this work, we have chosen CASP-12. CASP-12 measures the degree in which the old person has his/her needs covered. This degree is measured over 4 dimensions: control, autonomy, self-realization and pleasure. For each of the dimensions, three questions are asked, and each of those 12 questions are responded by ascending 1 to 4 scales.¹ Thus, the total value of the indicator takes values on a range 12 to 48 points. A higher value is related to better quality of life. SHARE reports the values recorded for each of those dimensions [4].

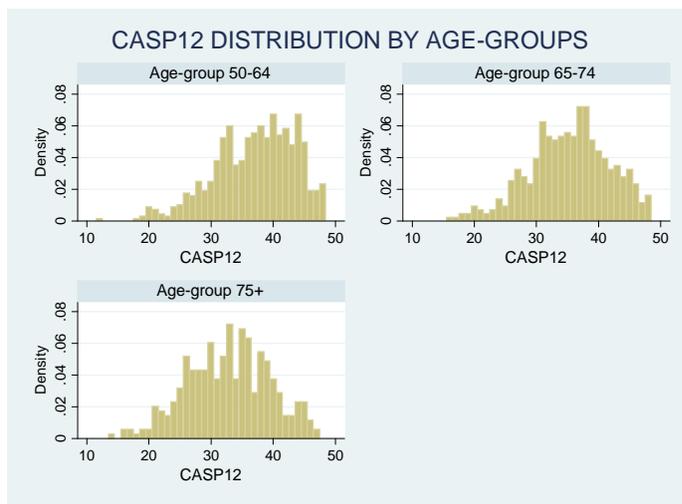
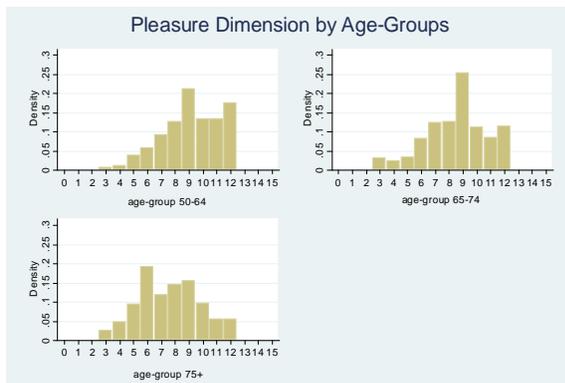
Average values by country goes from 33.32 in Greece, to 40.48 in Switzerland. The average score for the whole sample(all countries) is 37.37. In Spain, the average value is 35.57. Average values for Spain are lower in every dimension of the index than the average when the complete sample is considered. .

Quality of life by country. CASP-12 average values						
(standard error in brackets)						
Country	control	autonomy	self-realization	pleasure	CASP12	obs.
Spain	8,53 (2,49)	8,28 (1,94)	10,11 (2,01)	8,65 (2,26)	35,57 (6,70)	1.485
All countries	8,79 (2,16)	8,75 (1,89)	10,43 (1,78)	9,39 (2,15)	37,37 (6,10)	17.320
Source: SHARE 2004, Release 2.3.1						

¹The questions of each of the dimensions to build the CASP12 index are shown in the appendix 1.

Next we look at the distribution of each of the four theoretical dimensions of CASP12 and the overall CASP12 by age-group within spanish subsample. We consider three main age categories: 50-64, 65-74, and 75+. The first group contains individuals who may still be in the labor force; the second one could be labelled as the "early old", and the last one as the "oldest old" [12]. The next first 4 graphs represent the histograms for the scores obtained in control, autonomy, self-realization and pleasure. Since we have added the scores obtained in each of the 3 questions over each domain, the variables take values between 3 and 12 (lowest to higher). The last figure plots the histogram of the overall CASP12 score (taking values from 12 to 48).





3.2 Description of interdependence: time and money transfers

Since we are particularly interested in determining the effect of intrafamily transfers over the welfare of an individual, we consider that a person can be in seven different situations regarding either the transfer of time or money at an intrafamiliar level. All this information is transformed from the original database. We introduce the potential influence by means of a set of dummy variables.

Regarding time, it can be the case that the person neither transfers to nor receives from others time (NGNR variable), this will be a baseline category in our regressions. It can also be the case that this person do not transfer time to anyone, but he/she receives time help (NGYR). The opposite can happen, not receiving but giving time transfers (YGNR). And finally, it can be the case in which the person not only gives to but receives time from others (YGYR).

For money, the reference category for our analysis will be the person that neither gives money, nor receives it (NO variable). An alternative one captures the situation in which the old person gives more money that he/she receives (DONOR). The third category includes people that receive more money that what they get (RECIPIENT).

A description of the transfers regime for our Spanish subsample by agegroup is represented in the following tables.

		AGE GROUPS				
		50-64	65-74	75+	total raw %	N. Obs.
TIME	NGNR	24,15	12,53	10,55	47,22	1097
	NGYR	2,45	2,67	7,02	12,14	282
	YGNR	16,01	12,01	4,52	32,54	756
	YGYR	3,31	2,54	2,24	8,09	188
	total column %	45,93	29,75	24,32	100	2323
		AGE GROUPS				
		50-64	65-74	75+	total raw %	N. Obs.
MONEY	NO	37,84	26,09	21,48	85,41	1984
	DONOR	6,33	2,80	1,46	10,59	246
	RECIPIENT	1,76	0,86	1,33	3,96	92
	total column %	45,93	29,75	24,28	100	2322

Other explanatory variables are described in the following table. We consider gender, where 41.33% of the sample are men; the average age is 66.13 years (ranging from 50 to 99). We also control for the number of years of education (with an average duration of 6.55 years), the household income, whether the person is living with a partner (74.33% does) and the household size. Self reported health status has been criticized as a valid measure of the objective

health condition of the individual. We use instead one of the alternative measures, the Global Activity Limitation Indicator, GALI. This indicator makes reference to long-standing activity limitations (i.e., with a duration of at least 6 months), considers the presence of a general health problem (thus, including both physical and/ or mental health), it makes reference to activities people usually do and is not preceded by a screening question on health problems to avoid selection. 44.10% of the individuals have some limitation to undertake daily activities according to this measure.

VARIABLE	MEAN	SD	MIN	MAX
Male	41.33	.493	0	1
Age	66.13	10.379	50	99
Years of schooling	6.55	4.193	0	17
Household Income (log)	9.74	1.457	0	15.68
Living with a partner	74.33	.4317	0	1
Household Size	2.71	1.271	1	9
Limited with daily activities	44.10	.497	0	1

To account for possible institutional differences, we also control for the region of residence (NUTS1).²

4 Methods

CASP-12 is an ordered discrete variable, whose total value lies in a range from 12 to 48 points. As we have said, it is constructed such that a higher value is related to better quality of life. When interpreting the estimated coefficients, a positive sign will be identifying a positive partial effect over the dependent variable.

We will explore two distinct estimation methods: an ordered probit and a finite mixture regression model. The first one is the standard approach since the dependent variable is an ordered outcome and some of the previous results presented in section 2 rely on this type of empirical specification.³ The second approach, the finite mixture model, is a model that has been increasingly used in Health Economics because it allows the researcher to deal with the problem of unobserved heterogeneity in a quite easy way

As we have already mention, the demographic group we are studying is an increasing group and, as a consequence of this increment, one of its main

² Appendix 2 shows the definitions of the variables used.

³ Ordered regression models rely on the parrallel regression assumption.

characteristics is precisely the increasing heterogeneity within it and we, the researchers, do not have the complete information to control for this heterogeneity, so we face a potential problem of heavy unobserved heterogeneity. We deal with this problem assuming that there are a finite number of unobserved subpopulations, each of them with different behavior. We will try to capture in our estimations the existence of different subgroups, each of them having a different valuation function of their quality of life.

4.1 First estimation method: ordered probit models

The first estimation method that we choose is determined by the fact that our dependent variable, CASP12, is a discrete ordered variable. We use therefore an ordered probit model. We cannot observe the true value of the quality of life that a particular individual has reached under her surveyed conditions, which would depend on objective and personal characteristics, capturing the heterogeneity among the elderly. The researcher can observe some of these characteristics but others are completely unobservable, such as ambitions or aspiration levels. However we can get a measure of her subjective condition or of her valuation in each of the 4 theoretical dimensions of CASP12. This is done by asking individuals how they feel about several items included in those 4 dimensions of CASP12. We assume that such answers are meaningful and comparable between individuals, providing interesting and plausible results.

Let us assume that there exists a latent variable (quality of life, QOL) linear on the explanatory variables and on the error term, which is $\epsilon_i \sim N(0, 1)$. The real axis is split in 37 intervals, $(-\infty, \mu_1], \dots, (\mu_{36}, \infty)$, so $CASP12 = k$ if the latent variable is such that $QOL \in (\mu_k, \mu_{k+1}]$. When crossing a threshold level μ_k , the observed category of CASP12 changes. In this way, the relation between the surveyed variable and the latent one is determined by

$$CASP12_i = \begin{cases} 1 \text{ (lowest qol) if } -\infty < QOL_i < \mu_1 \\ 2 \text{ (second lowest qol) if } \mu_1 < QOL_i < \mu_2 \\ 3 \text{ (third lowest qol) if } \mu_2 < QOL_i < \mu_3 \\ \dots\dots \\ 37 \text{ (highest qol) if } \mu_{36} < QOL_i < \infty \end{cases}$$

Since ϵ follows a normal distribution, we get the following probabilities

$$\begin{cases} \Pr(CASP_i = 1) = \Phi(\mu_1 - \beta X) \\ \Pr(CASP_i = 2) = \Phi(\mu_2 - \beta X) - \Phi(\mu_1 - \beta X) \\ \Pr(CASP_i = 3) = \Phi(\mu_3 - \beta X) - \Phi(\mu_2 - \beta X) \\ \dots\dots \\ \Pr(CASP_i = 37) = 1 - \Phi(\mu_{36} - \beta X) \end{cases}$$

Alternatively, given the 37 alternative values that the CASP-12 can take, we propose a second method of estimation in order to be able to account for the potential unobserved heterogeneity among the elderly. We present this alternative method, of estimation, the finite mixture model, in the next section.

4.2 Second estimation method: finite mixture model

One of the assumptions underlying the ordinal probit estimation method is that all the elderly belong to a homogenous population. Thus, since all individuals come from the same population, we assume a common residual error. However, the increase in the life expectancy has contributed to have a much more heterogeneous group of elderly. Many people of this demographic group enjoy a reasonable good health status (both physical and psychological), and are active transferrers of time and money to other members of their families. Many others suffer severe health conditions and are net demanders of special care. This means that we may be facing two or more behaviorally different subgroups of elderly. Our research investigates this possibility by extending the standard ordered model to include a finite mixture of distributions of reported CASP-12 outcomes. We study the quality of life of the elderly having into account this potential significant heterogeneity in their underlying behavior and allowing for the existence of two or more kinds of elderly.

Finite Mixture Models (FMM) allow people's underlying behavior be different, in the sense that there is a mixing process that determines that the observed behavior is determined by the existence of a finite number of distinct but homogenous subpopulations. In this way, we let the effect of the explanatory variables differ for each of the empirically optimally determined number of subgroups, which may be regarded as a type. Both the determinants of belonging to one class or another (that determine the probability of being characterized as a type), as well as the corresponding behavioral models are estimated simultaneously.

Research on health economics has benefited from the use of this estimation methods.[6] One of the best examples of this approach to the study of the determinants of subjective well-being is the study of financial satisfaction in the paper of Clark *et. al* [5]. Evidence shows that the FMM has superior ability to predict the actual distributions of the endogenous variable.

FMM allows the researcher to use the whole sample to study the determinants of quality of life, taking into account the unobserved heterogeneity among the eldest dividing the sample among two or more types of respondents. Actually, each observation may have a non-zero probability of belonging to each of the classes, so all the observations are used to estimate the FMM model. This is done by distinguishing between distinct classes of individuals (reporters): taking into account different behavior underlying their reported quality of life measure (heterogeneity). Our results will allow us to see whether the CASP-12 outcomes (reported quality of life) can be differentiated in such a way and, if so, whether intergenerational time and money transfers and other factors have differing effects on them. Actually, our estimates show the existence of two statistically different subgroups of elderly.

5 Results

Our dependent variable is CASP-12, an ordered categorical variable which can take values from 12 to 48. The higher the value the better quality of life. Therefore, positive estimated coefficients are interpreted as the corresponding variable affecting positively to the quality of life of the elderly. Our reference group is a woman who does not give nor receive neither time transfers nor money transfers, is retired, with no partner and living in the south of Spain.

We start using one of the standard estimation methods prescribed when the dependent variable is an ordered categorical variable, we estimate an **ordered probit model**. The results are shown in the first two columns of the table below. According to our results, there are not significant differences by gender. Age has a negative, monotonic and significant negative effect. The years of education have a significant positive effect. Significant differences by labor market status are found, being employed individuals more likely to report higher quality of life than those retired; whereas those unemployed, permanently sick or disabled and housewives have higher probability of being worse off.

Household income has a positive and significant effect, but money transfers have not a significant effect on the reported quality of life. However, time transfers do have a significant effect. *Ceteris paribus*, those who do not give nor receive time transfers enjoy a better quality of life than those who receive but do not give and than those who give but do not receive. There are no significant differences among those who do not give and do not receive and those who give and receive time transfers. These last results may be suggesting that reciprocity is an important determinant of quality of life.

We find significant differences by region of residence. Those living in the northeast (País Vasco, Navarra, La Rioja and Aragón) report a significantly better quality of life than those living in the south (Andalucía, Murcia, Ceuta and Melilla). On the contrary, those living in the Center Region (Castilla y León, Castilla-La Mancha y Extremadura) report a significantly lower quality of life.

Before presenting the results of the **FMM**, we would like to recall that we have jointly estimated a mixing probability equation (ruled by a logit process) and two behavioral equations (each of the process is estimated by OLS).⁴ Our finite mixture model therefore yields two sets of coefficient estimates that characterize two types: one that corresponds to subgroup 1, and one to subgroup 2. It also yields an estimated probability of belonging to subgroup 1 (the proportion of the population classified in the first type is 61%). We propose to parameterize the mixing probability as a function of three observables: age, sex and GALI. However, only this last variable turn out to be statistically significant in the determination of the finite typology. Both age and sex have a non statistically effect on the determination of the probabilities of the types. This

⁴Given that FMM estimates the behavioral equations by OLS, we also present the results of estimating the model by OLS without controlling by unobserved heterogeneity.

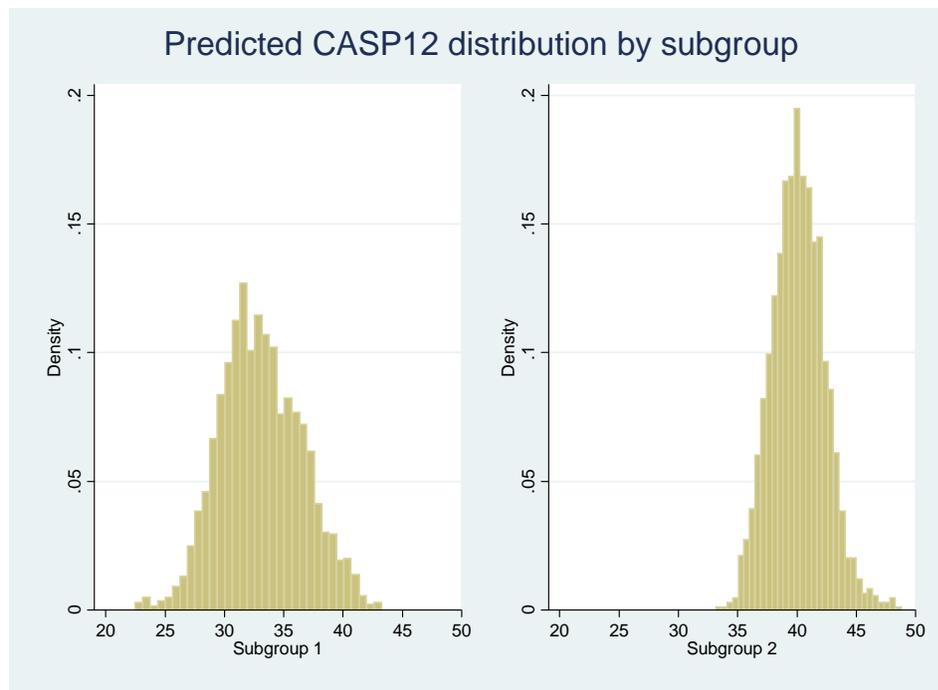
finding has, at least, the following implication: Most of the policy measures targeted to ensuring the quality of life of old people rely on some age criterion (being above some threshold). However, our results seem to suggest that this age variable is not relevant on the determination of the type of the individual. Rather, it is the existence or not of limitations in the development of daily activities, the observed variable that classifies individuals into each of the types. We control for age given that the distribution of the values of CASP-12 index and the scores of each of the 4 dimensions measured in the index seem to be dependent on age.

Looking at the estimated effect of our explanatory variables we see significant differences by subgroup. In fact, the majority of the characteristics found to affect reported quality of life in the ordered probit model (labor market status and income) affect primarily the reported quality of life of subgroup 1. Living with a partner, however, only affects the quality of life of subgroup 2, and does so positively. Education increases quality of life on the two subgroups and the effect seems to be more intense in the first group. Time transfers have a negative effect over quality of life only for the first type: receiving time transfers (in the form of help) have a negative effect, no matter if the individual also gives help (-1.615 negative coefficient, smaller intensity) or if the individual does not transfer time (negative and greater intensity -2.979)

Region of residence has a significant effect on the two subgroups, probably due to the fact that institutional arrangements and publicly provided care have a distinct effect depending on the type of the individual. For both subgroups, those elderly living in the northeast region of Spain (País Vasco, Navarra, La Rioja and Aragón) report a significant higher quality of life than the others. For subgroup 2, those elderly living in the Center or in the east regions (Castilla - La Mancha, Castilla-León, Extremadura, Cataluña, Comunidad Valenciana and Islas Baleares) are worse off.

Estimation Results: CASP12	Ordered Probit		OLS		Finite Mixture Model					
					Subgroup1		Subgroup 2		Mixing probabilities equation	
	coef	se	coef	se	coef	se	coef	se	coef	se
Male	0,084	0,077	0,546	0,449	0,250	0,896	-0,584	0,803	-0,602	0,509
Age	-0,016***	0,004	-0,093***	0,025	-0,045	0,034	-0,048	0,042	0,018	0,016
Education	0,036***	0,008	0,193***	0,048	0,146**	0,074	0,144**	0,061		
Employed	0,197*	0,104	1,222**	0,592	2,119*	1,087	-0,080	0,979		
Unemployed	-0,352**	0,159	-1,901**	0,963	-1,758	1,222	-1,837	1,348		
Disabled	-0,724***	0,176	-4,493***	1,048	-3,391***	1,061	4,523*	2,381		
Housework	-0,205**	0,092	-1,220**	0,551	-1,674**	0,709	-0,015	0,948		
Household income	0,057***	0,021	0,312**	0,125	0,676***	0,225	0,184	0,151		
Living with partner	0,123	0,075	0,726	0,443	-0,218	0,632	1,769**	0,820		
Household size	-0,007	0,024	-0,022	0,143	0,296	0,220	-0,257	0,246		
Net money giver	0,153	0,095	0,701	0,527	0,540	0,790	0,874	0,820		
Net money receiver	0,037	0,159	0,048	0,909	1,163	1,486	-1,889	2,309		
NGYR	-0,479***	0,111	-2,956***	0,668	-2,979***	0,706	1,754	1,715		
YGNR	-0,116*	0,066	-0,664*	0,386	-0,772	0,587	-0,435	0,586		
YGYR	-0,157	0,118	-0,964	0,671	-1,615*	0,932	-0,390	0,926		
Northwest	-0,162	0,113	-0,850	0,663	-0,964	0,831	-0,212	1,064		
Northeast	0,543***	0,108	3,071***	0,591	3,763***	0,847	1,477*	0,761		
Madrid	0,182	0,113	1,303**	0,635	2,568**	1,203	-1,506	1,083		
Center	-0,264**	0,112	-1,377**	0,677	-1,364	1,021	-3,036***	0,739		
East	-0,081	0,079	-0,223	0,467	1,220*	0,722	-2,678***	0,635		
Canary Islands	-0,057	0,161	-0,403	0,861	1,571	1,779	-1,995	4,422		
Limitations with daily									3,179***	0,740
Constant			25,636***	2,388	16,029***	3,791	29,238***	3,706	-1,570	1,059
R ²			0,238							
/Insigma1					1,709***	0,041				
/Insigma2					1,267***	0,074				
note: *** p<0.01, ** p<0.05, * p<0.1										

Our model predicts the following distribution of the CASP-12 scores across types.



Once that we have jointly estimated the types and the behavioral equation, we would like to know more about the composition of each of the types for which we have characterized the determinants of their quality of life. For a more detailed description of the estimated types, we will discuss the results that are summarized in the table below.

Descriptive statistics by subgroup of population	Subgroup 1		Subgroup2	
	mean	s.d.	mean	s.d.
CASP12	31,91	6,11	40,36	3,90
Male	0,37	0,48	0,56	0,50
Age	68,13	10,93	62,51	9,73
Education	5,87	4,05	7,84	4,27
NGNR	0,44	0,50	0,54	0,50
NGYR	0,17	0,37	0,04	0,20
YGNR	0,30	0,46	0,34	0,47
YGYR	0,08	0,28	0,08	0,27
NGNR money	0,84	0,37	0,84	0,36
Net money giver	0,11	0,31	0,13	0,33
Net money receiver	0,05	0,22	0,03	0,18
Retired	0,39	0,49	0,32	0,47
Employed	0,12	0,33	0,39	0,49
Unemployed	0,04	0,19	0,04	0,19
Disabled	0,08	0,26	0,01	0,09
Housework	0,37	0,48	0,24	0,43
Household income	9,61	1,25	9,76	1,73
Living with partner	0,61	0,49	0,69	0,46
Household size	2,50	1,27	2,62	1,33
Northwest	0,12	0,32	0,11	0,31
Northeast	0,12	0,33	0,13	0,34
Madrid	0,05	0,23	0,10	0,30
Center	0,10	0,30	0,13	0,34
East	0,25	0,43	0,26	0,44
South	0,30	0,46	0,24	0,43
Canary Islands	0,05	0,22	0,03	0,18
Limitations with daily activities	0,75	0,43	0,02	0,14
N. Observations	810		616	

Our results suggest that in our sample of elderly we have two different subgroups, subgroup 1 and subgroup 2. The average reported quality of life of subgroup 1 is 31.91, about 8 points (in a range from 12 to 48) lower than the average reported by subgroup 2 (40.36). This finding is quite consistent with the type of elderly that are assigned to each subgroup.

Elderly in subgroup 1 are quite limited for daily activities. 75% of them have some limitation to undertake daily activities, while only 2% of the elderly in subgroup 2 have some limitations to undertake daily activities. Elderly in subgroup 1 are 6 years older, on average, than elderly in subgroup 2 (68 years old vs. 62), are mainly women (63% of them are women), 25% of them receive time transfers compared to 12% in subgroup 2. With respect to the labor market status the main difference is that in subgroup 2 39% of the elderly are working while in subgroup 1 this figure goes down to 12%. The percentage of people in subgroup 1 that receives time transfers but do not give is more than four times higher than the percentage in subgroup 2.

Our results suggest the the main variable in classifying people into subgroup 1 and subgroup 2 is the variable that describes their limitatios with daily activities.

6 Overall conclusions.

In this paper we have undertook an analysis of the effect of different transfer regimes over the quality of life of the Spanish subsample of 50+ contained in the first wave of the SHARE study. We have characterized an individual in terms of the situation of interdependence from other generations of the same family. In this sense, we have provided a classification in 4 categories regarding time transfers (helps from and to outside the household) and 3 for money transfers. We use a functional indicator of quality of life, CASP12, and we propose two alternative estimation methods: the first one is the traditional ordered approximation and the second one allows for high unobserved heterogeneity and tries to capture the underlying behavior of a finite number of distinct subpopulations

Our results suggest that in our sample of elderly we have two different subgroups, subgroup 1 and subgroup 2. Elderly in subgroup 1 are quite limited for daily activities, are 6 years older, on average, that elderly in subgroup 2, are mainly women (63% of them are women), only 12% are working and the percentage of people in subgroup 1 that receives time transfers but do not give is more than four times higher than the percentage in subgroup 2.

With respect to the main determinants of their quality of life, we find that, independent of the subgroup, neither gender nor age have a significant effect on the elderly's quality of life. Education, however, have a significant positive in both subgroups.

Focusing now in subgroup 1 we find significant differences by labor market status. Employed individuals more likely to report higher quality of life than those retired; whereas those unemployed, permanently sick or disabled and housewives have higher probability of being worse off. Household income has a positive and significant effect, but money transfers have not a significant effect on the reported quality of life. However, time transfers do have a significant effect. *Ceteris paribus*, those who do not give not receive time transfers enjoy a better quality of life than those who receive but do not give and than those who give but do not receive. There are no significant differences among those who do not give and do not receive and those who give and receive time transfers. These last results may be suggesting that reciprocity is an important determinant of quality of life. We find significant differences by region of residence. Those living in the northeast (País Vasco, Navarra, La Rioja and Aragón) and Madrid report a significantly better quality of life than those living in the south (Andalucía, Murcia, Ceuta and Melilla).

The determinants of the quality of life of elderly of subgroup 2 are education, living with a partner and the region of residence. Education and living with a partner have a significant positive effect on the quality of life of this subgroup. Neither time transfers nor money transfers have a significant effect. Region of residence is also important but for these subgroup living in the east and the center regions (Cataluña, Comunidad Valenciana, Islas Baleares, Castilla y León, Castilla-La Mancha and Extremadura) lower quality of life relative to those living in the south. It is likely that institutional arrangements and publicly provided care have a distinct effect depending on the type of the individual.

We find that both age and sex have a non statistically effect on the probability of belonging to either subgroup 1 or subgroup 2. The main variable in classifying people into subgroup 1 and subgroup 2 is the variable that describes their limitations with daily activities. This finding may suggest that policies oriented to improve the quality of life of individuals older than 50 years should not be based on age but on the existence or not of limitations in the development of daily activities.

7 References

References

- [1] Arrondel L. and A. Masson (2001). Family Transfers Involving Three Generations. *Scandinavian Journal of Economics*, 103, 415-443.
- [2] Arrondel L. and A. Masson (2002). Altruism, Exchange or indirect Reciprocity: What do the Data on Family Transfers Show?. *DELTA WP 2002-18*.
- [3] Bonsang, E. (2009). Does informal care from children to their elderly parents substitute for formal care in Europe?. *Journal of Health Economics*, 28, 143-154.
- [4] Börsch-Supan A., Brugiavini A., Jürges H., Mackenbach J., Siegrist J. and G. Weber (2005). *Health, Ageing and Retirement in Europe First Results from the Survey of Health, Ageing and Retirement in Europe*. Mannheim Research Institute for the Economics of Aging.
- [5] Clark, A. , Senik, C., Etilé, F., Van der Straeten, K., Postel-Vinay, F (2005). Heterogeneity in Reported Well-Being: Evidence from Twelve European Countries. *The Economic Journal* ,115 (502), 118-132.
- [6] Conway, K.S. and Deb, P. (2005). Is prenatal care really ineffective? Or, is the "devil" in the distribution?. *Journal of Health Economics*, 24, 489-513.

- [7] Cox, D. and G. Jakubson (1995). The connection between public transfers and private interfamily transfers. *Journal of Public Economics*, 57, 129-67.
- [8] Crespo, L. and P. Mira (2008). Caring for Parents and Employment Status of European Mid-life women. In Börsch-Supan, A., A. Brugiavini, H. Jürges, A. Kapteyn, J. Mackenbach, J. Siegrist, and G. Weber (eds.), *Health, Ageing and Retirement in Europe (2004-2007). Starting the Longitudinal Dimension*, Mannheim: Mannheim Research Institute for the Economics of Aging (MEA).
- [9] Deaton, A. (2007). Income, Aging, Health and Wellbeing Around the World: Evidence from the Gallup World Poll. *NBER Working Paper No. 13317*.
- [10] Esping-Andersen, G. (2003). A welfare state for the 21st century. In *The Global Third Way Debate*, ed. A. Giddens, 134-56, Polity: Oxford.
- [11] Fagerström, C., Borg, C., Balducci, C., Burholt, V., Wenger, C.G., Ferring, D., Weber, G., Holst, G., and I. R. Hallberg (2007). Life Satisfaction and Associated Factors Among People Aged 60 Years and Above in Six European Countries. *Applied Research in Quality of Life*, 2 (1), 33-50.
- [12] Gwozdz, W. and A. Sousa-Poza (2009). Ageing, Health and Life Satisfaction of the Oldest Old: An Analysis for Germany. *IZA DP No 4053*.
- [13] Hyde, M, Wiggins, R.D., Blane, D. and P. Higgs (2003). A measure of quality of life in early old age: The theory, development and properties of a needs satisfaction model. *Ageing and Mental Health* 7, 86-94.
- [14] Huppert, F.A., Marks, N., Clark, A., Siegrist, J., Stutzer, A., Vitterso, J. and M. Wahrendorf (2009). Measuring Well-being Across Europe: Description of the ESS Well-being Module and Preliminary Findings. *Social Indicators Research*, 91, 301-315
- [15] Katz, R. (2009). Intergenerational family relations and subjective well-being in old age: a cross-national study. *European Journal of Ageing*, 6 (2), 79-90.
- [16] Laferrère, A. and F.C. Wolf (2005). Microeconomic models of family transfers. *Handbook on the Economics on Giving, Reciprocity and Altruism*, eds. Kolm, S.C. and J. Mercier-Ytier. North-Holland.
- [17] Nevuteli, G., Wiggins, R.D. Hildon Z. Montgomey, S.M. and D. Blane (2006). Quality of life at older ages evidence from the English longitudinal study of aging (wave 1. *Journal of Epidemiology and Community Health*, 60, 357-363.
- [18] Sirven, N. and T. Debrand (2008). Social participation and healthy ageing: An international comparison using SHARE data. *Social Science and Medicine*, 67, 2017-2026.

- [19] Von dem Knesebeck, O., Wahrendorf, M. Hyde, M. and J. Siegrist (2007). Socio-economic position and quality of life among older people in 10 European countries: results of the SHARE study. *Ageing & Society*, 27, 269-284.
- [20] Wahrendorf, M., Von dem Knesebeck, O. and J. Siegrist (2006). Social Productivity and well-being of older people: baseline results from the SHARE study. *European Journal of Ageing*, 3, 67-73.
- [21] Walter, A. (2005). A European perspective on quality of life in old age. *European Journal of Ageing*, 2, 2-12.
- [22] Wiggis, R.D., Higgs, P.F.D., Hyde, M. and D.B. Blane (2004). Quality of life in the third age: key predictors of the CASP-19 measure. *Ageing & Society*, 24, 693-708.
- [23] Wiggis, R.D., Netuveli, G., Hyde, M., Higgs, P. and D.B. Blane (2008). The Evaluation of a Self-enumerated Scale of Quality of Life (CASP-19) in the Context of Research on Ageing: A Combination of Exploratory and Confirmatory Approaches. *Social Indicators Research*, 89, 61-77.

Appendix 1

CASP12. is a measure of how well people function. In this measure, quality of life refers to four conceptual domains of individual needs that are particularly relevant in early old age: control (C), autonomy (A), self realization (S), and pleasure (P). Items measuring the four respective domains (3 items per domain) assess the degree to which these aspects are perceived as being satisfied on a four-point Likert scale. Therefore the total value of the CASP12 indicator can take 37 different values ranging from 12 to 48. The first letter of each domain and its 12 items create the acronym. The wording in the questionnaire is the following:

2. Here is a list of statements that people have used to describe their lives or how they feel. We would like to know how often, if at all, you think this applies to you.

(Please tick one box in each row)

	Often ₁	Sometimes ₁	Rarely ₁	Never ₁
	▼ ₁	▼ ₁	▼ ₁	▼ ₁
a) My age prevents me from doing the things I would like to	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) I feel that what happens to me is out of my control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) I feel left out of things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) I can do the things that I want to do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Family responsibilities prevent me from doing what I want to do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Shortage of money stops me from doing the things I want to do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) I look forward to each day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) I feel that my life has meaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) On balance, I look back on my life with a sense of happiness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) I feel full of energy these days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k) I feel that life is full of opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l) I feel that the future looks good for me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	▲ ₁	▲ ₁	▲ ₁	▲ ₁
	Often ₁	Sometimes ₁	Rarely ₁	Never ₁

Appendix 2

The variables we use are defined in the following table:

Variables definitions	
Gender	gender = 1 if male
Age	years of age when interviewed
Education	years of education
NGNR	Takes value 1 if the individual neither gives nor receives time, 0 otherwise
NGYR	Takes value 1 if the individual does not give but does receive time, 0 otherwise
YGNR	Takes value 1 if the individual does give but does not receive time, 0 otherwise
YGYR	Takes value 1 if the individual gives and receives time, 0 otherwise
NGNR money	Takes value 1 if the individual neither gives nor receives money, 0 otherwise
Net money giver	Takes value 1 if the individual gives more money than he/she receives, 0 otherwise
Net money receiver	Takes value 1 if the individual receives more money than he/she gives, 0 otherwise
Retired	retired=1 if individual is retired, 0 otherwise
Employed	employed=1 if individual is working, 0 otherwise
Unemployed	unemployed =1 if individual is unemployed, 0 otherwise
Disabled	disabled =1 if individual is disabled, 0 otherwise
Housewife	housewife = 1 if individual is engaged in household chores, 0 otherwise
Household income (loginh)	It is defined as the logarithm of annual gross household income
Living with a partner	takes value 1 if the individual lives with his partner, 0 otherwise
Household size	Number of members living in the household
Northwest	Takes value 1 if the individual lives in Galicia, Asturias or Cantabria, 0 otherwise
Northeast	Takes value 1 if the individual lives in Pais Vasco, Navarra, La Rioja or Aragon, 0 otherwise
Madrid	Takes value 1 if the individual lives in Madrid, 0 otherwise
Center	Takes value 1 if the individual lives in Castilla-La Mancha, Castilla-León y Extremadura, 0 otherwise
East	Takes value 1 if the individual lives in Cataluña, Comunidad Valenciana or Islas Baleares, 0 otherwise
Canary Islands	Takes value 1 if the individual lives in Canary Islands, 0 otherwise
South	Takes value 1 if the individual lives in Andalucía, Murcia, Ceuta or Melilla, 0 otherwise
GALI	Takes value 1 if the individual has some limitation with daily activities