Soc Indic Res (2013) 110:973–991
DOI 10.1007/s11205-011-9968-5

The Impact of Different Types of Resource Transfers on Individual Wellbeing: An Analysis of Quality of Life Using CASP-12

Victoria Ateca-Amestoy · Arantza Ugidos

Accepted: 16 June 2011 / Published online: 7 December 2011

Abstract This paper uses data for Spain from the Survey of Health, Ageing and Retirement in Europe (release 2.3.1) to model the determinants of the quality of life of the elderly, paying special attention to their intergenerational relations. The aim is to study CASP-12 (a social functional index) and explore the effect of interdependency in terms of the transfer of the resources of time and money between the elderly and other family members. To do so, we estimate a latent class model to explore the determinants of wellbeing. This allows us to distinguish between two different subpopulations, whose quality of life is modeled in different ways and who potentially would require different types of public care policies.

Keywords Survey of Health, Ageing and Retirement in Europe (SHARE) · CASP-12 · Ageing · Interdependency · Latent class models

1 Introduction

Life expectancy has lengthened in European countries and the ageing process presents new needs for long-term care in order to guarantee the quality of life of an increasingly large segment of the population. Some of those needs may be catered for within the family, but some of them should be considered by public institutions. Today, any policy designed to increase the wellbeing of the elderly needs to consider several specific features of that age group. In this work, we explicitly focus on two of them: the heterogeneity of the demographic group (defined as those aged 50+), and the significance of the interdependence between different family generations. The purpose of this paper is to determine the effect intergenerational transfers between family members has on the quality of life of old people. We will explore the characteristics of these transfers involving time and money, as well as

V. Ateca-Amestoy · A. Ugidos (✉)
Fundamentos del Análisis Económico II, University of the Basque Country, Avda. Lehendakari Aguirre, 83, 48015 Bilbao, Spain
e-mail: arantza.ugidos@ehu.es

V. Ateca-Amestoy
e-mail: victoriamaria.ateca@ehu.es

other determinants of quality of life, by using data for Spain taken from the Survey of Health, Ageing and Retirement in Europe (SHARE) for 2004.

Intergenerational transfers within the family are to be considered if we seek to improve our understanding of the potentially different influences on quality of life of publicly provided care and family care. We need to take into account the relevance of social relations to wellbeing, specifically, of intra-family transfers of time and money in order to explain quality of life. Those transfers can either be studied by using a 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), which is the one that we model. Given that the cost of long-term care is expected to increase dramatically (around 149% in Spain between 2000 and 2050 in some projections), intra-family and intergenerational transfers may have a major impact on public finances. There is no consensus on the definition of quality of life, nor on the determinants of a high standard of living. Indeed, quality of life and wellbeing are complex concepts, built upon several aspects of a very different nature. They incorporate objective and subjective aspects, as well as social arrangements and individual characteristics. Researchers focusing on the particular social group comprising the elderly have highlighted the changing characteristics of the people included in the "senior" group.

We have used the information recorded in the SHARE, to describe the intra-family structure of transfers and the effect of interdependence on the quality of life of the elderly people. It appears to be a suitable tool, since the survey identifies determinants of wellbeing that are specific to this age group. We conduct the analysis for the 2004 Spanish subsample in release 2.3.1 of the survey. We use a functional indicator of quality of life, the CASP-12, which is a self-report index consisting of 12 Likert scale items. This measure has been theoretically developed at a time when "changing social, economic and demographic circumstances of people in early old age… required a rethink of the concept of what is to be "old" (Wiggis et al. 2008)". We model the interdependency of our target group in terms of the transfer of the resources of time and money between the elderly and other family members. In order to do so, we focus on the different time and money transfers an individual receives from and gives to other members of the family. We propose the concept of a person as a "net donor" or "net recipient" of money transfers, based on the money the person gives or receives. For time transfers we consider four alternative situations that represent interdependence based on whether a person does or does not give or receive time regarding another member of the family. We study the influence those intergenerational interactions have on the quality of life of the elderly, as measured by the CASP-12 index.

The structure of the paper is as follows: the next section provides an overview of recent research on the quality of life of the elderly and its determinants. Section 3 presents the dataset, as well as certain 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 the benchmark and the option of using a finite mixture model (FMM) is discussed. The results of the models' estimation are presented in Sect. 5, and Sect. 6 concludes.

2 Literature Review and the Alternative Approaches to the Measurement of Well-Being

The literature on economics has paid increasing attention to subjective wellbeing (or happiness, or life satisfaction), and has used mostly hedonic measures to characterize the

determinants of individual quality of life (either by asking individuals to assess their life as a whole, or evaluate some particular area of their lives). The fact that we can closely relate that approach to welfare with the economic concept of utility partially explains this burgeoning literature. Many of those contributions have sought to explain the impact several socioeconomic factors have on individual satisfaction with life, or on one or other life "domain" or even some "subdomain" (financial satisfaction, job satisfaction, satisfaction with job flexibility, and so on). The major 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.

Eudemonic measures have been used mostly in other social disciplines. Eudemonic wellbeing is typically measured by means of questions regarding autonomy, determination, interest and sense of fulfilment. Sociology literature, for instance, posits that eudemonia captures the functional dimensions of welfare, so it plays a complementary—albeit different—role regarding the hedonic component of welfare (i.e. happiness or life satisfaction). Round 3 of the *European Social Survey* included measures of how people feel (in terms of happiness, satisfaction and pleasure) and included measures of how well people perform (Huppert et al. 2009).

When focusing on the social group that is the object of our analysis, Walter (2005) proposes up to eight models of quality of life that he finds particularly suitable for explaining quality of life amongst the elderly. These are the following: (1) objective social indicators on quality of life (mostly referred to income, health, mortality and morbidity); (2) human needs fulfilment (measured as individual subjective satisfaction with the degree of accomplishment of those needs); (3) subjective social indicators such as satisfaction with life, psychological wellbeing, and happiness; (4) Social capital in terms of personal resources, social networks, support, participation in activities, and integration in the community; (5) resources in the environment regarding the crime rate; (6) health and functionality, especially 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 approaches that highlight the individuals' values, interpretation and perceptions.

One of the clear benefits of using the SHARE is that it provides a wide range of measurements of wellbeing that relies on many of those different perspectives and approaches. Some of those measures, such as the individual's self-reported health status, rely on directly measured individual assessments and have already been widely used in the social sciences literature. However, others are wellbeing measures that have been particularly developed for the elderly and have to be constructed by means of synthetic indexes that gather information from different questions in the survey. As indicated in Gwozdz and Sousa-Poza (2009), we can broadly consider two families of domains and models of quality of life, namely, subjective social indicators of life satisfaction and psychological wellbeing, and health and functioning models. Most of the discussion that follows presents the advantages of using the latter type of measures, some of which have yet to be incorporated in the economic approach of wellbeing.

The analysis is conducted using an alternative measure to life satisfaction, by using the CASP-12 index, in an attempt to study the effect of interdependency relationships on quality of life. Certain previous studies have set out to explain the individual health by using the subjective self-assessed health status of the individual as an approach to their wellbeing, whereas some others have used subjective health status as one of the main predictors of quality of life. Gwozdz and Sousa-Poza (2009) focus on people over the age

of 75 and combine evidence from GSOEP and from SHARE. They conclude that "objective" health status measurements, such as objective impeding conditions, do not have a major impact on the subjective wellbeing of that segment of the population, whereas a "subjective" health condition, i.e. self-assessed, is significant in determining wellbeing. They provide several explanations for this puzzle, relying on previous gerontological findings: either (1) those objective health measures only influence social participation with some time lag, so they do not influence straightforward subjective wellbeing, or (2) as a question of low expectations for this age group, defined as the survivors of a segment characterized by high morbidity and dependency.

For some authors, such as Wiggis et al. (2004), that variable has several drawbacks: as it is subjective and self-assessed, it can be considered, at the most, a "proxy" for 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, the CASP index has a solid theoretical grounding 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 Wiggis et al. (2004), the authors have found 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 difficult financial situation, and living in a degraded neighbourhood.

As a first approach, Von dem Knesebeck, Hyde, Higgs, Kupfer and Siegrist (in Börsch-Supan et al. 2005), chose a eudemonic index to model the quality of life of our focus group: CASP-19. They assume that the degree to which each old person can fulfil their needs is a measure of their quality of life. By using CASP-19, they consider that the degree of fulfilment is especially relevant in the following domains: control (i.e. the ability for active performance in the environment), autonomy (i.e. the right to be free of undesired interferences), self-fulfilment, and pleasure. Wiggis et al. (2008) 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 an abridged version of the index that accounts for 12 ordered variables. The CASP-12 index is therefore built using the answers 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 in due course report the values for each of the four theoretical dimensions of CASP-12 in the sample that we are going to use for our analysis.

Some previous studies on quality of life have used data from SHARE to construct the CASP index (Von dem Knesebeck et al. in Börsch-Supan et al. 2005). 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 European countries (Netherlands and Denmark, notably). That pattern also applies for the study of each of the four different dimensions 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 young and elderly in this analysis are broader for Southern European countries. This means, therefore, that the negative impact of age is more prevalent in Southern Europe, as in the case of Spain, as we will discuss later (both in the descriptive section, when we 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. (2006), use SHARE data to determine the positive effects of social productivity on the wellbeing of the elderly. These authors define social productivity in terms of

any activity previously agreed and continuous over time that generates goods or services that are either socially or economically valuable to the recipients, even if they are not provided through a formal contract. They consider the significance of time transfers, just as we do, but in a broader sense. In fact, they consider the possibility of transferring time by means of charitable or voluntary activities. Thus, they consider up to three types of time-transfers involving activities: (1) voluntary or charity work, (2) care of sickly or disabled adults and, (3) the provision of informal help to family, friends or neighbours. To measure the wellbeing of the elderly, they use two indicators: CASP-12 and CES-D. This last measure captures the depressive condition that reflects the reduction of emotional wellbeing. The authors use 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 outbound time transfers, since they also control for the inbound ones received by the elderly. The objective of their work is to test the hypothesis on the positive effect of "reciprocity" on wellbeing. This implies lower levels of wellbeing for those people whose social interaction is determined by non-reciprocal exchange, with respect to people that enjoy a more balanced situation between efforts and rewards. They conclude that the "quality" of the interchange is the key variable for wellbeing. Accordingly, the relationship between social productivity and wellbeing 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 (2008). They also use data from SHARE and explore and quantify the positive contribution of high social participation in the self-reported health status measurement. They also find evidence for the country gradient in the efficiency of the production of good health by using social capital as an input.

By using this same database, Von dem Knesebeck et al. (2007) analyze the association between the quality of life of European old people and an array of socioeconomic status indicators for different European countries. Their aim is to determine whether the relative importance of socioeconomic status changes with age. They study the correlation between this eudemonic measure of interest, CASP-12, and five measures of relative position that determine socioeconomic status: income, education, household tenure, net wealth and ownership of a car. They use multivariate analysis to estimate certain models and conclude that even if there are positive correlations, the results vary by country. They also find that the impacts those factors have are different before and after retirement. Overall, the house tenure regime is the one with the weakest relationship with quality of life.

With UK data from the English Longitudinal Study of Aging (ELSA), Nevuteli et al. (2006) determine that quality of life is reduced by depression, by the perception of a difficult financial situation, by limitations in mobility and undertaking daily activities, and by impeding chronic diseases. On the other hand, quality of life increases with trusting relationships in the family and social networks, frequent contacts with friends, living in a good neighbourhood and having more material goods. They only find slight differences by age groups and by gender. Based on these results, they conclude that any policy designed to increase the quality of life of the elderly should seek to alleviate financial difficulties and limiting health conditions, and improve the conditions of aged neighbourhoods and the density of the social relationships of old people.

Another interesting source of information for the measurement and analysis of wellbeing is the *Gallup World Poll*, since it contains data for 132 countries. Deaton (2007) uses data from the 2006 survey in a cross-country empirical exercise to analyze the relationship between financial situation, ageing, health and wellbeing (this latter is measured as happiness or life satisfaction and as health satisfaction). Average happiness is related with national per capita income. This effect holds true for every society analyzed, and it is an interesting new finding. Improvements in life expectancy determine that a person is more likely to be 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 correlation between age and reported happiness. However, for poor countries, there seems to be evidence supporting the opposite.

There is sufficient evidence in the literature about intergenerational transfers of income and wealth (see Arrondel and Masson 2001, 2002; Laferrère and Wolf 2006, for instance). Less attention has been paid to the transfer of time from one generation to another. Time transfers may also have a major impact on the wellbeing of the agents involved. They imply that some commodities can be produced inside the family, without having to buy certain services on the market. For instance, some generations of European women take care of their grandchildren and/or their parents (for this latter case, see for instance the analysis by Crespo and Mira 2008). Bonsang (2009) considers the family as the traditional source of care provision for the frail and older individuals. This author contends 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 care.

Overall, we have found few items of research that consider the effect of interdependence on the wellbeing of the oldest members of population. Even though Bonsang (2009) states that transfers between children and parents are important and should be considered when evaluating population welfare, very few studies have addressed that question. Katz (2009) uses data for people 75+ in five countries to determine the effect of different family relations (solidarity, conflict and ambivalence) on three alternative measurements of individual wellbeing (life satisfaction, positive affects and negative affects). This author finds a different impact on the three dependent variables, concluding the pertinence of using multiple measurements for the outcome variable. All in all, among that scarce literature, there is common agreement on two facts: (1) the need for longitudinal data to fully characterize the impact of any change in the interdependence variables on the evolution of individual conditions (since by using cross-sectional data, only static situations can be evaluated), and (2) the importance of social participation on wellbeing.

3 Data Description

We use data for Spain from the first release of the 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, socioeconomic status and social and family networks of people aged over 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 (e.g. mental health, life satisfaction), economic variables (e.g. labour 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 (e.g. 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 EU FP5. Those variables and indicators include recoded variables, as well as harmonisations (for instance, into Euros by using exchange rates and parities for 2004) that enable international comparisons to be made. All this information is provided in

Table 1 Quality of life by country

Country	Control	Autonomy	Self-realization	Pleasure	CASP-12	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

CASP-12 average values

Source: SHARE 2004, Release 2.3.1

19 modules. Some of these collect information on the household and family that is provided by the person in the family chosen as 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 indicated, there is no a clear consensus on the most suitable measurement of wellbeing and of quality of life. SHARE contains several measurements of this concept. For this work, we have chosen CASP-12. CASP-12 measures the degree to which the old person has his need covered. This degree is measured over four dimensions: control, autonomy, self-realization and pleasure. For each of the dimensions, three questions are asked, and each one of the answers for those 12 questions is rated by an ascending 1–4 scale.[1] Thus, the total value of the indicator records scores ranging from 12 to 48 points. A higher value is related to better quality of life. SHARE reports the values recorded for each of those dimensions (Börsch-Supan et al. 2005).

The average values by country range 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 (Table 1).

3.2 Description of Interdependence: Time and Money Transfers

Since we are particularly interested in determining the effect of intra-family transfers on individual's welfare, we consider that a person can be in four different situations regarding the transfer of time and in three different situations regarding money transfers at an intra-family 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, the survey provides information, for each individual in the sample, about help received from family members from outside and inside the household and help given to a family member from outside and inside the household regarding personal care (i.e. dressing, bathing or showering, eating, getting in or out of bed, using the toilet, including getting up or down), practical household help (e.g. with home repairs, gardening, transportation, shopping, household chores) and help with paperwork (such as filling out forms, settling financial or legal matters). The individuals in the sample are also asked if they have looked after their grandchildren without the presence of the parents.

[1] The questions for each of the dimensions used to build the CASP-12 index are shown in "Appendix 1".

Time transfers are defined on the basis of that information as dummy variables and include any kind of help that involves time spent with a family member. It may be the case that the person neither gives nor receives time (NGNR dummy variable), and this will be a baseline category in our regressions. It may also be the case that this person does not give time to anyone, but instead receives time (NGYR). The opposite can happen, not receiving but giving time (YGNR). Finally, there may be the case in which the person not only gives but receives time (YGYR).

For money, the reference category for our analysis will be the person that neither gives money nor receives it (NGNR money). An alternative one captures the situation in which the old person gives more money than they receive (Net money giver). The third category includes people that receive more money than they give (Net money receiver).

We first look at the distribution of CASP-12 by transfer regimes. The Fig. 1 summarize the results of a mean-difference test run to test for the equality of means for different categories of resource transfers (James 1954). The test results show that the means of the quality of life measure (CASP-12) are statistically different across transfer regimes, being those who do not give time but receive time and those net recipients of money who report a significant lower quality of life.

Regarding the characterization of our sample in terms of the transfer regimes, results for our Spanish subsample by age group are represented in Table 2.

The other explanatory variables are described in Table 3. 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), household income, whether the person is living with a partner (74.33% does) and household size. Self-reported health status has been criticized as a valid measure of an individual's objective health condition. Instead, we use one of the alternative measures, the Global Activity Limitation Indicator (GALI). This indicator refers 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) and the activities people usually do and it is not preceded by a screening question on health problems to avoid selection. 44.10% of the individuals have some limitation on performing daily activities according to this measurement.

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

4 Estimation Method

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 so that a higher value is related to better quality of life. When interpreting the estimated coefficients, a positive sign will identify a positive partial effect on the dependent variable.

We explore two distinct estimation methods: an ordinary least squares regression model (OLS) and a finite mixture regression model (FMM). The former, though not the standard approach when the dependent variable is an ordered outcome, provides robust results that are to be compared with the ones derived from the FMM model.[3] The latter approach has

[2] "Appendix 2" shows the definitions of the variables used.

[3] For a review of the implications of using different estimation methods and the estimation of subjective well-being models, see Ferrer-i-Carbonell and Frijters (2004).

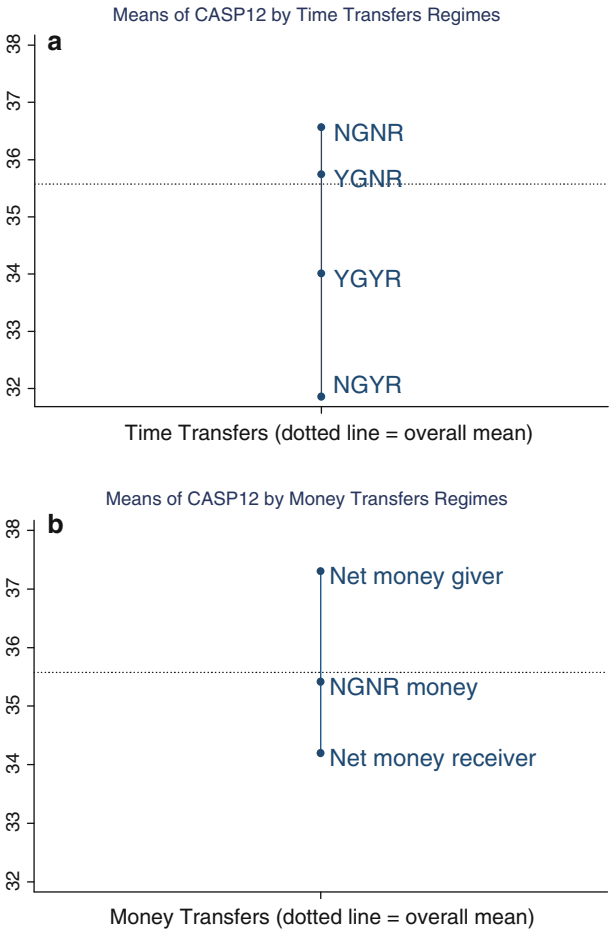

Fig. 1 CASP-12 mean values by time (**a**) and money (**b**) transfer regimes

been increasingly used in Health Economics because it allows the researcher to deal with the problem of unobserved heterogeneity in relatively easy way.

One of the assumptions underlying the OLS 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 life expectancy has contributed to a much more heterogeneous group of elderly people. Many people in this demographic group enjoy reasonably good health (both physical and mental), and actively exchange time and money with other members of their families. Many others suffer from severe health conditions and are net recipients of special care. This means that we may be facing two or more behaviourally different subgroups amongst the elderly. Our research investigates this possibility by extending the model to include a finite mixture of distributions of reported CASP-12 outcomes. We study the quality of life of the elderly taking into account this potentially significant heterogeneity in their underlying behaviour and allowing for the existence of two or more kinds of elderly people.

As we have already mentioned, the demographic group we are studying is a growing segment of the population and, as a consequence of this increase in number, one of its main

Table 2 Time and money transfers regimes in Spain by age group

	Age groups			Total row %	Obs.
	50–64	65–74	75+		
Time					
NGNR	24.15	12.53	10.55	47.22	1,097
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
Money					
NGNR money	37.84	26.09	21.48	85.41	1,984
Net money giver	6.33	2.80	1.46	10.59	246
Net money receiver	1.76	0.86	1.33	3.96	92
Total column %	45.93	29.75	24.28	100	2,322

Source: SHARE 2004, Release 2.3.1

Table 3 Descriptive statistics

Variable	Mean	SD	Min.	Max
Male	41.33	0.493	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 partner	74.33	0.4317	0	1
Household size	2.71	1.271	1	9
Limited with daily activities—GALI	44.10	0.497	0	1

Source: SHARE 2004, Release 2.3.1

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

A FMM allows people's underlying behaviour to be different, in the sense that there is a mixing process that determines that the observed behaviour is informed by the existence of a finite number of distinct but homogenous subpopulations. Accordingly, we let the effect of the explanatory variables differ for each of the empirically and optimally determined number of subgroups, which may be regarded as a type. Both the determinants of belonging to one subgroup or another (determining the probability of being characterized as a type) as well as the corresponding behavioural models (each process is estimated by OLS) are estimated simultaneously.

In the FMM, the random variable of interest (CASP-12 in our case) is assumed to be a draw from a population that is an additive mixture of distinct subpopulations or classes (c)

in proportions p_c where $\sum_{c=1}^{C} p_c = 1, p_c > 0 \longleftarrow \forall c = 1, 2, \ldots C$. For CASP-12, the mixture density can be described in general by

$$g(\text{CASP-12}|\Theta) = p_1 g_1(\text{CASP-12}|\Theta_1) + p_2 g_2(\text{CASP-12}|\Theta_2) + \cdots + p_c g_c(\text{CASP-12}|\Theta_c),$$

where the class densities, $g_c(\text{CASP-12}|\Theta_c)$, are assumed to be normals, i.e.

$$g_c(\text{CASP-12}|\Theta_c) = \frac{1}{\sqrt{2\pi\sigma_c^2}} \exp\left(-\frac{1}{2\sigma_c^2} (\text{CASP-12} - X\Theta_c)^2 \right)$$

The regression coefficients, Θ_c, and the standard deviation, σ_c, vary across classes. Note that the mixing probabilities, p_c, (which in our exercise are going to depend on long-standing activity limitations index, gender and age) are jointly estimated with the class-specific regression coefficients and standard deviations. This model is estimated by maximum likelihood, where the log likelihood function for the data is given by:

$$l(\text{CASP-12}|\Theta) = \sum_{i=1}^{N} \log(g_i(CASP12_i|\Theta))$$

Research on health economics has benefited from the use of this estimation method (Conway and Deb 2005). One of the best examples of this approach to the study of the determinants of subjective wellbeing is the study of financial satisfaction in the paper by Clark et al. (2005). Evidence shows that a FMM better predicts the actual distributions of the endogenous variable.

A 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 elderly by dividing the sample between two or more types of respondents. In fact, each observation may have a non-zero probability of belonging to each one 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): considering the different behaviour underlying their reported quality of life measurement (heterogeneity). Our results will allow us to see whether 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. Indeed, our estimates reveal the existence of two statistically different subgroups of elderly people.

5 Results

Our dependent variable is CASP-12, an ordered categorical variable that can have values from 12 to 48. The higher the value of CASP-12 the better the quality of life. Therefore, positive estimated coefficients are interpreted as the corresponding variable positively affecting the quality of life of the elderly. Our reference group is a woman who does not give or receive either time transfers or money transfers, she is retired, with no partner and lives in the south of Spain.

We start discussing the results obtained by estimating the model by OLS. These results are shown in the first two columns in Table 4.[4] According to the estimated model, there are no significant differences by gender. Age has a negative and significant negative effect.

[4] An ordered probit model was also estimated, in order to check the results.

Table 4 Estimation results

CASP-12	OLS		Finite mixture model					
			Subgroup 1		Subgroup 2		Mixing probabilities equation	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Male	0.546	0.449	0.250	0.896	−0.584	0.803	−0.602	0.509
Age	−0.093***	0.025	−0.045	0.034	−0.048	0.042	0.018	0.016
Education	0.193***	0.048	0.146**	0.074	0.144**	0.061		
Employed	1.222**	0.592	2.119*	1.087	−0.080	0.979		
Unemployed	−1.901**	0.963	−1.758	1.222	−1.837	1.348		
Disabled	−4.493***	1.048	−3.391***	1.061	4.523*	2.381		
Housework	−1.220**	0.551	−1.674**	0.709	−0.015	0.948		
Household income	0.312**	0.125	0.676***	0.225	0.184	0.151		
Living with partner	0.726	0.443	−0.218	0.632	1.769**	0.820		
Household size	−0.022	0.143	0.296	0.220	−0.257	0.246		
Net money giver	0.701	0.527	0.540	0.790	0.874	0.820		
Net money receiver	0.048	0.909	1.163	1.486	−1.889	2.309		
NGYR	−2.956***	0.668	−2.979***	0.706	1.754	1.715		
YGNR	−0.664*	0.386	−0.772	0.587	−0.435	0.586		
YGYR	−0.964	0.671	−1.615*	0.932	−0.390	0.926		
Northwest	−0.850	0.663	−0.964	0.831	−0.212	1.064		
Northeast	3.071***	0.591	3.763***	0.847	1.477*	0.761		
Madrid	1.303**	0.635	2.568**	1.203	−1.506	1.083		
Center	−1.377**	0.677	−1.364	1.021	−3.036***	0.739		
East	−0.223	0.467	1.220*	0.722	−2.678***	0.635		
Canary Islands	−0.403	0.861	1.571	1.779	−1.995	4.422		
GALI							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							
/lnsigma1			1.709***	0.041				
/lnsigma2			1.267***	0.074				

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

The years of education have a significant positive effect. Significant differences by labour market status are found, with employed individuals being more likely to report a higher quality of life than those retired; whereas those unemployed, on permanent sick leave or disabled and housewives have a higher probability of being worse off.

Household income has a positive and significant effect, but money transfers have no significant effect on the reported quality of life. However, time transfers do have a significant effect. Ceteris paribus, those who do not give or 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 between those who do not give and do not receive and those who give and receive time transfers. These last results may suggest that reciprocity is an important determinant of quality of life.

We find significant differences by region of residence. Those living in the northeast (Basque Country, Navarre, La Rioja and Aragon) report a significantly better quality of life than those living in the south (Andalusia, Murcia, Ceuta and Melilla). On the other hand, those living in the central region (Castilla y León, Castilla-La Mancha and 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 the parameters of the behavioural equation for the potential latent subpopulations (each process is estimated by OLS). Our FMM 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 56.8%). We propose to parameterize the mixing probability as a function of three observables: age, sex and GALI. However, only this last variable is statistically significant in the determination of the finite typology. Both age and sex have a non-significant effect on the determination of the probabilities of the types. This finding has, at least, the following implication: most of the policy measures designed to ensure 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 has no impact on the determination of the individual's type. Instead, the observed variable that classifies individuals into each one of the types is the existence or otherwise of limitations in the pursuit of daily activities. We control for age given that the distribution of the values of the CASP-12 index and the scores for each of the four 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 OLS model (labour 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 in both subgroups, although the effect seems to be more intense in the first group. Time transfers have a negative effect on quality of life only for the first type: receiving time transfers (in the form of help) has a negative effect, regardless of whether 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 impact on the two subgroups, probably due to the fact that institutional arrangements and publicly provided care have a different effect depending on the individual's type. For both subgroups, the elderly living in the northeast region of Spain (Basque Country, Navarre, La Rioja and Aragon) report a significantly higher quality of life than the others. For subgroup 2, the elderly living in the Central or eastern regions (Castilla-La Mancha, Castilla-León, Extremadura, Catalonia, Community of Valencia and the Balearic Isles) are worse off.

Our model predicts the following distribution of CASP-12 scores across types (Fig. 2).

Once we have jointly estimated the types and the behavioural 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 summarized in Table 5.

According to our results, the population of elderly people has 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 people assigned to each subgroup.

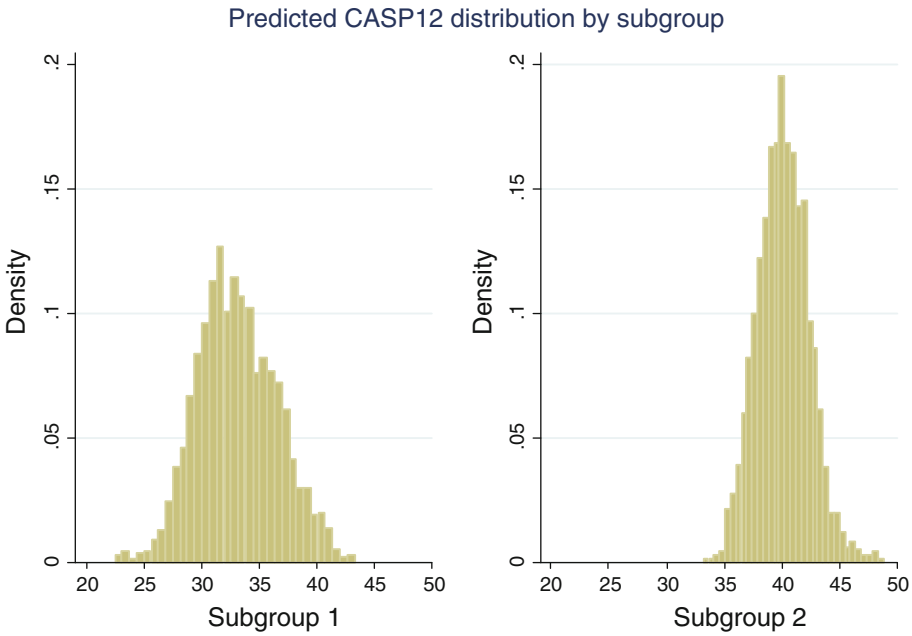

Fig. 2 CASP-12 predicted distribution by subgroup of population

The elderly in subgroup 1 are quite limited for daily activities. 75% of them have some limitation for performing daily activities, while only 2% of the elderly in subgroup 2 have such limitations. The elderly in subgroup 1 are 6 years older, on average, than their counterparts in subgroup 2 (68 years old vs. 62); they are mainly women (63% of them are women), 25% of them receive time transfers, compared to 12% in subgroup 2. With respect to labour market status, the main difference is that 39% of the elderly in subgroup 2 are working, while in subgroup 1 this figure drops 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 that the main variable for classifying people into subgroup 1 and subgroup 2 is the one that describes their limited performance of daily activities.

6 Overall Conclusions

This paper has analyzed the effect of different transfer regimes on the quality of life of the Spanish subsample of those 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. Accordingly, we have provided a classification in four categories regarding time transfers (helps to and from family members outside the household) and three for money transfers. We use a functional indicator of quality of life, CASP-12, and we propose two alternative estimation methods: the first one is the traditional ordered approach and the second one allows for high unobserved heterogeneity and seeks to capture the underlying behaviour of a finite number of different subpopulations.

Table 5 Descriptive statistics by subgroup of population

Descriptive statistics by subgroup of population	Subgroup 1		Subgroup 2	
	Mean	SD	Mean	SD
CASP-12	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. individuals	810		616	

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

Regarding the main determinants of their quality of life, we find that, regardless of the subgroup, neither gender nor age has a significant impact on elderly people's quality of life. Education, however, has a significant and positive impact on both subgroups.

Focusing now on subgroup 1, we find significant differences by labour market status. Employed individuals are more likely to report a higher quality of life than those who are retired, whereas those who are on permanently sick leave or disabled and housewives have a higher probability of being worse off. Household income has a positive and significant effect, but money transfers have no significant effect on the reported quality of life. However, time transfers do have a significant effect: receiving time transfers (in the form of help) has a negative effect, regardless of whether the individual also gives help or if the

individual does not transfer time. When unobserved heterogeneity is controlled for we do not find evidence of reciprocity being an important determinant of quality of life. We find significant differences by region of residence. Those living in the northeast (Basque country, Navarre, La Rioja and Aragon) and Madrid report a significantly better quality of life than those living in the south (Andalusia, Murcia, Ceuta and Melilla).

The determinants of the quality of life of the elderly in subgroup 2 are education, living with a partner and the region of residence. Education and living with a partner have a significant and positive effect on the quality of life of this subgroup. Neither time transfers nor money transfers has a significant effect. Region of residence is also important, but those subgroups living in the eastern and central regions (Catalonia, Community of Valencia, Balearic Isles, Castilla y León, Castilla-La Mancha and Extremadura) record a lower quality of life than those living in the south. It is likely that institutional arrangements and publicly provided care have a different effect depending on the individual's type.

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 for classifying people into subgroup 1 or subgroup 2 is the one that describes their limitations regarding daily activities. This finding may suggest that policies designed to improve the quality of life of individuals over the age of 50 should not be based on age but on the existence or otherwise limitations in the performance of daily activities. Our results show that labour 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 in both subgroups. Time transfers have a negative effect on quality of life only for the first subgroup.

We can draw two main implications from our work. The first one is a methodological one; it concerns with the suitability of the FMMs when unobserved heterogeneity is a relevant factor to be considered to characterize the behaviour of a population. FMM models have been applied to analyze life satisfaction in a group of different countries (such as the *ECHP* in Clark et al. 2005). In our paper we study just one country and the source of heterogeneity is mainly unobserved. We argue that our population (Spaniards 50+) is formed by different subpopulations and that the effect that time and money transfers have on their well-being is different, depending on the types. Our results back up that FMM models are also suitable when considering a group of population which members differ in both observed and unobserved characteristics, as it is the case of our elderly Spanish population.

The second implication concerns with the main variable to be considered when designing target groups by policy makers, in order to promote the quality of life of the elderly in Spain. The results of the estimated model show that limitations performing daily activities turn to be the variable that better separates the elderly population in Spain into two homogeneous subgroups of people. More specifically, it determines different effects of the explanatory variables in the determination of good quality of life, as measured by the CASP-12 index. Thus, the existence of a limiting condition could be a good candidate when choosing a variable to determine eligibility criteria to receive special public attention.

Acknowledgments We would like to acknowledge the invaluable research assistance of Clara Velásquez and the financial support of Spain's Ministry of Work and social Affairs (IMSERSO) and Ministry of Science and Technology "ECO2009-10818", and the Basque Government "IT241-07". Arantza Ugidos also wants to thank the members of the *Labotatoire d'Économie d'Orlèans* for their comments and their hospitality during her stay. All errors are solely ours. This paper uses data from SHARE, Wave 1, Release 2.3.1.

Appendix 1

CASP-12 is a measurement of how well people function. In this measurement, 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 (three 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 CASP-12 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 in Fig. 3.

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	☐$_1$	☐$_2$	☐$_3$	☐$_4$
b)	I feel that what happens to me is out of my control	☐$_1$	☐$_2$	☐$_3$	☐$_4$
c)	I feel left out of things	☐$_1$	☐$_2$	☐$_3$	☐$_4$
d)	I can do the things that I want to do	☐$_1$	☐$_2$	☐$_3$	☐$_4$
e)	Family responsibilities prevent me from doing what I want to do	☐$_1$	☐$_2$	☐$_3$	☐$_4$
f)	Shortage of money stops me from doing the things I want to do	☐$_1$	☐$_2$	☐$_3$	☐$_4$
g)	I look forward to each day	☐$_1$	☐$_2$	☐$_3$	☐$_4$
h)	I feel that my life has meaning	☐$_1$	☐$_2$	☐$_3$	☐$_4$
i)	On balance, I look back on my life with a sense of happiness	☐$_1$	☐$_2$	☐$_3$	☐$_4$
j)	I feel full of energy these days	☐$_1$	☐$_2$	☐$_3$	☐$_4$
k)	I feel that life is full of opportunities	☐$_1$	☐$_2$	☐$_3$	☐$_4$
l)	I feel that the future looks good for me	☐$_1$	☐$_2$	☐$_3$	☐$_4$
		▲$_1$	▲$_1$	▲$_1$	▲$_1$
		Often$_1$	Sometimes$_1$	Rarely$_1$	Never$_1$

Fig. 3 CASP-12 measurement

Appendix 2

The variables we use are defined in Table 6.

Table 6 Variable definitions and labels

Gender	Gender = 1 if male, 0 otherwise
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 gives 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 is received, 0 otherwise
Net money receiver	Takes value 1 if the individual receives more money than is given, 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	It is defined as the logarithm of annual gross household income
Living with a partner	Takes value 1 if the individual lives with their 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 Basque Country, Navarre, 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 Catalonia, Community of Valencia or Balearic Isles, 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 Andalusia, Murcia, Ceuta or Melilla, 0 otherwise
Limited with daily activities—GALI	Takes value 1 if the individual has some form of limitation regarding daily activities

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