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Using Stated Preferences Data to Analyze Preferences for Full and Partial Retirement

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ABSTRACT

Using Stated Preferences Data to Analyze Preferences for Full and Partial Retirement*

Structural models explaining retirement decisions of individuals or households in an intertemporal setting are typically hard to estimate using data on actual retirement decisions, since choice sets are for a large part unobserved by the researcher. This paper describes an experiment in which both perceived retirement opportunities and preferences for retirement are measured. For the latter, respondents evaluate how attractive they find a number of hypothetical, simplified, retirement trajectories involving early retirement, late retirement, and gradual retirement, each with its own corresponding income path. The questions were fielded in the Dutch CentERpanel. The answers are used to estimate a stylized structural life-cycle model of retirement preferences. The results suggest that, for example, many respondents could be convinced to work part-time after age 65 before retiring completely at age 70 for a reasonable financial compensation. Simulations combining the information on perceived opportunities with estimated preferences illustrate the importance of employer imposed restrictions on retirement and the scope for increasing labor force participation of the elderly by creating opportunities for gradual retirement.

JEL Classification: C81, J26

Keywords: replacement rates, ratings, gradual retirement

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1. Introduction

Structural models explaining retirement decisions of individuals or households in an inter-temporal setting are typically hard to estimate using data on actual retirement decisions, because choice sets are largely unobserved by the researcher. Furthermore, individuals face various sources of uncertainty, which are, again, only partly known to the researcher (for a review see Lumsdaine and Mitchell, 1999).

This paper describes an experiment in which preferences are estimated by asking respondents in a representative sample of the Dutch population to rate a number of hypothetical, simplified, retirement trajectories. The respondents are asked to consider early and late retirement (with corresponding income paths) as well as gradual retirement plans, whereby they reduce their working week to three days per week for some years, before retiring completely. In addition, data on respondents' perceptions of their retirement opportunities are collected, describing perceived flexibility of retirement age and the corresponding retirement replacement rate, and perceived opportunities for gradual retirement.

Over the past 25 years several countries have adopted gradual retirement programs, first in combination with early retirement programs and later as an attempt to reduce complete withdrawal from the labor market and to increase the activity rate among workers age 50 to 65. In the United States, about 18% of the cohort of salaried workers born between 1931 and 1941 were in phased or partial retirement in 1998 and 2000 (Scott, 2004). In most western countries, the fraction of male and female part-time workers in the age group 60 to 64 is larger than the fraction of part-time workers among males or females in the population at large (Latiluppe and Turner, 2000). In The Netherlands, gradual retirement plans have been offered explicitly to current cohorts of senior workers by some major pension funds, and it has been suggested that gradual retirement plans may also help to keep people at work after the standard retirement age of 65. In order to design successful retirement plans that are both attractive to older workers and financially sustainable, it is essential to know older workers' and their employers' preferences for such plans. More generally one needs to know the trade offs between retiring earlier or later and having less or more income before and after the standard retirement age.

The economic literature explains labor supply behavior at older ages in an inter-temporal framework (Lazear, 1986; Hurd, 1990), where workers choose the optimal combination of work, leisure, income, and consumption, accounting for the future by

maximizing expected utility over the life cycle. Sophisticated empirical models for retirement have been developed that rely on observed actual behavior of the individuals in the sample, that is, on their *revealed preferences* (RP) (see for example Stock and Wise, 1990, and Rust and Phelan, 1997). The main drawback of these types of models is that they require strong assumptions on the (unobserved) expectations and opportunities that workers have. In general it is not clear to which extent observed choices represent workers' preferences and to which extent they represent limited choice sets (Hurd, 1996). This is particularly problematic for gradual retirement plans since existing survey data often do not provide information on whether an employer offers such a plan, and, if so, which income stream the plan entails.

Our analysis of the respondents' choice sets is based upon two types of information. The first type is based on responses to questions regarding whether a respondent's employer would allow retirement before or after the standard retirement age, and, if so, how retiring earlier or later would affect retirement income. The second type is based on answers to questions about respondents' perceptions of whether their employer would allow for phased retirement, that is, reducing the number of hours worked per week before retiring completely.

Our estimates of preferences are based upon stated preference (SP) questions. Survey respondents are shown retirement paths with different hours and income patterns over time. They are asked to indicate how attractive they find each plan, on a scale from 1 (very unattractive) to 10 (very attractive). Citing Louviere et al. (2002), "SP data can capture a wider and broader array of preference-driven behaviors than revealed preference (RP) data on actual behavior, allowing for experiments with choice opportunities that do not yet exist in the market." Our goal is to estimate preferences for retirement plans that do not yet exist or to which workers currently do not have access.

Until recently economists have been reluctant to use stated preference methods relying exclusively on data of actual behavior. One of the reasons has been the negative experiences with willingness to pay (WTP) estimates on the basis of SP data, leading to implausibly large estimates of WTP and over-predictions of the use of, for example, new transport means or environment friendly products. In the past few years, however, the use of SP has gained acceptance, particularly since the SP study on measuring time preferences by Barsky et al. (1997). Louvière et al (2002, Chapter 13) give an overview of studies comparing preference parameter estimates based upon

SP data with estimates based upon RP data and find that the two are usually quite close, although formal statistical tests sometimes reject exact equality. Van Rooij et al. (2007) study preferences for DB versus DC pensions, using the same Dutch panel that we use.

The only example of stated preference data for retirement plans that we are aware of is Nelissen (2001). His study does not look at gradual retirement and uses very detailed plan descriptions that may inadvertently complicate the choice set of individuals and impede the goal of estimating preferences. The current study maintains the key features of the retirement plans but keeps the retirement trajectories simple thereby creating an environment that facilitates optimal decision-making. We work with a stylized utility function for one individual, modeling within period utility as a function of leisure and (pension and labor) income.[2] The parameters of the utility function are allowed to vary across individuals depending on both observed and unobserved characteristics. The results are used to analyze the effects of financial incentives on the choice of retirement path and highlight the scope for increasing the labor force participation of the elderly by creating opportunities for gradual retirement.

The remainder of this paper is organized as follows. Section 2 explains the nature of the experiment. Section 3 describes the data on perceived retirement opportunities. Section 4 describes the stated preference data, and section 5 introduces a stylized structural model that is estimated using these data. Section 6 presents the results of some simulations of retirement path choices based upon the model estimates and the perceived retirement opportunities. Section 7 concludes.

2. Experimental Design

The experiment was fielded in the Dutch CentERpanel, run by CentERdata, a data collection agency affiliated with Tilburg University. The CentERpanel is an ongoing panel comprising about 2,000 households that answer questions on the Internet every weekend. The CentERpanel is not restricted to households with (initial) access to the Internet. Respondents are recruited by telephone. CentERdata provides respondents with Internet access if needed. If households do not possess a personal

[2] Future experiments will be designed to provide additional information on other features of preferences. For example, in the current experiment there is no uncertainty, and we do not consider the role of the spouse or of savings. As a consequence, we cannot, for example, study the effect of uncertainty and risk aversion on retirement choices, or the role of joint decision making of spouses.

computer, they are supplied with a set-top box that can be connected to their television set and a phone line (CentERdata also gives them a television set if they do not have that either). Panel members are selected on the basis of a number of demographics so as to match the distribution of these demographics in the Dutch population.

Since this is an ongoing panel, there is a wealth of background information available on the respondents. For example, as part of the "DNB Household Survey", which is administered to the panel members over a number of weekends every year, information is collected on: demographics and work; housing and mortgages; health and income; assets and liabilities; economic psychology. The Internet technology is well suited for adding experimental questions, partly because of the extremely short turn around times between drafting questions and delivery of the collected data (typically a couple of weeks), but also because of the very extensive information already available on the respondents in the sample. The existing information can be added to the newly collected data and can be used in analysis.

In November 2004, a questionnaire on retirement preferences and actual retirement opportunities was fielded among respondents who were either younger than 55 and working for pay, or 55 or older and working for pay when turning 55. The self-employed were not included. This generated a sample of 1395 respondents. Table 1 shows selected characteristics of the sample.

The sample is selective. For example, 416 respondents from the CentERpanel drop out because they do not satisfy the work criterion. These are mainly women, and respondents with poor health and low education. Thus, males, highly educated and healthy individuals are over-represented in this sample compared to the complete CentERpanel.

In spite of the work criterion, not everyone younger than 55 gives working for pay as their main occupation; 9.3% of the respondents under 55 report that their main occupation is something other than part-time or full-time work. Two thirds of these respondents are women whose self-reported main occupation is homemaker.

In this paper, we focus on two sets of questions: those about opportunities for early, late, and phased retirement (Section 3) and those on preferences for retirement (Section 4).

Table 1. Background Characteristics

	Age < 55 (891 obs.)	Age ≥ 55 (504 obs.)
Age	40.9	65.4
Percentage female	42.2	26.6
Education level:		
Primary education	2.1	6.4
Lower vocational	19.2	29.4
Intermediate vocational	26.4	12.3
General, intermediate	11.9	12.5
Higher vocational	27.8	25.8
University	12.5	13.5
Percentage living with partner	77.1	77.6
Main occupation working for pay (%)	90.7	31.5
Hours of work current or last job	32.9	35.5
Monthly net household income		
more than 2000 euros (%)	63.9	63.3
Median monthly net household income	2300	2353
Percentage Home owners	74.7	75.2
Self-reported health:		
Excellent or very good (%)	48.3	38.0
Good (%)	44.7	49.7
Poor or fair (%)	7.0	12.3

Note: CentERpanel, November 2004; sample: age < 55 and working for pay, or age ≥55 and working for pay when turning 55; self-employed excluded.

3. Perceived opportunities for flexible and phased retirement

We asked employees about the perceived retirement opportunities at their current or past employer. The first questions were on the earliest and latest age of retirement, and the pension as a percentage of net pre-retirement earnings corresponding to retirement at both of these ages:

> *What is the earliest/latest age at which you think you can retire according to your employer's pension plan?*
> *If you actually retire at age […/…], which percentage of net earnings do you think you will receive as a pension (including old age social security benefits)?*

Here *[…/…]* denotes the earliest or latest age given in the previous question. Adjusted wording was used for former employees about their last job as an employee. Social security benefits refer to the state pension (AOW) to which almost everyone in

the Netherlands of age 65 and older is entitled. The amount is independent of previous earnings and depends on marital status and on the number of years spent in the country. It is included because the retirement plans are commonly presented with amounts including this state pension.

Figures 1a and b present the histograms of the earliest and latest possible retirement ages. The earliest retirement age varies from age 55 to age 65, with median 62 and mean 61.7.[3] On the other hand, the latest possible retirement age is very much concentrated at age 65, with 76.5% of all observations. This is the standard age of mandatory retirement for most occupations. The average is 65.1 years. The difference between latest and earliest age (not shown in the figures) ranges essentially from 0 to 10 years, with a median of 3 and a mean of 3.6 years. About 74%, gave different earliest possible and latest possible retirement ages. Mutivariate regressions (see appendix, Table A1) show that older respondents and low educated respondents have a significantly smaller age range for flexible retirement than others. The reason is that they report a lower latest possible age of retirement. Gender has no significant effect on either the earliest or the latest age.

The distributions of net retirement income as a percentage of pre-retirement earnings at the earliest and latest possible retirement age are presented in Figure 2 for the sample of respondents for whom these ages are different. The percentages at the latest retirement age tend to be higher – the medians are 70% for the earliest retirement age and 76.2% for the latest retirement age. Particularly at the earliest retirement age, there is a clear spike at 70% of pre-retirement earnings, which is the benchmark percentage in almost all traditional Dutch defined benefit occupational pension systems.[4] The spike is smaller for those who would retire at the latest possible age; they can then often make more than 70%.

Figure 3 presents net retirement income as a percentage of pre-retirement earnings at the earliest retirement age separately for respondents younger than 55 years of age and 55 years of age or older. The older workers perceive high percentages of pre-retirement earnings for early retirement, in line with the generous early retirement arrangements that many of them can benefit from. The younger workers do not expect the same generous arrangements, which is understandable

[3] Seven outliers reporting earliest retirement age above 75 are set to missing.
[4] Strictly speaking this is not correct for two reasons: the 70% typically refers to before tax income and is only reached by employees who have worked for 40 years without changing pension fund. However in public discussions 70% is the magic number that people have in mind as the standard.

given the policy debate on the ageing population and the gradual elimination of "overly generous" (i.e., actuarially unfair) early retirement schemes. We do not find such differences between young and old respondents in the expected percentage at the latest possible retirement age (not shown), in line with the fact that no major policy change concerning late retirement has taken place or is expected.

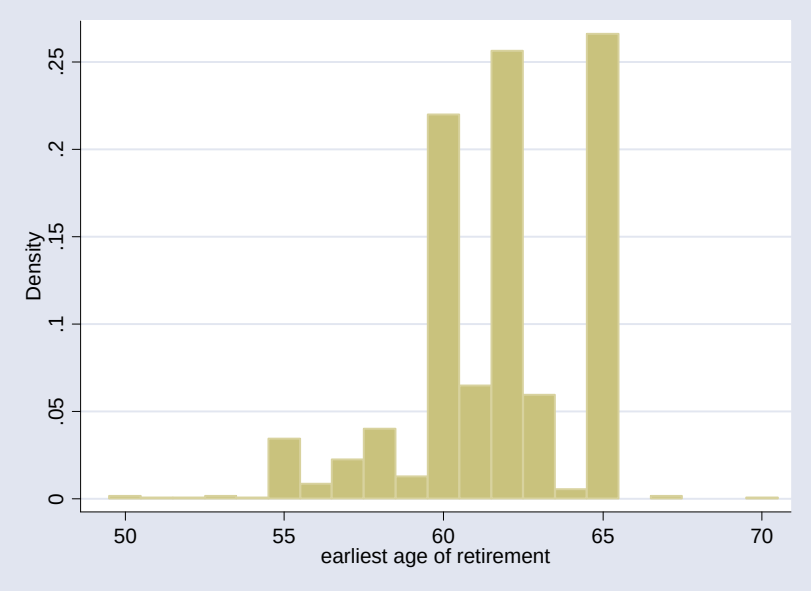

Figure 1a. Earliest possible age of retirement at current or last employer

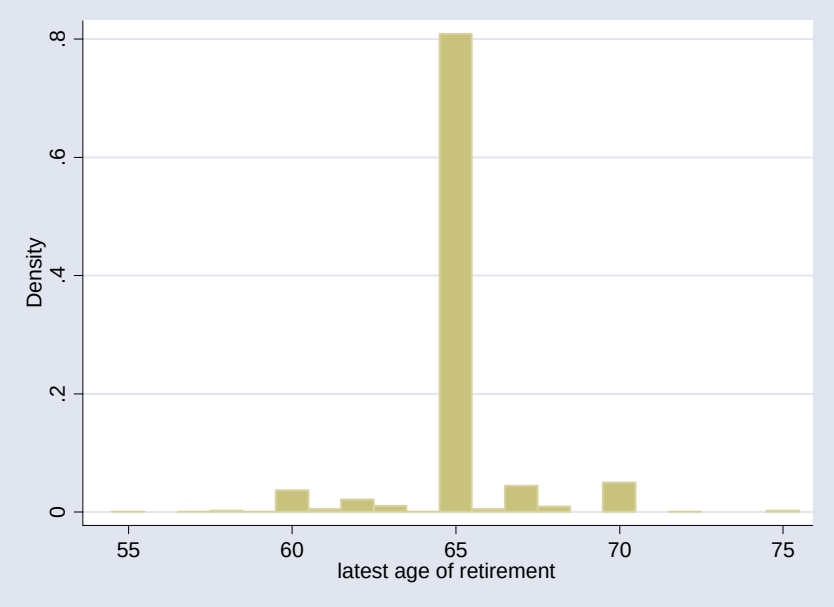

Figure 1b. Latest possible age of retirement; current or last employer

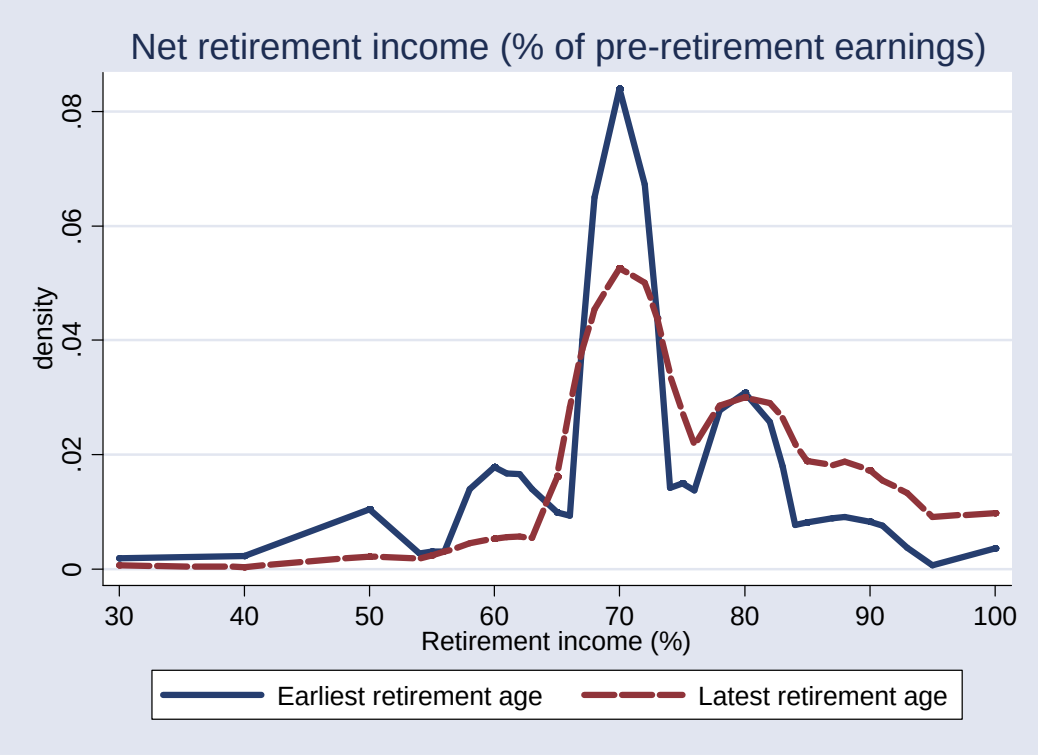

Figure 2. Retirement income as a percentage of pre-retirement earnings (after taxes and social premiums) at earliest and latest possible retirement if these ages differ

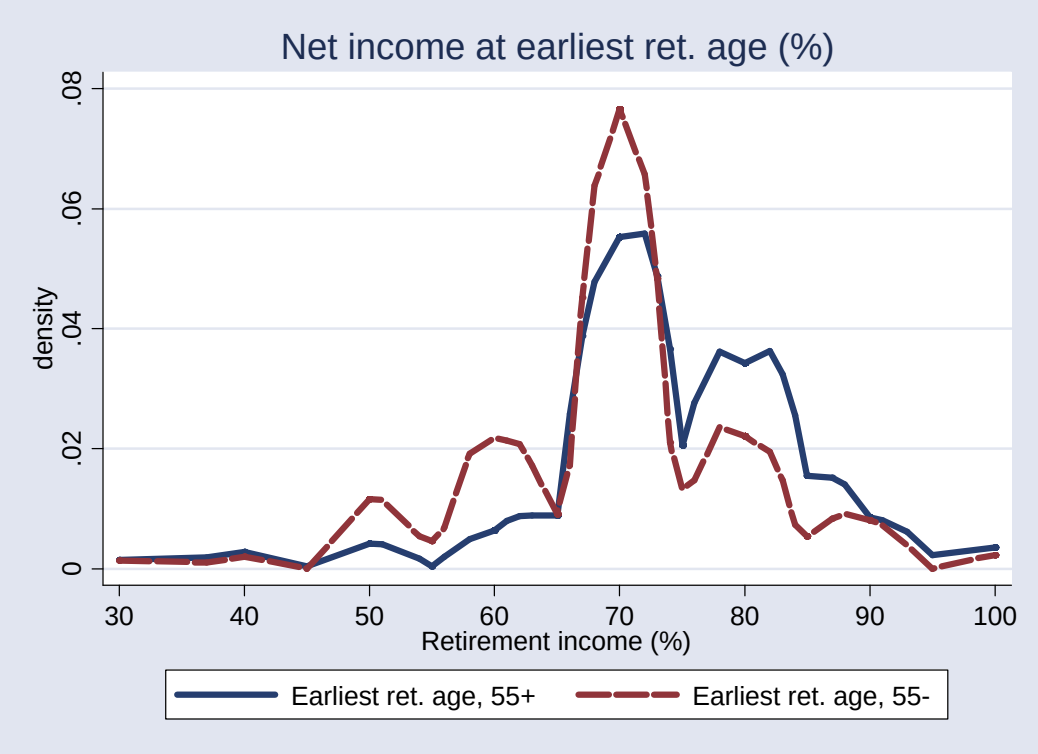

Figure 3. Net income at earliest retirement age, by respondent age (%)

Multivariate regressions (see appendix, Table A2) show that the percentage of pre-retirement income at the earliest (latest) possible retirement age decreases (increases) with the distance to the standard retirement age, but the slope is much smaller than what would be actuarially fair. Women expect lower percentages than men, probably reflecting the fact that not all women have enough years of labor market experience to be entitled to full pension benefits (40 years, usually). The education variables indicate higher percentages for the lower educated groups, which may reflect more years of experience among the lower educated. An alternative explanation is that Social Security benefits are integrated into occupational systems. Since these benefits are a flat rate (equal to the statutory minimum wage), low-wage workers may face very modest income falls, or no fall at all, at retirement. Current workers are more pessimistic about replacement rates at early retirement than others, possibly reflecting the anticipation of pension cuts discussed in the political debate. The difference in percentages for retiring late and retiring early increases when the age range increases, but again the slope is much smaller than what would be actuarially fair.

Phased retirement was asked as follows for current employees:

> *Does your employer offer you the possibility of part-time retirement? (Part-time retirement means that you retire part of your working week but keep working the other part, for example from age 62 until age 65).*

Perceived flexibility in terms of the retirement age is more common than flexibility in terms of gradual reduction of the working week. Only 34.2% of current or former workers say their employer offers (or offered) the opportunity of gradual retirement. Table 2 shows how this is associated with characteristics of the respondent. There is no correlation between age and the opportunity for gradual retirement. Women have more options than men, perhaps because they are more likely to have a part-time job or work in a sector where part-time work is common. The lower educated have fewer opportunities to reduce hours worked in anticipation of retirement than the higher educated. Those who are currently at work are more optimistic about opportunities for gradual retirement than those who are not at work. In sum, we find substantial variation among respondents in earliest possible retirement age (ages 55 to 65) while the latest possible retirement age is concentrated at age 65. The distribution of net

retirement income as a percentage of pre-retirement earnings at the earliest age of retirement is concentrated at 70%, which corresponds to the most common percentage of most traditional defined benefit plans. This percentage is more disperse and with a median of 76.2% when examined at the latest retirement age. Interestingly, over one-third of respondents report their employer offers (or offered) phased retirement. We use these data, along with estimates from our model (Section 5) to simulate choice probabilities in Section 6.

Table 2. Access to phased retirement – Probit results

	Coef.	t-val
constant	–0.507	-2.02
age	-0.003	-0.82
female	0.357	4.71
primary	-0.406	-1.78
lowvoc	-0.301	-2.41
intvoc	-0.337	-2.67
intgen	-0.335	-2.33
higvoc	-0.023	-0.19
lfs_work	0.418	3.86

Notes: 1356 observations;
Dependent variable: 1 if employer offers phased retirement, 0 otherwise
Lowvoc, intvoc, intgen, higvoc: dummies for lower, intermediate, and higher vocational (voc) or general(gen) education.
Benchmark: university education.

4. Stated Preferences

Respondents are asked to evaluate a number of simple retirement trajectories. The wording of the questions depends on whether they have already retired or are still working for pay. We present the questions for those who are still at work. They first receive the following introductory text:

> *In the next questions we describe a number of possible ways to move into retirement. Assume that your employer fully cooperates with all options that are described and assume that at least until age 60, you keep working your current hours.*

After this introduction, eight trajectories are described. The eight scenarios are given in Table 3. Respondents are randomly allocated to three groups that in all but the first

question get trajectories with different percentages, given in square brackets.[5] The presentation in the table is different from that in the survey, where we used time lines like the one given below (scenario 8, random group III). In each of the questions, the respondent is asked to evaluate the scenario on a ten-point scale from 1 (*I don't like this at all*) to 10 (*This is perfect*).[6]

until 65	**from 65 until 70**	**70 and over**
Working 38 hrs per week	Working 23 hrs per week, after tax earnings are 100% of earnings at age 65.	Not working, pension equal to 90% of after tax earnings at age 65.

Table 3. Stated Preference Questions

SP1	Work 40 hours till age 65; retire full-time at age 65; disposable pension income is 70% of last earnings.
SP2	Work 40 hours till age 67; retire full-time at age 67; disposable pension income is [80%; 85%; 90%] of last earnings.
SP3	Work 40 hours till age 70; retire full-time at age 70; disposable pension income is [90%; 95%; 100%] of last earnings.
SP4	Work 40 hours till age 62; retire full-time at age 62; disposable pension income is [50%; 55%; 60%] of last earnings.
SP5	Work 40 hours till age 60; retire full-time at age 60; disposable pension income is [40%; 50%; 60%] of last earnings.
SP6	Work 40 hours till age 60; work 24 hours per week from age 60 till age 65 for a disposable income [90%; 80%; 70%] of earnings before age 60; full-time retirement at age 65 for a disposable pension income of [55%; 60%; 65%].
SP7	Work 40 hours till age 63; work 24 hours per week from age 63 till age 67 for a disposable income [90%; 85%; 80%] of earnings before age 63; full-time retirement at age 67 for a disposable pension income of [80%; 75%; 70%].
SP8	Work 40 hours till age 65; work 24 hours per week from age 65 till age 70 for a disposable income [90%; 95%; 100%] of earnings before age 65; full-time retirement at age 70 for a disposable pension income of [80%; 85%; 90%].

Notes: The presented questions are those for someone who works or worked 40 hours per week in the current or last job. Hours are reduced proportionally for part-timers. Percentages in square brackets: depends on randomized group number. Group I always gets the first number, group II the second, group III the third.

[5] The order in which the questions are presented is randomized. Order effects are not analyzed in the current paper.

[6] There was no opportunity to answer "don't know" or "refuse." There are some missing values (7 for most questions) because respondents stopped their interview before getting to he SP questions.

Figure 4 presents a histogram of the evaluations of the benchmark option SP1, which can be seen as the traditional standard retirement trajectory that was very common before early retirement plans were introduced. The mean is 4.8 but the distribution is quite dispersed. This can be due to preference heterogeneity (some people really like this option and others do not) or due to variation in the response scales (some people give everything a high evaluation and others always give low evaluations). To control for the latter, we may consider the differences between the evaluations of the other scenarios with the evaluation of this benchmark scenario (SP2-SP1, …, SP8-SP1).

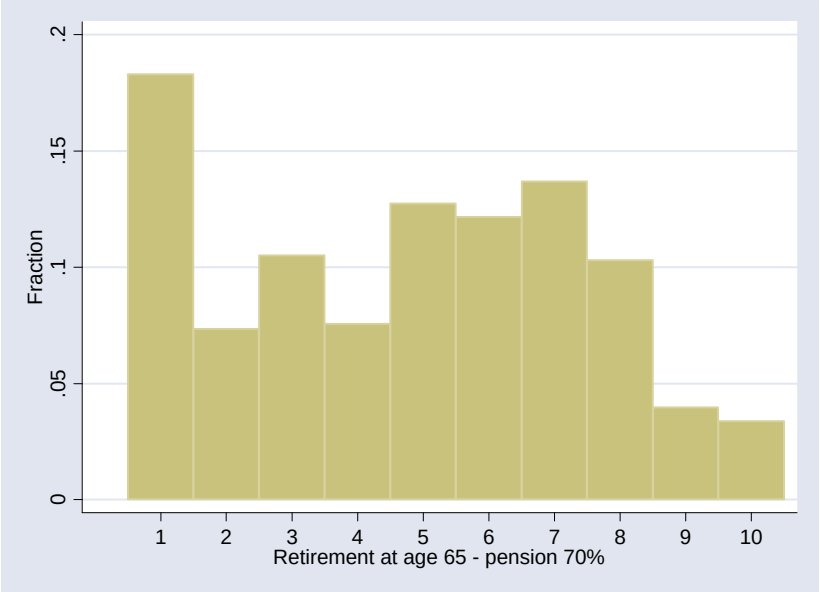

Figure 4. Histogram of evaluations of the benchmark retirement scenario (SP1)

Figures 5 and 6 present the distributions of SP2-SP1 and SP4-SP1; SP2 represents delayed retirement while SP4 represents early retirement. In the pictures the three groups (with different income replacement rates) are merged. In both cases, the modal difference is zero, indicating indifference between the alternatives, but there is substantial variation.

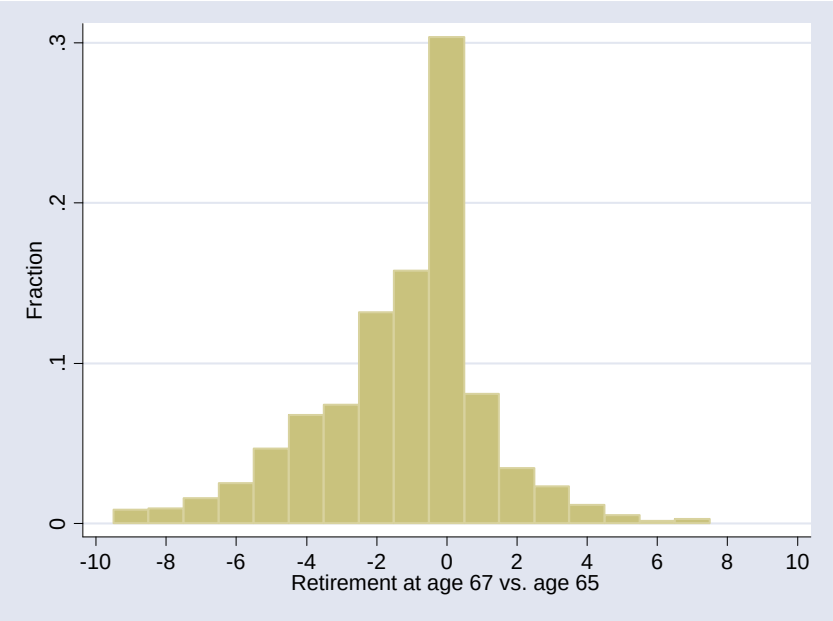

Figure 5. Histogram of SP2-SP1 (Postponed retirement - benchmark)

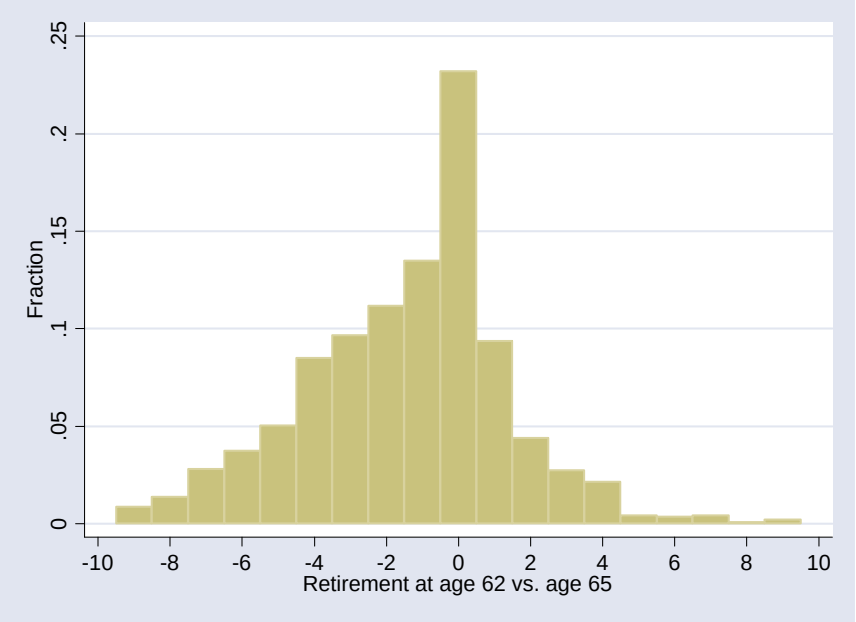

Figure 6. Histogram of SP4-SP1 (Early retirement - Benchmark)

Table 4 presents means and standard deviations of the evaluations SP2 to SP8 in deviations from the SP1 evaluation, separately for the three treatment groups. The table confirms the asymmetries in Figures 5 and 6: on average, almost all scenarios are rated less positively than the benchmark. Only scenarios 6 and 7, with

part-time work before age 65, are close to the benchmark. Perhaps this benchmark is so much the norm that status quo bias leads to its high ratings. SP3, the scenario where everyone works till age 70, is clearly evaluated as the least favorable one. SP5, the scenario with full retirement at age 60, seems to generate the largest dispersion. This is also the scenario where the pension benefit level seems to matter most, leading to substantial differences between the three groups (with replacement rates 40%, 50% and 60%).

For each of the seven questions SP2 - SP8, the differences between the three groups with different pension replacement rates are jointly significant at the 5% level. For SP2 – SP5 and for SP8, the first group gets a less attractive scenario than the second group, and the third group gets the most attractive scenario. The average evaluations reflect this, with much clearer differences between groups for SP4 and SP5 than for the other questions. For SP7, the order is reversed from most to least attractive, and this is also reflected in the means. For SP6, none of the three scenarios dominates any of the other two, so that we cannot a priori expect any ordering.

Table 4. Means and Standard Deviations of Stated Ratings

	Group I		Group II		Group III		P-value
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	
SP2-SP1	-1.40	2.47	-1.37	2.52	-0.98	2.32	0.0116
SP3-SP1	-2.57	2.98	-2.44	2.86	-2.10	2.67	0.0292
SP4-SP1	-1.75	2.90	-1.67	2.82	-0.78	2.63	0.0000
SP5-SP1	-2.32	3.12	-1.72	3.19	-0.28	3.08	0.0000
SP6-SP1	-0.60	3.07	-0.13	3.01	-0.03	2.64	0.0084
SP7-SP1	0.05	2.75	-0.30	2.57	-0.35	2.37	0.0381
SP8-SP1	-1.51	2.77	-1.12	2.61	-0.83	2.63	0.0008

Note: See Table 3 for a definition of the scenarios. All ratings are in deviations from the rating of the benchmark "standard retirement" scenario (SP1).
P-value: the p-value for a test that the three groups have equal means (obtained from linear regressions on group dummies).

5. Modeling Retirement Preferences

In this section we introduce a stylized model that can be estimated with the SP data at hand and that has enough structure to simulate preferences for alternative retirement trajectories. It is assumed that ratings reflect "life cycle utility" from age 60 onward. Utility is assumed to be additively separable over time. In each time period, within-period utility depends on leisure and income as follows: First, it depends on

whether respondents work the original number of hours before going into partial (or full) retirement, whether they work the reduced number of hours (60% of their original working week), or whether they do not work at all (full retirement). These are the only three choices considered in the SP questions; estimating a complete specification of the utility function as a function of all possible hours of work is beyond the scope of this paper. Second, within period utility depends on income as a percentage of pre (partial) retirement earnings, i.e., the percentages stated in the SP questions. We condition on pre (partial) retirement earnings and hours worked, and include these variables as taste shifters in the model. A special case of the model will be the case where utility depends on absolute income rather than relative income.

To be precise, we specify utility of individual *i* at age *t* as

$$u_{it}(L_t, Y_t) = \alpha_{0i} + \alpha_{Pit} D_P(L_t) + \alpha_{Rit} D_R(L_t) + \alpha_{Yit} \ln Y_t; t = 60, 61, ... \quad (1)$$

Here L_t is labor force status in period *t*, which can be: not retired $(D_P(L_t) = D_R(L_t) = 0)$; partially retired $(D_P(L_t) = 1; D_R(L_t) = 0)$; or fully retired $(D_P(L_t) = 0; D_R(L_t) = 1)$. Y_t denotes income in period *t* as a percentage of pre-retirement earnings, varying from 40 to 100 (see Table 3). The coefficient α_{Pit} indicates how respondent *i* values the additional leisure at age *t* associated with partial retirement (compared to the leisure associated with working pre-partial-retirement hours, the omitted labor force status). We expect this to be positive in most cases but do not impose this, since there may be people who do not prefer, for example, part-time work to full-time work, even when income is kept constant. Similarly, α_{Rit} indicates how respondent *i* values the additional leisure at age *t* associated with complete retirement and is also expected to be positive. The coefficient α_{Yit}, indicating how much the respondent appreciates additional income at age *t*, is also expected to be positive. Finally, the coefficient α_{0i} determines the level of all evaluations of respondent *i*, irrespective of income or labor force status.

The preference parameters of respondent *i* are allowed to depend on the respondent's observed and unobserved characteristics as follows:[7]

$$\begin{aligned} &\alpha_{0i} = X_i{}'\beta_0 + \eta_{0i}; \\ &\alpha_{Ait} = X_i{}'\beta_A + \gamma_A(t-60) + \eta_{Ai};\ A = P, R, Y;\ t = 60, 61, ... \end{aligned} \quad (2)$$

[7] In principle α_{0i} could also vary with age but the age effect is not identified (since everyone evaluates over the same age range).

Here X_i is a vector of taste shifters, including educational dummies, gender, age at the time of the survey (a cohort effect), and, as explained before, pre-retirement (and pre partial retirement) log hours worked and log earnings. The parameters γ_P and γ_R are expected to be positive, since respondents' disutility of working is expected to increase when they age. One reason for this may be deteriorating health, since in X_i, we can control for health at the time of the survey but not for expected future health (for the younger age groups) or past health (for the elderly). We have no a priori expectation concerning the sign of γ_Y.

The terms η_0, η_P, η_R, and η_Y reflect unobserved characteristics driving preferences (and, for η_0, the tendency to give higher or lower evaluations). They are the analogs of the random components of coefficients in SP studies of consumer choice, cf., e.g., Revelt and Train (1998). These unobserved heterogeneity terms are assumed to follow independent normal distributions with mean zero and variances to be estimated, independent of the characteristics X_i.[8]

Reported evaluations will be based on total utility over the life cycle, given by

$$U(L,Y,X_i)=\sum_{t=60}^{100}\delta^{t-60}u_{it}(L_t,Y_t) \tag{3}$$

Here $(L,Y)=(L_{60},Y_{60},...L_{100},Y_{100})$ denotes the complete scenario of labor force status and income from earnings and/or retirement benefits described in the SP question. The time horizon is somewhat arbitrarily fixed at 100 years of age; the discount rate δ also captures mortality risk – it can be seen as the product of the respondent's perceived survival probability (assumed constant) and the discount rate. Identification of δ appears to be hard in this model with the data at hand. Instead, we set δ equal to 0.90 (and test the sensitivity of estimates to this assumption in Section 5).

Allowing for "reporting error" in each of the reported evaluations, the observed reports on the discrete 1 to 10 scale will be modeled as follows:[9]

$$\begin{aligned} &E^*=U(L,Y,X)+\varepsilon \\ &E=k \text{ if } m_{k-1}<E^*\le m_k;\ k=1,...,10 \end{aligned} \tag{4}$$

[8] It seems natural to allow for a (positive) correlation between η_P and η_R, since both relate to the preference for leisure. We extended the model with such a correlation but found that it was insignificant and incorporating it did not change any of the results.

[9] Indices for respondents and scenarios are omitted for notational convenience.

Error terms ε are assumed to be i.i.d. normal with mean zero, independent of the random coefficients (i.e., independent of X, η_0, η_P, η_R, and η_Y. Threshold parameters $-\infty = m_0 < m_1 < ... < m_9 < m_{10} = \infty$ are the same for all respondents. By means of normalization of location and scale, m_1 is set to 1.5 and m_9 is set to 9.5.

This model is obviously not a complete structural life cycle model. For example, there is no saving and no uncertainty in this model. The latter seems reasonable since the scenarios sketched in the SP questions do not leave room for uncertainty. Uncertainty about, for example, future health may play a role when respondents make their evaluations, but cannot be incorporated explicitly due to lack of data. The no savings assumption is mainly for convenience, but also seems plausible because the framing of the SP questions does not suggest that respondents should take savings into account**.** Moreover, due to the system of occupational pensions, private savings for retirement play a limited role except for the self-employed (cf., e.g., Alessie, Kapteyn and Klijn, 1997, and Euwals, Eymann and Boersch-Supan, 2004).

Estimation

This model can be estimated by simulated maximum likelihood. This is similar to the estimation procedure for mixed logit and other random coefficient models, cf., e.g., Revelt and Train (1998). Conditional on the unobserved heterogeneity terms η_0, η_P ,η_R, and η_Y, an individual's likelihood contribution can be written as the product of all the probabilities of observed answers to the SP questions. This is a product of independent univariate normal probabilities. The unconditional likelihood contribution is the four-dimensional integral over possible realizations of η_0, η_P, η_R, and η_Y, approximated using simulated values based upon Halton draws.[10]

Estimation Results

Estimation results are presented in Table 5. The estimates of β_0 determine how the levels of the ratings vary with individual characteristics, irrespective of leisure and income. $X_i'\beta_0$ does not affect the choices between scenarios and can be interpreted as

[10] See Train (2003). Halton draws can achieve much larger precision than random draws for a given number of draws. Here we used 100 draws per respondent. Results with 200 draws per respondent were virtually identical.

determining how response scales vary with individual characteristics. Separately interpreting the coefficients in β_0 is not useful, since if characteristics change, the terms $\alpha_{Pit} D_P(L_t)$, $\alpha_{Rit} D_R(L_t)$ and $\alpha_{Yit} \ln Y_t$ will change as well.

The coefficients in β_P and β_R determine how the utility of working part-time or of not working at all, compared to the utility of working full-time, varies with individual characteristics. We find no gender effects on the utility of working part-time or not working compared to working full-time. The age terms imply significant cohort effects, with maximum utility of working part-time for birth cohort 1952 and maximum utility of not working at all for birth cohort 1954. Married and partnered respondents have a preference for less work (part-time compared to working full-time).

Table 5. Estimation Results Preferences Model

	β_0		β_P		β_R		β_Y	
	Coeff.	T-val.	Coeff.	T-val.	Coeff.	T-val.	Coeff.	T-val.
constant	4.123	1.18	-2.398	-6.46	-3.513	-4.37	-1.023	-1.45
female	-0.081	-0.18	0.061	1.22	0.119	1.15	0.002	0.02
age/10	-0.192	-0.21	0.516	5.24	0.616	3.08	-0.111	-0.61
(age/10)^2	-0.001	-0.01	-0.050	-5.43	-0.057	-3.06	0.015	0.86
partner	-0.402	-0.92	0.110	2.10	0.107	1.08	0.066	0.75
low educ	-0.990	-2.08	0.116	2.17	0.174	1.63	0.201	2.12
medium edu	-1.094	-2.60	0.142	2.88	0.254	2.62	0.214	2.55
home owner	0.286	0.65	-0.022	-0.44	0.041	0.41	-0.071	-0.81
fair/pr hl	0.471	0.68	-0.051	-0.65	-0.237	-1.50	-0.069	-0.50
good hlth	-0.714	-1.93	0.081	1.94	0.136	1.60	0.150	2.03
log earn	-0.622	-2.46	0.031	1.18	0.143	2.46	0.125	2.47
d earn mis	-4.737	-1.89	0.088	0.35	1.088	1.89	0.953	1.91
log hours	-0.465	-0.89	0.286	5.13	0.092	0.79	0.086	0.82
γ			0.118	10.92	0.275	14.99	0.043	2.94
sigma eta	0.006	0.46	0.153	4.07	0.205	16.29	0.051	32.81

Auxiliary parameters:	Coeff.	S.e.
Sigma epsilon	2.182	0.019
Thresholds		
1	1.5	--
2	2.484	0.022
3	3.417	0.029
4	4.215	0.034
5	5.202	0.039
6	6.102	0.044
7	7.175	0.049
8	8.480	0.049
9	9.5	--

Lower education levels lead to higher appreciation for less work, possibly reflecting better job quality and satisfaction of the highly educated. On the other hand, keeping education level (and other characteristics in X_i) constant, the people with the

higher pre-retirement earnings seem to have the largest preference for not working. This may reflect an income effect, if leisure (over the life-cycle) is a normal good. The effects of home ownership and (self-assessed) health at the time of the interview are insignificant. The people who work more hours before (partial) retirement have the largest preference for partial retirement (keeping earnings, income percentage, and other factors constant). Finally, the estimates of γ_P and γ_R show that preferences for partial or full retirement increase in a given period significantly with age in that period, and the effect on full retirement is much larger than that on partial retirement. This may, for example, be due to reference group effects or social norms, or expected health deterioration.

The final columns present the estimates of the marginal utility of log income. The effects of gender, age and marital (partner) status are insignificant. Lower educated respondents attach more value to a higher replacement rate in partial or full retirement, conditional on pre-retirement earnings and hours. Conditional on education level, however, the high-income respondents attach more value to a higher replacement rate. Again, the effect of health at time of the interview is not so clear, with the intermediate group (good health) giving the highest value to income. Those for whom no earnings information is available are similar to those with average log earnings. Other variables are insignificant, including home ownership, log hours worked and birth cohort.

There is no evidence of unobserved heterogeneity in α_0, but there is significant heterogeneity in α_P, α_R, and α_Y. Allowing for the unobserved heterogeneity terms, we find that the fraction with negative marginal utility of a higher replacement rate is virtually zero, which seems supportive of the quality of the data and the specification of the model. Similarly, we find that more than 95% of all respondents prefer working reduced hours or not working at all to working full-time. Only in the age range 60-64, a minority of respondents would like to work part-time (less than 10%) or full-time (about 20%), keeping income constant. This may be due to the imposed linearity of the age term in this stylized model.[11]

[11] We tried quadratic trends but this led to convergence problems.

6. Simulations

Table 6 presents results of some simulations based upon the estimates in Table 5. The table presents the choice probabilities for alternative retirement scenarios, assuming there are only two alternatives: the benchmark of retiring at age 65 with a pension equal to 70% of final earnings, or the scenario that is described. Choice probabilities are averaged over the sample, accounting for observed and unobserved individual heterogeneity (the unobserved heterogeneity terms are drawn from their estimated distributions). The first probability in the table takes full account of the noise in the utility evaluations. That is, we assume that the individual chooses the option that gives the largest value of E^* in equation 4, with independent errors ε across the two alternatives. The assumption that RP data on actual decisions contain the same amount of optimization or reporting error as stated preference data is criticized in the literature, where it is found that preference parameters based upon RP data and SP data are usually in line with each other, but that the noise levels can differ (cf. Louviere et al, 2002). Therefore the final column of the table presents the aggregate choice probabilities under the assumption that people make no optimization errors. In this case every individual chooses either the benchmark or the alternative without any noise, but due to observed and unobserved heterogeneity, the fractions choosing the alternative are not equal to zero or one.

The first four scenarios are traditional retirement scenarios, without gradual retirement. The first two scenarios involve postponing retirement to age 70, with financial compensation in the form of a higher pension. In the first scenario, the replacement rate is raised from 70% to 90%, in the second case to 100%. Although the latter is approximately actuarially fair, this is still not enough to convince many people to postpone retirement to age 70. Only 0.13% of all respondents would choose this alternative if no optimization errors are made. This corresponds to the relatively low evaluations of the late retirement scenarios in the raw data.

Scenarios 3 and 4 involve complete retirement at age 62. In scenario 3, the price for early retirement is a 10%-points reduction in the replacement rate, less than actuarially fair. About 68% of all respondents would choose this option instead of the benchmark with retirement at age 65. Apparently, however, the utility difference with the benchmark scenario is often quite small, so that if optimization errors play a role, the number of respondents choosing this alternative would go down to only 53%. Scenario 4 increases the price of early retirement beyond what is actuarially fair – a

20%-points reduction of the replacement rate. Respondents appear to be quite sensitive to this: for only 11%, this scenario would be preferred to the benchmark.

The other scenarios involve gradual retirement. Scenarios 5, 6 and 7 have partial retirement two years before the benchmark retirement age of 65 years, and full retirement two years after the benchmark retirement age. Scenario 5 is close to "symmetric" compared to the benchmark plan with partial retirement income right in between full-time earnings and full retirement pension income. This scenario is more attractive than the benchmark for about 66% of all respondents. Increasing income during partial retirement (scenario 6) or full retirement (scenario 7) makes the scenario even more attractive. Income after full retirement has a stronger effect, due to the longer time period that this is received (and the fact that the marginal utility of income increases with age - the estimate of γ_Y in Table 5 is positive and significant).

Table 6. Simulated Choice Probabilities: Alternatives to the Benchmark

Scenario	Partial retirement Age	Partial retirement % Income	Full retirement Age	Full retirement %Income	Prob. with error	Prob. without error
1: Postponed retirement	--	--	70	90	18.44	0.04
2: Postponed retirement	--	--	70	100	21.78	0.13
3: Early retirement	--	--	62	60	53.41	68.21
4: Early retirement	--	--	62	50	39.68	11.32
5: Partial retirement	63	85	67	70	52.64	66.34
6: Partial retirement	63	100	67	70	55.23	77.79
7: Partial retirement	63	85	67	80	60.06	91.30
8: Late partial retirement	65	90	70	90	42.49	20.12
9: Late partial retirement	65	100	70	100	49.16	47.16
10: Early partial retirem.	60	75	65	60	54.91	69.17

Notes:

"Prob." is the probability that the given scenario is preferred to the benchmark, which is full retirement at age 65 for a 70% net pension.

"With error": probability allowing for optimization errors of the same size as the errors in the observed evaluations;

"Without error": probability assuming no optimization error.

While we found that hardly anyone would want to work full-time until age 70, many more people would be willing to work part-time until that age. This is borne out by scenarios 8 and 9, which involve reduced working hours from age 65 till age 70 and full retirement at age 70. Scenario 8 gives a 20 %-points premium on income after age 65 compared to the benchmark, in return for working 60% of the pre-retirement

working week for five years. This is an attractive alternative for 20% of all respondents, still a small minority, but many more than in scenarios 1 and 2. A higher compensation for the additional work as in scenario 9 raises the fraction of respondents for whom this is more attractive than the benchmark to 47%.

Finally, scenario 10 is a form of early gradual retirement at age 60. In spite of the lower replacement rates, this scenario would be preferred to the benchmark by a majority of the respondents. This scenario is about equally attractive as full-time retirement at age 60 with the same replacement rate (scenario 3).

Table 10 presents results of some simulations using the data on retirement flexibility and the opportunity for partial retirement described in Section 3. The sample is based on respondents for whom the latest possible retirement age is strictly higher than the earliest possible age (1007 observations). Reporting and optimization errors are not taken into account. Simulation 1 in Table 10 just allows two choice opportunities: full retirement at the earliest and the latest age, with the respondents' self-reported pension percentages. We find that a large majority would prefer retirement at the earliest possible age to retirement at the latest possible age. This is not so surprising, given the fact that the difference between the average income percentages at the latest and earliest retirement age is only 6.24%, for an average age difference of 4.77 years. Obviously, from the point of view of actuarial fairness, this will generally imply that early retirement is a much better deal than late retirement.

The second simulation in Table 10 introduces the possibility of partial retirement at the earliest possible age and full retirement at the latest possible age, with an income scheme that is a weighted average of the schemes of the options of full retirement at earliest and latest possible age (see notes to Table 10 for details). It assumes that each of the 1007 respondents considered here has this option. This additional option appears to be quite attractive. More than two fifths of the 67.1% who would choose earliest possible retirement if the choice was between early and late, would now choose partial retirement. Moreover, more than two fifths of the 32.9% who would choose the latest possible retirement would now also opt for partial retirement. In total, 43% of all respondents would choose partial retirement, and because most of this comes from the "early retirees" in the first simulation, total labor supply would increase substantially.

Finally, simulation 3 repeats this but then only for those who report that their (previous) employer is expected to offer (or would have offered) an opportunity for

partial retirement. Of the group of 1007 observations considered here, 40.8% report that there is such an option, 6.6%-points more than in the complete sample (due to the high correlation between flexibility in terms of retirement age and flexibility in terms of reducing hours). The questionnaire does not ask about the exact nature of the partial retirement opportunity, so we use the same partial retirement scenario as in simulation 2. The result is very similar as for simulation 2, with an even somewhat higher percentage of respondents choosing partial retirement. Apparently, the characteristics that make respondents more likely to have the opportunity of partial retirement also make them somewhat more likely to have a preference for part-time work as a bridge to full retirement.

Table 10: Simulated Choice Probabilities: Retirement at Latest or Earliest Possible Age and Partial Retirement

	Prob. Earliest Age	Prob. Latest Age	Prob. Partial
1: No partial retirement	67.1	32.9	--
2: Partial retirement option for everyone	37.6	19.3	43.1
3: Partial retirement for those with access to partial retirement	36.2	20.1	43.7

Notes:

Prob. earliest age, prob. latest age: probabilities (in %) to choose full retirement at earliest and latest possible age (no period of partial retirement). Income percentage set equal to reported percentage if retiring at earliest or latest possible age (imputed if missing)

Prob. partial: probability (in %) to choose partial retirement, defined as full-time work until earliest possible retirement age, working 60% of pre-retirement hours from earliest to latest possible retirement age. Income after full retirement: 0.6 times reported percentage at latest age plus 0.4 times reported percentage at earliest age. Income during partial retirement: 0.4 times income after full retirement plus 0.6 times pre-retirement earnings.

1, 2: observations with earliest retirement age < late retirement age only

3: only the observations used in 1 and 2 who report that their employer offers/would have offered partial retirement (40.8% of the 1007 observations).

In Tables 11 and 12, we analyze the sensitivity of the simulation outcomes in Tables 9 and 10 to some of the specification choices made in the stylized model. Model 0 is the model discussed above, on which Tables 9 and 10 are based. Models 1 and 2 are identical to Model 0 except for the discount rate – it is set to 0.95 in model 1 and to 0.85 in model 2. Model 3 uses only the sub-sample of workers 55 or younger, excluding the retired. This is because SP questions looking back to the last job before

retirement may give rather different answers than looking ahead to future retirement opportunities. Finally, model 4 accounts in a simple way for a potential "status quo" bias in evaluating scenario 1, the benchmark scenario of full retirement at age 65 for a 70% net replacement rate. It adds a fixed utility to that scenario, the same for all respondents. The estimated value of that utility is positive (as expected) and significant (0.249 with standard error 0.013).

Table 11 shows that the qualitative conclusions from Table 9 remain valid in the alternative specifications, although the probabilities sometimes change substantially. The rank order of the alternatives remains similar, with very few people attracted by the late full-time retirement scenarios 1 and 2, and with the highest scores for the scenario with part-time retirement at age 63 and full-time retirement at age 67, with an 80% replacement rate in full retirement (scenario 7).

Table 11. Sensitivity of Analysis Choice Probabilities - Alternatives to the Benchmark (cf. Table 9)

Scenario				Probability				
Part. ret.		Full ret.		Model 0	Model 1	Model 2	Model 3	Model 4
Age	%Inc.	Age	%Inc.					
1	--	--	70	90	0.0	0.0	0.1	0.0	0.0
2	--	--	70	100	0.1	0.1	0.3	0.0	0.1
3	--	--	62	60	68.2	70.4	65.8	72.5	77.7
4	--	--	62	50	11.3	4.3	17.0	17.8	4.2
5	63	85	67	70	66.3	68.4	62.9	70.1	80.6
6	63	100	67	70	77.8	80.5	77.3	79.8	89.0
7	63	85	67	80	91.3	89.3	91.6	93.7	96.9
8	65	90	70	90	20.1	11.8	24.5	23.6	12.9
9	65	100	70	100	47.2	37.4	52.5	51.2	61.9
10	60	75	65	60	69.2	69.3	68.1	75.9	79.3

Notes:
"Prob." is the probability that the given scenario is preferred to the benchmark, which is full retirement at age 65 for a 70% net pension, assuming no optimization error.
Model 0: benchmark (used in Table 9); model 1: δ=0.95; model 2: δ=0.85; model 3: only 55 and younger (both in estimation and simulation); model 4: model with status quo bias.

The same conclusion can be drawn from Table 12, which considers the same scenarios as Table10. According to all models, there would be substantial scope for a gradual retirement scenario with income during gradual retirement and a replacement rate after full retirement in a reasonable range.

Table 12: Sensitivity Analysis of Simulated Choice Probabilities: Retirement at Latest or Earliest Possible Age and Partial Retirement (cf. Table 10)

	Model 0		Model 1		Model 2		Model 3		Model 4	
	Late	Part.	Late	Part.	Late	Part.	Late	Part.	Late	Part.
1: No partial.	32.9	----	29.4	----	35.2	----	19.1	----	28.0	----
2: Part. Ever.	19.3	43.1	18.3	48.0	19.4	39.5	15.5	44.8	18.0	48.2
3: Part. Acc.	20.1	43.7	19.1	48.8	20.3	40.1	18.4	44.8	18.9	48.8

Notes:

Prob. latest age: probabilities (in %) to choose full retirement at earliest and latest possible age (no period of partial retirement). Income percentage set equal to reported percentage if retiring at earliest or latest possible age (imputed if missing)

Prob. partial: probability (in %) of choosing partial retirement, defined as full-time work until earliest possible retirement age, working 60% of pre-retirement hours from earliest to latest possible retirement age. Income after full retirement: 0.6 times reported percentage at latest age plus 0.4 times reported percentage at earliest age. Income during partial retirement: 0.4 times income after full retirement plus 0.6 times pre-retirement earnings.

Prob. Earliest age: not reported (cf. Table 10)

Simulation scenarios:

1, 2: observations with earliest retirement age < late retirement age only

3: only the observations used in 1 and 2 who report that their employer offers/would have offered partial retirement (40.8% observations for models 0, 1, 2 and 4; 44.9% for model 3 with the younger than 56 sample only).

6. Conclusions

We have analyzed data on current and former employees' perceptions of retirement flexibility at their current or previous employer, and on their stated preferences for early, late, and gradual retirement. We find that employees often report opportunities for retiring early, whereas it is less common that they can retire later than at the benchmark age or can retire in steps, first reducing their hours worked. Only 34% report that they have such an option. This makes clear that analyzing retirement preferences on the basis of actual behavior without accounting for restrictions imposed by employers and occupational pension plans may give biased estimates of employee preferences. Instead, we have asked respondents to rate how attractive they find hypothetical, simplified retirement trajectories. These ratings were used to estimate a stylized structural model of retirement behavior. The descriptive statistics suggest that people are reasonably satisfied with retiring at the benchmark age. The most salient finding in the ratings is a general aversion against working full time after the age of 65.

Simulations based upon a model explaining the stated choices confirm that, in the Netherlands, it is quite difficult to convince people to keep working full-time after

age 65, even with substantial financial incentives. On the other hand, many more people would agree to keep working part-time after age 65, if given the option to gradually reduce hours worked by 40% before retiring completely. Increasing opportunities for partial retirement thus seems a potentially powerful tool to increase labor force participation and average hours worked of age groups around the retirement age. A remaining issue not addressed in this paper is how offering partial retirement can be made more attractive for employers.

This paper can be seen as a pilot project for using subjective data on perceived employer imposed restrictions and stated preferences for retirement to analyze retirement behavior. The preference specification is stylized and we cannot claim that it provides an accurate description of all features playing a role in the retirement decisions of employees. Still, the results are encouraging, and suggest that it would be worthwhile collecting richer data of a similar nature, creating opportunities for analyzing more realistic structural models, allowing, for example, for savings and uncertainty.

References

Alessie, R., A. Kapteyn and F. Klijn (1997), Mandatory pensions and savings in the Netherlands, *De Economist*, 291-324.

Barsky, R. B., F. T. Juster, M. D. Shapiro (1997), Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study, *The Quarterly Journal of Economics*, 112(2), 537-579.

Euwals, R., A. Eymann and A. Boersch-Supan (2004), Who determines household savings for old age? Evidence from Dutch panel data, *Journal of Economic Psychology*, 25(2), 195-211.

Hurd, M. (1990), Research on the elderly: economic status, retirement, and consumption and saving, *Journal of Economic Literature*, 28(2), 565-637.

Hurd, M. (1996), The effect of labor market rigidities on the labor force behavior of older workers, in *Advances in the Economics of Aging*, D. Wise (ed.), University of Chicago Press, Chicago.

Latulippe, D. and J. Turner (2000), Partial retirement and pension policy in industrialized countries, *International Labour Review*, 139(2), 179-195.

Lazear, E. (1986), Retirement from the labor force, *Handbook of Labor Economics, Vol. 1*, , O. Ashenfelter and D. Card (eds.), North-Holland, Amsterdam, 305-355.

Louviere, J., D. Hensher and J. Swait (2002), Stated Choice Methods, Cambridge University Press, Cambridge.

Lumsdaine, R. and O. Mitchell (1999), New developments in the economic analysis of retirement, *Handbook of Labor Economics, Vol. 3C*, O. Ashenfelter and D. Card (eds.), North-Holland, Amsterdam, 3261-3307.

Nelissen, J. (2001), Het effect van wijzigingen in vervroegde uittredingsregelingen op de arbeidsparticipatie van oudere werknemers, Ministry of Social Affairs and Employment, The Hague.

Revelt, D. and K. Train (1998), Mixed logit with repeated choices: Household choices of appliance efficiency level, *Review of Economics and Statistics* 80, 647-657.

Rust, J. and C. Phelan, (1997), How social security and Medicare affect retirement behavior in a world of incomplete markets, *Econometrica*, 65(4), 781-832.

Scott, J. (2004), Is phased retirement a state of mind? The role of individual preferences in retirement outcomes, paper presented at the Annual Meeting of the Population Association of America, Boston.

Stock, J. and Wise (1990a) "Pensions, the Option Value of Work and Retirement", *Econometrica* 58(5) 1151-1180.

Train, K. (2003), *Discrete Choice Methods with Simulation*, Cambridge University Press, Cambridge.

Van Rooij, M., C. Kool and H. Prast (2007), Risk-return preferences in the pension domain: are people able to choose?, *Journal of Public Economics*, forthcoming.

Appendix

This appendix presents the results of multivariate regressions concerning earliest and latest retirement age and retirement income percentages that respondents expect to receive when retiring at these ages. See section 3.

Table A1. Regressions Explaining Retirement Age

	Earliest age		Latest age		Age range	
diff	Coef.	t-val	Coef.	t-val	Coef.	t-val
constant	61.015	68.39	68.433	112.60	7.639	5.19
age	0.007	0.58	-0.049	-5.97	-0.057	-3.02
female	-0.407	-1.81	-0.141	-0.94	0.172	0.47
primary	0.215	0.38	-0.304	-0.89	-0.705	-1.02
lowvoc	0.572	1.58	-0.536	-2.10	–1.156	-1.95
intvoc	0.262	0.70	-0.801	-3.12	–1.241	-2.17
intgen	0.689	1.75	-0.358	-1.32	–1.537	-2.83
higvoc	-0.069	-0.18	-0.514	-2.10	-0.435	-0.74
Lfs_work	0.431	1.17	-0.438	-1.80	-0.659	-1.22
Observations	1131		1110		1091	
R-squared	0.012		0.061		0.027	
Root MSE	3.37		2.36		5.11	

Notes: Age groups <56 and >64
Age range: latest age at which respondent can retire – earliest age at which respondent can retire
Lfs_work: dummy; 1 if currently working (full-time or part-time)
Respondents aged 55-65 excluded (to avoid the problem that their labor force status may be endogenous to their retirement opportunities)
Lowvoc, intvoc, intgen, higvoc: dummies for lower, intermediate, and higher vocational (voc) or general(gen) education. Benchmark: university education.

Table A2. Regressions Explaining Retirement Income

	Percentage earliest age		Percentage latest age		Difference Percentages	
diff	Coef.	t-val	Coef.	t-val	Coef.	t-val
constant	74.995	29.50	77.923	29.91	0.061	0.02
ret age diff	-0.390	-2.30	0.919	5.05	1.131	4.67
age	-0.059	-1.65	-0.088	-2.40	-0.020	-0.47
female	-2.967	-3.87	-0.910	-1.12	1.139	1.27
primary	3.604	1.90	2.654	1.19	-0.521	-0.18
lowvoc	5.876	5.13	4.874	3.98	-1.121	-0.76
intvoc	4.663	4.45	4.313	3.79	-0.672	-0.50
intgen	3.937	3.14	1.360	0.99	-2.669	-1.56
higvoc	1.553	1.58	1.220	1.11	-0.021	-0.02
lfs work	-4.152	-3.72	-1.327	-1.14	4.090	3.06
Observations	916		920		709	
R-squared	0.081		0.073		0.098	
Root MSE	10.33		10.28		10.84	

Notes: Age groups <56 and >64.
Percentage earliest/latest age: Net pension income as a percentage of last net earnings when respondent would retire/have retired at earliest/latest retirement age.
Difference percentages: percentage at latest retirement age minus percentage at earliest retirement age; only for those for whom these ages are different.
Ret age diff: standard retirement age -/- earliest possible retirement age (columns 2-3), latest possible retirement age -/- standard retirement age (columns 4-5), or latest possible retirement age -/- earliest possible retirement age (columns 6-7).
Lfs work: dummy; 1 if currently working (full-time, part-time or self-employed).