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RETIREMENT EXPECTATIONS AND SATISFACTION WITH RETIREMENT PROVISIONS

by Jochem de Bresser*

University of Groningen

and

Arthur van Soest

Tilburg University and Netspar

This paper investigates the relationship between subjective expectations regarding the replacement rate of income at retirement and several measures of pension satisfaction. We use panel data on Dutch employees, analyzed with fixed effects models, allowing for correlation between unobserved heterogeneity in satisfaction and optimism or pessimism in expectations. The level of the expected replacement rate is found to be positively related to satisfaction: respondents who revise their expectations of the level of their replacement rate upwards tend to become more satisfied with their pension provisions, in particular with the level of the expected benefits. We do not find robust evidence for a relationship between uncertainty and pension satisfaction.

JEL Codes: D84, H55, I31

Keywords: retirement, subjective expectations, subjective wellbeing

1. Introduction

This paper analyzes the determinants of satisfaction with various dimensions of pension arrangements, emphasizing the role of subjective expectations regarding retirement income. The data come from a longitudinal sample of Dutch wage workers observed during five consecutive years. We consider satisfaction with the age at which workers expect to retire, with the level of the pension benefits they expect to receive, with the knowledge they have of their pension arrangements, with the overall nature of their pension plan, and with the Dutch pension system in general.

Pension satisfaction and its determinants is of substantial importance, since the preferences of citizens can have a profound effect on welfare state policies in many countries (Cremer and Pestieau, 2000; Brooks and Manza, 2007). Understanding the determinants of such preferences is therefore directly relevant for those who want to maintain support for pension systems in the current times of necessary reforms (O'Donnell and Tinios, 2003). Moreover, pension satisfaction is

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*Correspondence to: Jochem de Bresser, University of Groningen, P.O. Box 800, 9700 AV Groningen, The Netherlands (j.debresser@gmail.com).

closely related to general job satisfaction (Luchak and Gellatly, 2002), which in its turn is an important driver of satisfaction with life or happiness (Van Praag *et al*., 2003).

In particular, we test whether the expected replacement rate of income at retirement and the associated uncertainty affect pension satisfaction. We expect that higher expected replacement rates lead to higher satisfaction with personal pension provisions, in particular satisfaction with the benefit level. It is less clear, however, if a higher replacement rate also leads to more satisfaction with the system as a whole. This would suggest that satisfaction with the pension system is partly driven by self-interest, and the existing evidence on this seems inconclusive (O'Donnell and Tinios, 2003; Lynch and Myrskylä, 2009).

Analyzing the predictive power of expectations for satisfaction scales is also of relevance by itself, since it provides insight into the validity of expectations data on a relatively difficult topic. Expectations about retirement are relevant, since they affect the saving behavior of pre-retirees (Bottazzi *et al*., 2006). Previous research indicates that subjective expectations correlate with background characteristics in sensible ways (Manski, 2004), and the validity of expectations data has been established in this way mainly for conceptually straightforward examples such as individual mortality. We contribute to the literature by focusing on replacement rates. Moreover, the combination of panel data and several satisfaction scales allow us to go beyond the correlation of expectations with background characteristics, providing a stricter test for the validity of the expectations data.

We apply two different methods to construct subjective replacement rate distributions from the reported probabilities. The first, proposed in Dominitz and Manski (1997), fits an assumed underlying (log-normal) distribution for each observation by minimizing the squared difference between the probabilities implied by the assumed distribution and those reported in the data. Our second approach, adapted from Bellemare *et al*. (2012), uses spline interpolation to fit a subjective distribution that passes through the points corresponding to the probabilities reported by the respondents. This procedure is non-parametric, in the sense that it does not assume any parametric form of the underlying distribution.[1] Both methods allow calculating the median and standard deviation of the subjective distribution for each observation, which are then used as explanatory variables in models explaining the satisfaction scales.

Our results indicate that the median replacement rate of the respondent's subjective distribution affects satisfaction with various aspects of the pension arrangement significantly and with the expected sign. This finding is robust across parametric and non-parametric specifications of the subjective probability distributions. On a methodological level, the use of Fixed Effects (FE) estimation appears to mitigate the endogeneity of expectations with respect to unobserved heterogeneity. This is evident from Hausman tests comparing the coefficients on the expected replacement rate across Random Effects (RE) and FE models. The expected replacement rate enters almost all satisfaction regressions significantly

[1]The only assumptions imposed by spline interpolation are continuity and smoothness of the distribution function. Hence, the procedure can be used to approximate a large class of subjective distributions.

when we estimate RE models, even those that concern satisfaction with the system as a whole instead of one's personal situation. In the FE models, on the other hand, only those scales related to overall satisfaction with personal provisions and satisfaction with expected pension benefits are affected by the median subjective replacement rate. We interpret this as evidence that there is indeed a part of the error term, say "general optimism," that is correlated with our measures of expectations. Once we remove all unobserved, time-constant, factors from the error term, all correlations but those that we would expect a-priori to be important lose their significance. Time varying optimism, or mood effects, are not a likely explanation of these results, because our satisfaction scales are not elicited in the same survey as the expectations.

On the other hand, our FE models for the complete sample (ages 25 and older) do not provide evidence that pension satisfaction is related to subjective replacement rate uncertainty. The results therefore suggest that the expected benefit level is the more salient concern in our sample, even though the insignificance of uncertainty might reflect attenuation bias stemming from measurement error. These patterns persist if we estimate models on the subsample of respondents that provide logically consistent probabilities and if we limit the sample to middle aged respondents. We do find some evidence in RE models that more uncertain individuals tend to be less satisfied with their pension overall, if we control for aspect satisfaction. Hence our results suggest that pension satisfaction of all age groups is affected by the level of the expected pension income, but that uncertainty with respect to pension income is less important.

The structure of the paper is as follows. Section 2 provides a short summary of the related literature. Section 3 describes the institutional context of the Dutch pension system. Section 4 provides more details on our data. Section 5 introduces the econometric models used to relate satisfaction scales to expectations. Section 6 describes the subjective distributions of the replacement rates and Section 7 presents the empirical analysis of the effects of replacement rate expectations on pension satisfaction. Section 8 concludes.

2. Literature

The present paper is primarily concerned with the validity of subjective expectations elicited through probabilistic measures and with the causal impact of expectations on wellbeing. Interest in the direct measurement of expectations has increased considerably since the early 1990s, as expectations are of key interest in intertemporal economic models and measuring expectations helps to avoid making strong assumptions (Manski, 2002, 2004).

The measurement of expectations in terms of probabilities has become widespread in economics. As noted by Dominitz (1998), the main advantages of probabilistic questions are ease of interpretation, interpersonal comparability, and the ability to characterize uncertainty. Moreover, survey respondents are generally willing and able to think probabilistically and tend to do so using the full expanse of the 0–100 percent chance scale (Dominitz and Manski, 1997; Hurd and McGarry, 2002; Manski, 2004). Dominitz and Manski (2006) measured expected

old age social security benefits in the U.S. using subjective probability questions and found large uncertainty and heterogeneity. They emphasized the additional information contained in probability questions compared to traditional questions on point forecasts.

While it is impossible to verify whether reported probabilities reflect the actual beliefs held by respondents, a lot of effort has been exerted to assess the internal consistency and plausibility of responses. On the whole, the evidence suggests that responses have such "face validity" when the questions concern well-defined events that are relevant to respondents' lives (Manski, 2004). For instance, Dominitz (1996) finds that individuals' income expectations are stable across successive waves of the HRS. Hurd and McGarry (2002) find that mortality expectations contain an element of expectation that subjective health indicators do not, because the death of a parent affects expectations but not measures of present physical health. Another branch of support for the validity of probabilistic expectations data derives from plausible correlation patterns between expectations and socio-demographic covariates. For instance, earnings expectations are found to be more uncertain among the self-employed than among wage workers (Dominitz, 1998). Also, the median expected income one year in the future is lower for those who fear job loss, while reported uncertainty is greater (Dominitz, 1998). Such intuitive correlation patterns are also found in data from the Netherlands; see Das and Donkers (1999).

The measurement of subjective wellbeing by means of satisfaction scales is commonplace in the applied literature. The reliability of such data in the context of general life satisfaction has been confirmed through tests of their stability over time (Krueger and Schkade, 2008). Several studies have looked into the relationships among general satisfaction and satisfaction with aspects of life, suggesting that the latter is the product of complex interactions of the former (e.g., Van Praag *et al.*, 2003). Similarly, we will analyze overall pension satisfaction in isolation and while controlling for interdependencies between satisfactions with various aspects of pensions. To the best of our knowledge, this paper presents the first effort that combines data on probabilistic expectations with satisfaction scales.

Some related studies look at the opinions and preferences for pension arrangements in different ways than using satisfaction questions. Luchak and Gellatly (2002), analyzing data from a large firm in Ontario, found a negative relation between pension accruals on job satisfaction, implying that those with a large (pension) incentive to stay on the same job are also less satisfied with that job. Van Groezen *et al.* (2009) analyze preferences for public, occupational, or private pensions using data from the Eurobarometer on 15 different countries and find that current pension provision has a larger explanatory power than personal characteristics. They emphasize the impact of citizens' preferences on welfare state policies. Lynch and Myrskylä (2009), on the other hand, find no relation between public pension levels and support for reform of the pension system among 45+ survey respondents in 11 European countries. Using unique data on satisfaction with various aspects of pension arrangements, we can test more directly whether people who expect to benefit more are also more satisfied with their pension arrangements.

3. Institutional Background

In the Netherlands, it is common to think of income during retirement in terms of four categories or pillars. The first pillar consists of public pensions that cover everybody who lived in the Netherlands between the ages of 15 and 65. This public pension (or AOW in Dutch), aims to provide retirees with a subsistence income during retirement. Its level is set in relation to the minimum wage and depends only on the number of years spent abroad during the accumulation period (payments are cut with 2 percent for each year spent abroad between age 15 and 65). The second pillar is that of occupational pensions that cover 90 percent of Dutch workers (Bovenberg and Meijdam, 2001). The level of occupational pensions depends on the final or average wages of the individual worker throughout the accumulation phase. Though occupational pensions are mostly defined benefit, the possibility of incomplete adjustment for inflation introduces some uncertainty in payments. Together the first two pillars of the pension system replace on average 70 percent of gross final income (Bovenberg and Meijdam, 2001). The third pillar offers saving vehicles aimed specifically at generating additional retirement income, such as life annuities. In contrast to the first two pillars, such third pillar pensions are voluntary and usually of the defined contribution type. The fourth pillar contains all other assets that individuals may decumulate to generate income during retirement, such as savings accounts and housing wealth.

The provision of information about pensions changed in the middle of our sample period. After some pension funds and financial institutions started providing standardized information about pensions to their members in 2007, the release of a yearly Universal Pension Overview (UPO) by pension funds and insurers became mandatory in 2008. UPOs give participants in second and third pillar plans yearly updates on their current entitlements and projected entitlements at age 65 conditional on continuation of the current employment situation.

4. Data

The data are taken from the Netspar Pension Monitor (NPM), a survey initiated and funded by Netspar and administered to participants of the CentERpanel, an ongoing online panel survey administrated by CentERdata at Tilburg University.[2] The CentERpanel covers the population in the Netherlands of ages 16 and older and is composed of over 3000 households in which one or more adults are invited to complete questionnaires at home every week over the internet. Households are randomly selected and those without prior internet access are given access and the necessary equipment by CentERdata. About 75 percent of all panel members respond to the questions in a given weekend. Attrition is low, making longitudinal research possible. Rich background information about the panel respondents is available from previous interviews.

The questionnaires of the NPM are distributed to all CentERpanel members of ages 25 and older. We use data from the period 2006–10. The NPM consists of short monthly questionnaires including the questions on satisfaction with pension

[2]See http://www.centerdata.nl/en/centerpanel.

provisions and the pension system, and a longer annual survey including the questions on expected replacement rate. The monthly questionnaires were distributed to one third of the sample each month, so that every participant in the CentERpanel aged 25 or older got the questions on satisfaction once every three months. Since the annual data on replacement expectations were always collected in June, we used the monthly data on satisfaction obtained in May, June, or July.[3] In this way replacement rate expectations and pension satisfaction are measured at approximately the same time. On the other hand, it should be emphasized that annual and monthly surveys were always administered in different weekends, so that satisfaction and replacement rate expectations were never measured in the same weekend. This prevents mood effects playing a role as confounding factors (see below).

The satisfaction scales measure satisfaction with (aspects of) own pension provisions, as well as with the Dutch system of income provision for the elderly as a whole. Five questions were asked, using the same ten-point answering scale from not at all satisfied (1) to completely satisfied (10). See the top panel of Table A1 in Appendix A for the exact question wordings. In addition to overall satisfaction with personal pensions, the questions refer to satisfaction with the expected retirement age, the expected post-retirement benefit level, and the knowledge on one's personal pension provisions. The importance of these dimensions of pension arrangements is emphasized by, for example, Hyde *et al.* (2007). Furthermore, we include satisfaction with the system as a whole, which, in contrast to the other scales, does not refer to the individual's personal situation.

In addition to estimating models explaining each of the reported satisfaction levels, we also estimate a model explaining overall pension satisfaction from satisfaction with the aspects. The latter specification postulates that overall satisfaction is composed of satisfaction with various aspects of the phenomenon under consideration, as is common in the "domains of life" literature (see Van Praag *et al.*, 2003). It should be noted, however, that the latter regressions may be prone to endogeneity bias due to a mood effect at the time of the survey that affects different satisfaction levels measured during the same survey in the same direction.

The replacement rate questions were only given to respondents who indicated that their "most important activity" is wage labor, so that we cannot analyze the self-employed or those who are temporarily or permanently not working. Furthermore, our focus on wage workers implies that when we refer to pension income, this will include both the universal old age state pension (the first pillar; see Section 3) and the occupational pensions (the second pillar), as is emphasized in the questions; additional savings (the third and fourth pillar) are not included. The questions ask for the probability that the respondent's replacement rate will be below a series of thresholds, ranging from 50 to 100 percent. Two sets of such questions were asked, referring to the replacement rate at the earliest and at the latest possible retirement. Respondents were first asked at what age they expected to first have the possibility to retire, assuming they would stay with their current employer. This expected earliest retirement age was then inserted into the probability questions. Similarly, the probability questions for the replacement rate at

[3]The timing was slightly different at the pilot stage of NPM in 2006.

latest retirement were preceded by the question whether their employer can dismiss the respondent upon reaching a certain age. If so, that age was elicited and inserted into the second set of probability questions. If not, the latest retirement age is replaced by the earliest age plus five years. About 55 percent of the sample indicated that their present employer does not enforce a mandatory retirement age, in which case the rather arbitrary point of five years after the earliest retirement age was inserted. To avoid this problem, we only use the replacement rate expectations related to the earliest retirement option. The probability questions were phrased as follows:

> If you would retire at [earliest retirement age], please consider your net total pension income including public pension, relative to your present net wage or salary. What would you think is the probability that your net total pension income in the year after retirement will be worth in terms of purchasing power
> (a) More than 100 percent of your present net wage?
> (b) Less than 100 percent of your present net wage?
> . . .
> (g) Less than 50 percent of your present net wage?

Instead of the part in brackets, the respondents saw their own answer to the question on their earliest retirement age. Note that the answers to the first and second question should add up to 100 percent if the respondent's subjective distribution is continuous so that the probability that the replacement rate is exactly 100 percent equals zero. In the data, the answers to (a) and (b) add up to less than 100 percent in 38 percent of all cases. Since our analysis will use continuous distributions, we collapse the two questions into a single probability that the replacement rate is less than 100 percent (taking the average of 100 minus the answer to (a) and the answer to (b)).[4]

All replacement rate thresholds are presented on a single screen. As a result, respondents might misread the questions and interpret the thresholds as delimiters of bins and indicate, for instance, the subjective probability that their replacement rate will be between 90 and 100 percent (instead of smaller than 100). The reported probabilities suggest, however, that only very few respondents misinterpret the questions in this way: the fraction of respondents whose answers sum to less than 100 is only 0.022.

4.1. *Descriptive Statistics*

Appendix A presents definitions and descriptive statistics of the satisfaction scales and of all socioeconomic controls included in the regressions. Descriptive statistics are shown in Table A2 for the sample reporting wage labor as their most important activity. Relatively many respondents are employed in the industrial (16 percent), financial (16 percent), and healthcare (18 percent) sectors. About half of the respondents indicate that they have the option of gradual retirement. Almost half of the respondents report an expected earliest retirement age of 65 (the eligibility age for the public pension during the survey years). The majority

[4]We also estimated models using the answer to item (b) only; this gave very similar results.

(60 percent) of the sample are males, due to our selection of wage workers only. About 75 percent are living with a partner. By construction the age range is limited to 25 years and older, with an average age of 46. A large fraction (77 percent) own a house and the large majority of respondents are the head of their household. On average respondents have one child. The sample is relatively well educated: 44 percent have finished at least higher vocational training.

Table A3 in Appendix A contains descriptive statistics for the satisfaction scales and expectations measures. We find that on average respondents rate their overall satisfaction with personal provisions with a 6 (out of 10). The aspect respondents are least satisfied with is the expected retirement age, with an average rating of 5.5. Satisfaction with both the expected post-retirement income and insight into own provisions receive an average of 6.0. Compared to the personal provisions, respondents are slightly happier with the system as a whole, which receives an average grade of 6.2. The standard deviations of the satisfaction scales are around 2, so satisfaction varies considerably across the sample. Around 30 percent of the total variation in the scales occurs within individuals.

The reported subjective probabilities are used to estimate the median and the standard deviation of each respondent's subjective replacement rate distribution in each time period using a parametric method assuming log normality following Dominitz and Manski (1997), and using the non-parametric method of Bellemare *et al*. (2012). See Appendix B for implementation details. The average median replacement rates obtained using the spline and parametric methods are both presented in Table A3 in Appendix A. They are close to each other and indicate that, on average, respondents expect a median replacement rate of 77–79 percent. There is considerable dispersion around this value: the standard deviation is 18 percentage points for both estimation methods. Dropping censored values of the expected replacement rates lowers the sample average only slightly to 75 percent. These averages are quite high but they are in line with generally overly optimistic expectations of the Dutch population, as documented by the Dutch authority that supervises financial markets (AFM, 2010). Uncertainty in the sample is widespread as is evident in the average estimated standard deviation of 19–20 percent. Dispersion in uncertainty is almost twice as large for the measure based on log-normal expectations than for the spline estimates, due to the presence of some high uncertainty estimates for the former.

Possible selection issues that arise from either non-response or logically impossible answers to the probability questions are discussed in Appendix E. As reported there, little evidence is found for selectivity on observable covariates or with respect to satisfaction. However, both the average level of the expected replacement rate and the average uncertainty are different in the subsample that reports logically inconsistent probabilities. Therefore we conduct robustness checks in which we limit the estimation sample to logically consistent responses.

5. Econometric Models

We explain pension satisfaction from the estimated medians and standard deviations of the subjective replacement rate distributions and other factors using several panel data models. We prefer ordered logit models over linear models

because they fit better with an ordinal concept of satisfaction. More important is the distinction between RE and FE models. The literature on life satisfaction emphasizes the importance of controlling for unobserved individual characteristics that have a large impact on various satisfaction measures (Ferrer-i-Carbonell and Frijters, 2004). In light of the subjective nature of both expectations and satisfaction scales, FE models therefore seem most suitable. By controlling for any form of time-invariant unobserved heterogeneity, we account for unobserved personality traits, such as optimism. Hence, to the extent that optimism is time-constant, our analysis is not affected by the potential endogeneity of the expectations with respect to personality types. Furthermore, the mood at the time of the survey does not confound most of our analysis since expectations and satisfaction were elicited in different surveys that fielded in different weeks. This is in line with Podsakoff *et al*. (2003) who note that separating measurements mitigates the effect of fleeting moods when dealing with subjective data. On the other hand, time-varying optimism may drive correlations between different satisfaction scales measured at the same time, also in FE models. This can affect the results of one of our models—the model explaining overall satisfaction from, among other factors, satisfaction with several aspects of the pension arrangement. We also explored using instrumental variables methods as an alternative identification strategy, exploiting exogenous variation in expectations across sectors of employment and due to the partial introduction of UPOs in 2007. However, we found that the instruments are too weakly correlated with expectations to allow for reliable inference.

We apply two different FE ordered logit estimators, proposed in Das and van Soest (1999) and Baetschmann *et al*. (2011). The former divides the ordinal dependent variable into different binary variables that indicate whether or not the scale is above a certain threshold (for our 10-point scale there are nine such thresholds). Then it estimates a binary FE logit model for each threshold and combines the resulting estimates in an efficient way (see Das and van Soest, 1999, for details).[5] The Blow-Up and Cluster (BUC) estimator proposed by Baetschmann *et al*. (2011) also estimates conditional logits on all possible dichotomizations of the dependent variable, but does not require two separate steps to obtain estimates. Instead, it estimates all dichotomizations jointly subject to the restriction that the parameters are equal across dichotomizations (see Baetschmann *et al*., 2011, for more details as well as Stata code). In the next section we only report results for the Das and van Soest estimator, to save space. BUC estimates are always very similar and available upon request.

6. Variation in Replacement Rate Expectations

We first describe how both the medians and standard deviations of the subjective replacement rate distributions vary across socioeconomic groups, using kernel regressions and linear models. We perform kernel regressions on the full sample of expectations calculated by spline interpolation, since this methodology does not assume a certain form for expectations.

[5]We thank Paul Frijters for kindly sharing his GAUSS-code of the Das and van Soest estimator.

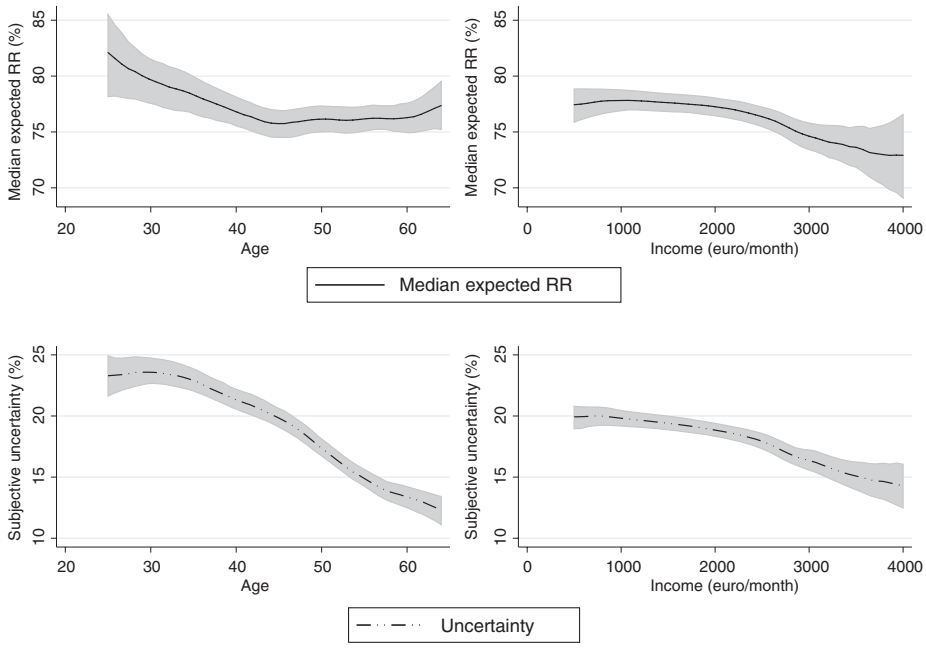

Figure 1. Kernel Regressions of the Median Expected Replacement Rate (upper panel) and Subjective Uncertainty (lower panel) on Age and Income

Figure 1 presents kernel regressions of the medians (upper panel) and standard deviations (lower panel) of the subjective replacement rate distributions on age and income. The top panel shows that the median declines with age up to the age of 40, after which it stabilizes. An explanation for this pattern may be that replacement rates are relative to current income, while the benefits paid through occupational plans usually depend on the average or the final salary. Younger respondents can expect to earn more in the future, implying that their replacement rates will be higher relative to their current earnings. The expected replacement rate does not change with income up to a net monthly income of 2000 euro, after which it declines from 78 to 73 percent. This decline may be due to the flat-rate public pension which does not depend on previous wages.

The lower panel of Figure 1 shows the intuitively plausible negative relationship between uncertainty and age. This can be due to an age effect on objective uncertainty or to an increase of information as the time period separating respondents from retirement gets shorter. Disentangling these pathways requires multivariate analysis; see below. Uncertainty also declines in income, suggesting that low income groups whose pensions depend to a larger extent on the state pensions, have become more uncertain due to the ongoing debate on state pensions during the time period covered by the survey.

6.1. *Linear Models*

To gain more insight in the variation of replacement rate expectations across different socioeconomic groups, Table 1 presents estimation results from linear

TABLE 1

Models of Medians and Standard Deviations of Subjective RR Distributions

	Dependent Variable: Median RR				Dependent Variable: S. D. RR			
	RE		FE		RE		FE	
Expected ret. age 50–60	−4.828***	(1.308)	−4.648**	(1.850)	−0.936	(0.778)	−1.965*	(1.045)
Expected ret. age 61–64	−0.873	(0.861)	−1.335	(1.140)	−1.179**	(0.508)	−1.203*	(0.644)
Expected ret. age 66–70	−0.347	(1.365)	−1.382	(1.740)	0.915	(0.802)	0.662	(0.983)
log(net HH income)	−2.375	(1.678)	−10.81**	(5.363)	−1.387	(1.055)	−0.700	(3.031)
Part-time pension	0.408	(0.788)	−0.632	(1.097)	−0.799*	(0.468)	−0.422	(0.620)
Age	−1.555***	(0.437)			0.125	(0.275)		
Age squared/100	1.537***	(0.489)			−0.552*	(0.308)		
Education middle	−1.884	(1.325)	20.16**	(9.733)	−1.305	(0.848)	−11.65**	(5.501)
Education high	−4.579***	(1.429)	12.43	(10.47)	−2.502***	(0.912)	−10.89*	(5.919)
Male	4.142**	(1.932)			−1.162	(1.233)		
HH. head	1.152	(1.524)	−0.306	(3.930)	0.655	(0.952)	−3.176	(2.221)
Number of children	0.143	(0.468)	−0.367	(1.570)	0.0609	(0.296)	−0.223	(0.887)
Partner	−0.266	(1.938)	−3.636	(6.753)	−0.546	(1.221)	−6.887*	(3.816)
Partner*male	−0.0690	(2.373)	3.312	(8.652)	1.681	(1.502)	8.156*	(4.889)
Homeowner	0.0555	(1.152)	−5.655*	(3.255)	−0.217	(0.725)	−0.286	(1.840)
Sector: agriculture	−4.960*	(2.938)	−18.50**	(8.852)	−3.069*	(1.855)	−0.0348	(5.002)
Sector: construction	−0.401	(2.502)	7.599	(8.749)	−0.941	(1.588)	12.30**	(4.944)
Sector: trade	0.722	(1.834)	−4.118	(7.337)	−1.236	(1.167)	4.016	(4.147)
Sector: transport	−1.569	(2.701)	10.37	(8.510)	−1.517	(1.694)	8.131*	(4.809)
Sector: financial services	0.333	(1.609)	−2.289	(5.640)	−1.614	(1.019)	2.634	(3.187)
Sector: education	−0.576	(1.790)	−3.306	(8.102)	−2.252**	(1.141)	1.347	(4.579)
Sector: healthcare	−0.0340	(1.708)	4.770	(6.528)	−3.284***	(1.084)	1.376	(3.689)
Sector: governance	−1.572	(1.759)	−3.190	(7.841)	−3.360***	(1.120)	6.022	(4.431)
Sector: other	2.902	(3.181)	7.171	(18.73)	−2.144	(2.033)	−5.398	(10.58)
Wave 2007	−1.225	(0.973)	−0.183	(1.127)	−1.679***	(0.560)	−2.171***	(0.637)
Wave 2008	−0.611	(1.060)	0.858	(1.248)	−1.752***	(0.610)	−2.895***	(0.705)
Wave 2009	1.454	(1.087)	3.487**	(1.353)	−1.306**	(0.628)	−2.917***	(0.765)
Wave 2010	2.615**	(1.169)	4.704***	(1.485)	−1.151*	(0.679)	−3.284***	(0.839)
Constant	132.2***	(14.51)	151.9***	(40.47)	41.02***	(9.111)	36.94	(22.87)
Observations	2360		2360		2360		2360	
Number of respondents	1042		1042		1042		1042	

Standard errors in parentheses.

*Significant at 10%; **significant at 5%; ***significant at 1%.

models explaining expectations constructed using the spline approach. We model the median (left-hand panel) and the standard deviation (right-hand panel) separately. We find intuitively plausible relationships between expectations and socioeconomic variables. Respondents who expect their earliest retirement option to occur no later than age 60 expect a replacement rate that is on average 5 percentage points lower than those who do not expect to be able to retire before age 65. On the other hand, an expected earliest retirement age above 65 is not associated with a higher expected replacement rate. As in the kernel regression presented above, log income is negatively associated with the median in the linear models with additional covariates, but the association is insignificant in the RE model. According to the FE estimates, the relation between income and the median expected replacement rate is significant and much larger in magnitude.

The expected replacement rate declines with age up to age 50 and then increases. This pattern is probably due to the definition of the replacement rate relative to current income, which is low relative to final or average earnings for younger workers. This makes it natural that younger respondents expect a higher replacement rate than their older peers. Respondents with high education level expect a 4.5 percentage points lower replacement rate at earliest retirement than respondents with the lowest education level. This may be because those who spent more time in full-time education entered the labor market later, giving them less time to build up a full pension. It may also be due to (relative) optimism of the poorly educated and pessimism of the higher educated. Alternatively, education may pick up some of the income effect since household income is probably measured imprecisely. We find a slightly lower expected replacement rate in the agricultural sector than in manufacturing (the omitted category).

The right-hand panel in Table 1 presents estimates of a linear model explaining the standard deviation of the expected replacement rate distribution. Uncertainty varies little with the expected retirement age: the only significant coefficient indicates that those who expect to retire between 60 and 64 are slightly less uncertain about their replacement rate than those who expect their earliest retirement to be at age 65. Respondents who think they will have access to gradual retirement are less uncertain than those without such an option. The interpretation of this difference is complicated by the fact that we do not observe whether or not respondents actually have access to gradual retirement. Hence gradual retirement may be associated with less uncertainty, whether through causality or self-selection among employees, or respondents without basic knowledge of their pensions may indicate that gradual retirement is not available for them. Age is negatively related to uncertainty, as would be expected since older respondents are closer to retirement. Better educated respondents report less subjective uncertainty, especially when the variation in education appears within respondents over time. The FE estimates show that women who find a partner become less uncertain about their replacement rate, while for men having a partner is not significant.

We find significant variation in subjective uncertainty across sectors: uncertainty at earliest retirement is about 2–3 percentage points lower in the (semi-) public sector compared to the industrial sector. It appears that working for public institutions is associated with less subjective uncertainty. This is in line with the

relatively secure pension plans and stable careers that traditionally characterized the public sector during the period covered by our data.

7. Satisfaction with Retirement Provisions

We first sketch the bivariate relationship between satisfaction and expectations by means of kernel regressions. We only show the graphs for the non-parametric expectation measures; analogous figures using the parametric method show similar patterns and are available upon request. Figure 2 shows the results, with the median expected replacement rate in the left-hand and the standard deviation in the right-hand column. Different rows correspond to different satisfaction scales. The general picture is that satisfaction levels are positively associated with the median replacement rate, though most of the associations are not very strong. The exception is satisfaction with expected retirement income, for which the average score is around 5.2 for respondents who expect a replacement rate below 50 percent of their current wage and 6.5 for those who expect this rate to be more than 100 percent. Since income is not controlled for in Figure 2, this implies that satisfaction is related to the relative level of post-retirement income even though a high relative income may still be low in absolute terms. This pattern may reflect that, perhaps due to the affluence of most respondents in our sample, relative income matters considerably and current income forms the baseline against which post-retirement income is evaluated. The relationship between satisfaction and the expected replacement rate is slightly hump-shaped with a maximum around 80–90 percent, which is why we will also consider quadratic terms in the regression models.

The right-hand panel of Figure 2 shows that there is a negative bivariate relationship between satisfaction and uncertainty, which is not very strong either. The strongest negative association with uncertainty is found for pension knowledge satisfaction, which seems intuitively plausible. For satisfaction with the age at which one can retire, only a very weak (and even non-monotonic) association is found.

7.1. *Ordered Logit Models*

RE and FE ordered logit estimates are presented in Tables 2 and 3, respectively. We use the non-parametric estimates of the medians and standard deviations of the subjective replacement rate distributions; using the parametric estimates gives similar results.[6] In the RE models, we control for all covariates listed in Table A1 of Appendix A. In the FE models, estimated using the Das and van Soest estimator, we could not include so many controls, since this would limit the sample size severely (because each coefficient must be identified for each cutoff that is included in the estimation). Hence in the FE models, we only control for replacement rate expectations, income, expected retirement age, owning a house, and time effects. Importantly, all models control for (the log of) net monthly personal income. Keeping income constant, a higher replacement rate corresponds

[6]Parametric estimates are available upon request. All fixed effects results reported in this section were confirmed using the BUC estimator and for linear models (results available upon request).

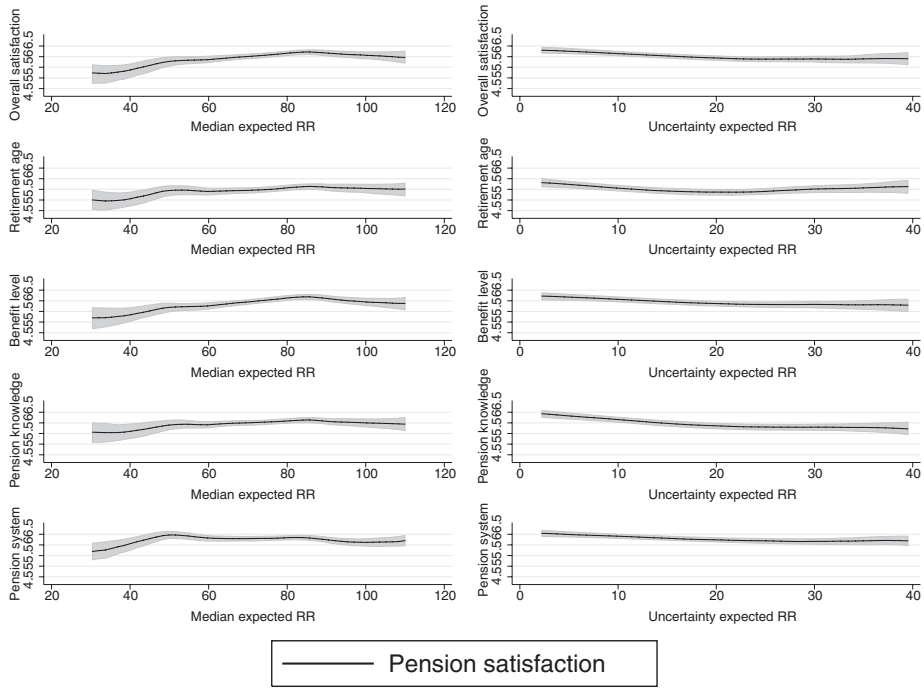

Figure 2. Kernel Regressions of Pension Satisfaction on Expectations: Median Expected Replacement Rate (left column) and Uncertainty (right column)

to a higher pension income. Hence, keeping income constant, we would expect a positive association between the replacement rate and pension satisfaction.

The RE models can be formally tested against FE through Hausman tests comparing the two sets of estimates. Considering the coefficient on the median subjective replacement rate, the RE null hypothesis is rejected in the models for satisfaction with pension benefits and for satisfaction with pension knowledge at a significance level of 1 percent. Though this implies that we need FE models for causal interpretation, we also present some results from RE ordered logit models for the sake of comparison and to see how heterogeneity in pension satisfaction is associated with time persistent characteristics. We prefer to estimate these correlations with random effects models rather than OLS, because of the panel structure of the data. Expectations are correlated across repeated observations of the same respondent: in the RE models, individual effects make up around 60 percent of the total unsystematic variance.

The first two models in Table 2 both explain overall satisfaction with personal pension provisions, but the second model also controls for aspect satisfaction. These aspect satisfactions are all positive and significant. The RE estimates suggest that satisfaction with the benefit level is more important than the other two aspect satisfactions, but this is reversed in the FE estimates. The difference suggests that unobserved individual effects driving satisfaction with benefits and overall satisfaction are particularly strongly correlated.

TABLE 2

RE Ordered Logit Models of Pension Satisfaction (expectations modeled using splines)

	Dependent Variable: Satisfaction with					
		Personal Provisions				
	Overall	Overall	Ret. Age	Benefits	Knowledge	The System
Satisfaction with ret. age		0.858***				
		(0.0447)				
Satisfaction with benefits		1.176***				
		(0.0639)				
Satisfaction with knowledge		0.660***				
		(0.0545)				
Median/10	0.148***	0.0668**	0.0656*	0.157***	0.0399	0.0680**
	(0.0372)	(0.0306)	(0.0358)	(0.0372)	(0.0348)	(0.0332)
S.D./10	–0.00313	–0.103**	0.0492	0.0652	0.0129	–0.0588
	(0.0686)	(0.0503)	(0.0598)	(0.0647)	(0.0588)	(0.0568)
Expected ret. age 50–60	0.612**	0.239	0.800***	0.660***	0.366	–0.168
	(0.246)	(0.189)	(0.228)	(0.242)	(0.227)	(0.223)
Expected ret. age 61–64	0.425***	0.0723	0.549***	0.355**	0.353**	0.0792
	(0.148)	(0.123)	(0.139)	(0.149)	(0.140)	(0.138)
Expected ret. age 66–70	0.0362	0.0781	0.00385	–0.298	0.0978	–0.130
	(0.235)	(0.207)	(0.221)	(0.242)	(0.218)	(0.213)
log(net HH income)	2.297***	0.609***	1.053***	2.356***	2.200***	1.064***
	(0.402)	(0.222)	(0.342)	(0.380)	(0.337)	(0.312)
Part-time pension	0.0486	–0.304***	0.307**	0.139	0.215	0.0415
	(0.143)	(0.111)	(0.137)	(0.141)	(0.131)	(0.129)
Age	–0.0757	0.0953*	–0.363***	0.00412	–0.0804	0.0312
	(0.106)	(0.0568)	(0.0956)	(0.104)	(0.0818)	(0.0795)
Age squared/100	0.139	–0.0992	0.454***	0.0288	0.138	0.00605
	(0.119)	(0.0633)	(0.106)	(0.115)	(0.0898)	(0.0876)
Education middle	0.0952	–0.00444	0.426	0.116	–0.176	0.581**
	(0.397)	(0.164)	(0.281)	(0.324)	(0.282)	(0.255)
Education high	0.289	–0.0983	0.619**	0.639*	–0.134	0.914***
	(0.372)	(0.178)	(0.267)	(0.337)	(0.292)	(0.275)
Male	0.0469	–0.0391	0.232	–0.141	0.133	0.111
	(0.527)	(0.237)	(0.387)	(0.376)	(0.343)	(0.335)
HH. head	–0.567*	–0.293	–0.283	–0.559*	–0.426	–0.292
	(0.337)	(0.203)	(0.293)	(0.331)	(0.282)	(0.280)
Number of children	–0.0116	–0.0347	–0.0562	0.0228	0.121	–0.139
	(0.126)	(0.0581)	(0.0992)	(0.109)	(0.0991)	(0.0850)
Partner	0.00906	0.00221	0.132	–0.306	0.211	–0.109
	(0.495)	(0.249)	(0.398)	(0.401)	(0.367)	(0.356)
Partner*male	–0.0381	0.129	0.374	0.317	–0.291	0.0878
	(0.643)	(0.300)	(0.504)	(0.504)	(0.436)	(0.425)
Homeowner	0.460	0.243*	–0.0926	0.316	0.377*	0.192
	(0.292)	(0.147)	(0.263)	(0.257)	(0.210)	(0.200)
Sector: agriculture	0.653	–0.493	0.999**	0.835*	1.339***	0.166
	(1.043)	(0.359)	(0.507)	(0.492)	(0.517)	(0.519)
Sector: construction	–0.126	0.319	0.310	–0.911*	–1.203**	–0.550
	(0.615)	(0.302)	(0.466)	(0.484)	(0.544)	(0.494)
Sector: trade	–0.379	–0.293	0.113	–0.396	–0.0308	0.0289
	(0.498)	(0.226)	(0.426)	(0.408)	(0.387)	(0.331)
Sector: transport	–0.172	1.020***	–0.526	–0.0761	0.518	–0.294
	(0.555)	(0.342)	(0.441)	(0.564)	(0.526)	(0.472)
Sector: financial services	0.258	0.00714	0.316	0.319	0.446	0.581**
	(0.390)	(0.200)	(0.305)	(0.384)	(0.328)	(0.284)
Sector: education	–0.0591	0.0547	0.0523	–0.00169	0.316	0.648**
	(0.460)	(0.218)	(0.366)	(0.402)	(0.378)	(0.329)
Sector: healthcare	0.482	0.148	0.00743	0.488	0.955**	0.458
	(0.505)	(0.213)	(0.364)	(0.379)	(0.372)	(0.308)
Sector: governance	0.980**	0.468**	0.503	0.280	0.713**	0.846***
	(0.414)	(0.217)	(0.309)	(0.394)	(0.335)	(0.310)
Sector: other	0.998	0.295	1.345*	0.449	0.331	0.781
	(0.920)	(0.461)	(0.702)	(0.863)	(0.610)	(0.695)
Wave 2007	–0.0844	–0.229	0.109	0.193	0.128	–0.117
	(0.154)	(0.146)	(0.147)	(0.154)	(0.148)	(0.146)
Wave 2008	–0.0925	–0.156	0.133	–0.0462	0.0231	–0.620***
	(0.173)	(0.161)	(0.163)	(0.171)	(0.160)	(0.163)
Wave 2009	–0.278	–0.154	0.0994	–0.204	–0.0782	–0.694***
	(0.182)	(0.159)	(0.166)	(0.173)	(0.163)	(0.164)
Wave 2010	–0.371*	–0.326*	0.0339	0.0817	–0.0399	–0.648***
	(0.201)	(0.172)	(0.182)	(0.193)	(0.181)	(0.180)
Fraction var. ind. effects	0.672***	0.117***	0.645***	0.656***	0.616***	0.592***
	(0.0208)	(0.0401)	(0.0221)	(0.0225)	(0.0238)	(0.0263)
Observations	1786	1680	1778	1716	1783	1796
Number of respondents	835	796	842	808	833	842

***Significant at 1%; **significant at 5%; *significant at 10%.

The median replacement rates at earliest retirement are strongly significant in four of the six RE models and always have the expected positive sign.[7] Higher expected replacement rates are associated with greater satisfaction with one's own pension provisions overall, but the significant coefficient in the second column suggests that this association is only partly captured by the significantly positive relations of the median replacement rate on satisfaction with the benefit level and the age at which one can retire. Although the final satisfaction scale refers specifically to satisfaction with the Dutch pension system, not taking into account one's personal situation, this measure also appears to be significantly positively related to the respondent's own median replacement rate. In this RE model, this positive association might reflect that respondents giving positive evaluations also tend to be optimistic. An alternative explanation could be that individuals' evaluations of the system as a whole are driven by self-interest. This is in line with the interpretation of O'Donnell and Tinios (2003), who find that the Greek pension system is evaluated better by those who benefit more. In the FE models we will be able to disentangle the various explanations.

As in the RE model, the median subjective replacement rate positively affects overall satisfaction with the personal provisions, mainly through satisfaction with the expected pension income—which is in this case the only aspect scale that is significantly affected by the median replacement rate. In contrast to the RE model, however, the FE estimates only provide limited support that satisfaction with the pension system as a whole is related to personal expectations. This result suggests that the RE result was due to correlation between optimism about replacement rates and a tendency to be positive about the pension system and does not reflect a causal (self-interest) effect.

In the RE models, the measure of uncertainty in the expected replacement rate is significant in only one case: more uncertainty is negatively associated with overall satisfaction with the personal provisions in the specification with controls for the aspect satisfaction levels.

The FE models, however, indicate that subjective uncertainty does not affect the satisfaction scales significantly, not even the scale measuring satisfaction with knowledge of one's pension rights. One interpretation of this result is that respondents may truly be indifferent to the uncertainty expressed through the subjective distributions, but another, perhaps more realistic, explanation which we cannot rule out is that subjective uncertainty is measured with considerable error so that the estimate suffers from attenuation bias. This consideration suggests using robustness checks in which we allow the parameters on the mean and standard deviation to differ across subsamples that are plausibly affected by measurement error to different degrees (see below).[8]

[7]Based on the kernel regressions in Figure 2, which reveal that the bivariate relationship between the expected replacement rate and satisfaction is slightly hump-shaped, we tested for quadratic relationships for both the median expected replacement rate and uncertainty. Since the quadratic terms were insignificant in all models, we dropped them from the final specifications.

[8]Accounting for fixed effects often increases attenuation bias but may also help to reduce the influence of measurement error: if a lack of understanding of the questions leads to uninformative answers that follow the same pattern in different waves, FE estimates will not be affected by such time persistent measurement errors.

TABLE 3

FE Ordered Logit Models of Pension Satisfaction (expectations modeled using splines)

	Dependent Variable: Satisfaction with					
	Personal Provisions					
	Overall	Overall	Ret. Age	Benefits	Knowledge	The System
Satisfaction with ret. age		0.788***				
		(0.102)				
Satisfaction with benefits		0.593***				
		(0.133)				
Satisfaction with knowledge		0.816***				
		(0.140)				
Median/10	0.118***	0.0279	–0.00207	0.104***	–0.00190	0.0705*
	(0.0356)	(0.0748)	(0.0332)	(0.0382)	(0.0383)	(0.0414)
Std. dev./10	0.0339	–0.172	0.107*	0.105	0.0399	0.0112
	(0.0660)	(0.149)	(0.0608)	(0.0726)	(0.0657)	(0.0678)
log(net HH income)	0.672	–1.840	0.632	0.770	0.994	–0.552
	(0.725)	(1.359)	(0.714)	(0.678)	(0.649)	(0.675)
Expected earliest age 50–60	0.480	0.190	0.327	0.163	–0.457*	–0.652**
	(0.257)	(0.418)	(0.227)	(0.286)	(0.269)	(0.263)
Expected earliest age 61–64	0.0713	–0.193	0.366**	0.0570	0.0967	0.0125
	(0.161)	(0.300)	(0.145)	(0.174)	(0.157)	(0.157)
Expected earliest age 66–70	0.080	–0.656	0.103	0.0946	0.208	0.185
	(0.244)	(0.411)	(0.249)	(0.237)	(0.283)	(0.221)
Homeowner	–0.302	1.009	–0.720**	–0.937***	–1.103***	–0.491
	(0.363)	(3.045)	(0.316)	(0.361)	(0.396)	(0.412)
Wave 2007	0.184	–0.155	0.230*	0.427***	0.436***	–0.0506
	(0.143)	(0.276)	(0.140)	(0.145)	(0.139)	(0.138)
Wave 2008	0.167	–0.0638	0.395**	0.235	0.404**	–0.516***
	(0.168)	(0.286)	(0.155)	(0.168)	(0.168)	(0.166)
Wave 2009	–0.044	–0.0453	0.605***	0.0382	0.195	–0.594***
	(0.184)	(0.354)	(0.168)	(0.181)	(0.172)	(0.172)
Wave 2010	–0.0226	–0.0393	0.453**	0.396*	0.390**	–0.428**
	(0.193)	(0.387)	(0.188)	(0.202)	(0.199)	(0.193)
Informative observations	1016	941	1001	990	1003	1042
Informative respondents	321	299	321	314	317	333
Observations	1786	1680	1778	1716	1783	1796
Number of respondents	835	796	842	808	833	842

Standard errors in parentheses.
*Significant at 10%; **significant at 5%; ***significant at 1%.

Household income is significantly positive in all RE models but not in any of the FE specifications. This suggests that, keeping replacement rate expectations and other factors constant, higher income groups are more satisfied with their pensions and the pension system, but these are not causal effects—a change in household income does not lead to more pension satisfaction in the same time period.

The RE models also show that a lower expected minimum age at which respondents can retire (earliest retirement age less than 65) is associated with higher satisfaction overall, with the retirement age, and with benefits. The effects largely disappear, however, in the FE estimates. Perhaps there is not enough genuine variation in the expected retirement age (other than reporting errors) to get reliable estimates of the causal effect.

According to the FE estimates, home ownership has a significantly negative effect on satisfaction with the retirement age, benefits, and pension knowledge. This could be related to the fact that mortgage interest payments generally increase financial needs and respondents anticipate that this will be the same after they have retired. Many mortgages in the Netherlands are interest-only. Interest payments are tax deductible for 30 years so that the after tax burden may increase after retirement. The FE estimates of the time effects suggest that satisfaction with the pension system has fallen over time, perhaps because of the negative publicity about the financial sector in general and pension funds in particular in the time period considered. On the other hand, satisfaction with the three aspects of personal pension provisions seems to have increased after 2006, although the time trends are not very clear.

Finally, the sector dummies in the RE models indicate that civil servants ("governance") tend to be more satisfied with their personal provisions as well as the system as a whole than most others (keeping expected replacement rates and other variables constant). Construction sector workers are particularly unhappy with their benefit levels and the knowledge about their pensions.

7.2. *Robustness Checks*

In order to evaluate the influence of measurement error on our results, Table A4 of Appendix C reports estimates of FE ordered logit models based on the subsample of respondents that report monotonic probability sequences. As mentioned above, the intuition is that violation of the monotonicity requirement of the cumulative distribution function signals poor understanding of probability and hence noisier reported probabilities. Limiting the sample to monotonic responses does not affect our conclusions. We still find a positive and significant effect of the expected replacement rate at earliest retirement on overall pension satisfaction, which runs through satisfaction with expected post-retirement income. Moreover, for the monotonic subsample we again find no significant effect of subjective uncertainty on satisfaction.

Another potential concern is that retirement might not be perceived as an urgent topic to think about by younger respondents. In light of the findings in Manski (2004), there is reason to doubt the value of retirement expectations data for the younger cohorts if they do not see their retirement income as relevant to their lives. Moreover, the sources of uncertainty about retirement income may be different for younger and older cohorts, since future wages are less certain at younger ages. Both arguments underline the importance of analyzing cohort-based subsamples. Appendix D, Table A5, displays estimates of the effect of the expected replacement rate and uncertainty on the various satisfaction scales for the subsamples that are over 40 and 50 years of age. Moreover, we also include different panels for subsamples according to logical consistency of the responses. The findings described above are corroborated for both age-based subsamples, regardless of further restrictions based on consistent answers. The expected replacement rate affects overall satisfaction with one's pension provisions positively, and this effect runs (partly) through satisfaction with the expected retirement income. As explained above, these subsamples of older respondents

probably provide a cleaner test for the effect of replacement rate uncertainty on welfare. However, we do not find robust evidence for an effect of subjective uncertainty on satisfaction even for older respondents. Hence, the effect of pension uncertainty on welfare appears to be less pronounced than that of expecting a low replacement rate.

As a final test of the robustness of our results we redid the analysis using a different range for the replacement rate. Note that the survey questions from which we estimate expectations do not ask for bounds on the replacement rates (see Section 4). Hence we need to impose a maximum and minimum replacement rate in order to carry out spline interpolation. All results described above are based on the relatively wide bounds of 20 and 170 percent. However, sensitivity analysis imposing bounds equal to 30 and 120 shows that none of our results is sensitive to changing the bounds. Moreover, all findings are robust to using the interquartile range as an alternative measure of uncertainty. Finally, we investigated the role of skewness in expectations by including the 10th and 90th percentiles of the replacement rate distributions as additional regressors in the fixed effects models. However, we found no evidence of a relationship between these higher order moments and satisfaction. Detailed results are available upon request from the authors.

8. Conclusion

Public attitudes toward pension provisions and a country's pension system play an important role in the political debate on pensions and retirement and the willingness to accept the necessary reforms. In this paper we have analyzed the determinants of satisfaction of Dutch employees with own pension provisions overall, with three aspects of own pension provisions (retirement age, retirement income, and insight into own entitlements), and with the Dutch pension system, emphasizing the role of the employees' expectations of the retirement income replacement rate. To this end we have constructed indexes of the level (represented by the median of the subjective distribution) and the uncertainty (represented by the standard deviation) of future retirement replacement rates from survey data on subjective probabilities that these replacement rates will be below certain thresholds. We used these indexes, together with other factors, to explain satisfaction scores. We used a longitudinal dataset comprised of Dutch wage workers spanning the five year period 2006–10. To account for the possibility that personality traits such as optimism may drive the subjective variables on both sides of the regression equation, we focused on FE panel data models. Time-varying optimism is unlikely to drive our results, since expectations and satisfaction were elicited in different questionnaires.

Our results indicate that the level of the expected replacement rate has a substantial positive effect on overall satisfaction with personal provisions. This plausible relationship is robust to non-parametric estimation of the probability distributions characterizing expectations. Moreover, we find that this effect on overall satisfaction runs through satisfaction with expected post-retirement income. In RE models we also find a positive association between the level of the expected replacement rate and satisfaction with other aspects of pension

provisions and with the Dutch pension system as a whole, but these become insignificant in FE models and therefore probably do not reflect causal effects. Similarly, the RE models reveal that higher income groups and workers who expect to be able to retire before age 65 tend to be more satisfied with their pensions, but the FE results suggest that income changes or changes in the expected earliest age at which retirement is possible do not have a causal effect on pension satisfaction.

We do not find much evidence that subjective risk is related to pension satisfaction. Only if we restrict the sample to individuals over 40 years of age, is a marginally significant negative effect found in the FE model, suggesting that uncertainty matters more for individuals who are closer to retirement (despite the fact that subjective risk declines strongly with age). An alternative explanation would be that the measurement of expectations is noisier for younger respondents, since they might perceive retirement as far away and not particularly relevant to their current situation. However, the finding that lower expected replacement rate levels reduce satisfaction over the entire age range 25–65 suggests that for younger respondents also, the data contain information on actual expectations.

Despite the fact that subjective expectations play an important role in inter-temporal economic models, elicitation of expectations by means of probabilistic measures only really took off at the end of the 1990s. Since then, the face validity of expectations data has been established for many conceptually simple topics, such as individual mortality and next year's wages. A second contribution of our study is that it specifically assesses the validity of measures of expectations regarding retirement.

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Supporting Information

Additional Supporting information may be found in the online version of this article:

Appendix A: Definitions of variables and descriptive statistics
Table A1: Variable definitions
Table A2: Descriptive statistics
Table A3: Descriptive statistics of the satisfaction scales and measures of retirement expectations
Appendix B: Subjective distributions of replacement rates
Appendix C: FE ordered logit models estimated on monotonic subsample
Table A4: FE ordered logit models for the internally consistent subsample
Appendix D: Robustness checks: estimates on subsamples defined by age-group
Table A5: Robustness checks: sample limited to older respondents
Appendix E: Tests for selectivity from non-response to expectations questions
Table A6: Descriptive statistics: sample selection
Table A7: RE ordered logit models of satisfaction—selectivity through non-monotonic/incomplete response