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ontwerp voorblad: WRIK Utrecht

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## Risk-return preferences in the pension domain: are people able to choose?\*

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December 2004

### Abstract

In this paper we investigate pension preferences and the effect of individual freedom of choice on risk taking in the context of pension arrangements based on a representative survey of about 1000 Dutch citizens. The attitude towards pension schemes and portfolio choices is explained by individual characteristics. Our main conclusions are the following. Risk aversion is domain dependent and highest in the pension domain. The vast majority of respondents is in favour of compulsory saving for retirement and favours a defined benefit pension system. If offered a combined defined benefit/defined contribution system, the majority of the respondents would like to have a guaranteed pension income of 70% or more of their net labour income. Self-assessed risk tolerance and financial expertise are important explanatory variables of pension system attitude. Respondents are on average conservative in their investment policy. If given investor autonomy, they are willing to change the composition of their retirement savings portfolio in response to their personal financial situation, general economic conditions, and expectations of financial markets. Respondents may be inconsistent in their preferences. Especially respondents who have chosen a relatively safe portfolio (less stock, more bonds) appear to prefer the retirement income streams of the median investment portfolio to their own portfolio choice. Finally, the average respondent considers himself financially unsophisticated, but is not very eager to take control of retirement savings investment when offered the possibility to increase expertise.

**Keywords:** behavioural finance, risk tolerance, pension preferences, defined contribution schemes, freedom of choice, portfolio investment

**JEL classification:** D12, D80, G11, J26

### Acknowledgements

We would like to thank Kristin Kleinjans, Paul Sengmüller, Arthur van Soest, Peter Vlaar and the other participants at the DNB Research conference on Household Panels, November 11 and 12, 2004.

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\* Maarten van Rooij and Henriëtte Prast are in the Research Department of the Nederlandsche Bank. While writing this paper, Prast was in the Supervision Division of the Nederlandsche Bank. Clemens Kool is at the Utrecht School of Economics. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Nederlandsche Bank.

## **1. Introduction**

For a number of reasons, the design of pension schemes and the investment policy of pension funds warrant attention from both academics and policy makers. In the years preceding the 2000 stock market decline, the booming stock market prompted many firms to offer their employees a pension premium holiday or to reduce compulsory contributions. Moreover, some funds changed the composition of their portfolios, increasing the share of stocks over bonds. The stock market declines around the world since 2000 have led to reduced values of the asset portfolios backing pension fund liabilities. Consequently, a number of defined benefit pension schemes offered by private companies became seriously under-funded. In the US, considerable changes in the design of pension schemes had already taken place since the 1980s, with defined benefit plans losing ground and defined contribution plans becoming more widespread. In the UK, too, defined contribution schemes are popular. The new international accounting standards may provide an additional impulse for companies to consider introducing defined contribution systems. According to the new IAS rules, the financial obligations of a company's pension fund, if it operates a defined benefit scheme, should appear on the company's balance sheet.

In the Netherlands, the reduced values of the portfolios backing pension fund liabilities triggered a policy debate about the supervisory requirements for pension funds and their effects on financial markets and the macro-economy. Moreover, it generated a discussion about whether the risk of price movements in financial markets should be run by the company and its pension fund, or by individual employees. Several corporate pension funds have made it clear that it is their intention to shift this risk toward the employees by a changeover from a defined benefit to a defined contribution pension scheme.

A changeover to a defined contribution scheme may have important effects both at the micro- and macro-level. At the micro-level, the question is whether individuals would benefit from a changeover. A defined contribution system has the potential of facilitating individual decision-making, of creating individually tailored pension plans, and of introducing market-discipline. Where defined contribution schemes have been implemented, notably in the United States, employees were allowed to select their own retirement-savings rate. Moreover, as a rule they were allowed to choose among various risk-return profiles for the investment of their contributions. Finally, employees were not required to join and could choose to invest their savings for retirement in some other way, for example individually. In

the Netherlands, pension schemes mostly are of the defined benefit type.<sup>1</sup> Saving for retirement is compulsory for the vast majority of the employees. This implies that employees cannot run from their pension commitments without relinquishing the associated job. As a result, market discipline by participants in a pension fund – that is by those who are paying current premiums – is in fact non-existent. In a defined contribution scheme, individuals can have substantial freedom of choice with regard to the risk profile of their pension arrangements. This would fit with other developments in the field of the (supervision of the) financial sector, where both academics and policy makers stress the importance of market discipline.

On the other hand, some studies indicate that individuals may not benefit and indeed would suffer from a changeover, despite the fact that it would enable them to influence the way their pension contributions are invested. Benartzi and Thaler (2002) conclude that autonomy with regard to the investment of retirement savings has very little value because agents typically have difficulties in choosing their portfolio in a consistent manner. Thaler and Benartzi (2004) find that if left to choose, people save less than their optimal life cycle savings rate would predict. At the macro-level, a changeover may, depending on the response by individuals, affect macroeconomic and financial stability, notably through changes in consumption and savings behaviour. Hence for reasons of macroeconomic policy, too, it is worthwhile to assess the likely response by individuals to proposed changes in pension arrangements.

The purpose of this paper is threefold. First, the paper assesses, on the basis of questionnaires, the attitude of individuals in the Netherlands vis-à-vis defined benefit and defined contribution pension schemes. Second, it investigates what investment choices individuals (say they) would make if their pension fund were to change from a defined benefit to a defined contribution scheme with freedom of choice in portfolio selection. Finally, the paper aims at assessing whether people are able to choose, that is whether individuals have well-defined preferences when it comes to their pension investments. By constructing a portfolio based on individually stated and measured risk preferences, and offering this portfolio along with others as a decision problem to the respondents, we are able to verify whether individuals make choices consistent with their preferences. In follow-up studies, we will use our data to explain risk aversion and choices in the pension domain by individual and household characteristics, and to assess whether the subjects exhibit extremeness aversion in the pension domain.

The main conclusions of this paper are the following. First, we find that respondents are on average more risk averse when it comes to their pension decisions than when it comes to financial decisions in general, or to their general attitude in life. We also find that the stated risk preferences of individuals

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<sup>1</sup> Only 4% of the pension funds offer defined contribution type arrangements in the Netherlands. See Appendix A.

are a significant predictor of their financial decisions. In line with their risk attitude in the pension domain, the majority of respondents in our survey prefer a defined benefit to a defined contribution pension scheme. In case of a changeover to a DC system, a minority would prefer investor autonomy. It cannot be excluded that these results are partly due to a status quo bias. Be that as it may, the results imply a high degree of household confidence in both the current system and the investment policy of the pension funds in the Netherlands. If respondents were forced to participate in a defined contribution scheme, they would, at first sight, be inclined to choose a low-risk, low-return portfolio. However, when confronted with two different expected pension income streams, one of which based on their own portfolio choice, they tend to choose a portfolio with more stocks than they had initially opted for. This result may be sensitive to the fact that in calculating future retirement income streams we have used our expectations of asset market developments.

The paper is structured as follows. The next section reviews some of the relevant literature, concentrating on the behavioural finance approach to decision-making under risk and on related empirical studies into risk attitudes and preferences, notably in the pension domain. Section 3 describes our dataset, introduces the questionnaires and explains the method used to measure risk preferences empirically. In section 4, the results are presented and discussed in the light of other studies on the subject. Section 5 provides a summary, conclusions, and scope for further research.

## **2. Theoretical background**

### *2.1 Decision making under risk*

If individuals dispose of all relevant information and are able to make rational choices about the investment of their pension contributions, it would seem that both a compulsory pension scheme with defined benefits and a system with defined contributions but without the possibility for the individual to choose the level of premiums and how they are invested are sub-optimal. Employees might benefit from having an individually tailored savings and retirement plan, adjusted to their personal finance concerns (Mitchell, Gordon and Twinney, 1997). However, for a number of reasons one might argue that compulsory schemes with limited investor autonomy need not be inefficient and may perhaps increase individual and/or social welfare.

First, not all individuals may have the financial sophistication and access to information to be able to make optimal decisions about retirement savings. As a result, actual household saving may differ from the optimal saving plan (Thaler and Benartzi, 2004). A pension fund might thus be regarded as a delegated investor which disposes of an information advantage. In fact, many defined benefit pension funds in the US have expressed doubts about the quality of the investment choices made by their

participants (Benartzi and Thaler, 2001; Mitchell and Zeldes, 1996). Second, pension funds may offer scale economies and risk sharing (Mitchell, Gordon and Twinney, 1997). Third, according to the behavioural finance theory, people exhibit systematic psychological biases when choosing in risky conditions (Kahneman and Tversky, 1979). For example, they are risk averse over gains, but risk seeking over losses, and risk aversion depends on recent history: after experiencing a financial loss people become less willing to take risks while after a series of gains risk aversion decreases. Also, risk aversion is domain-dependent: it differs according to the area in which decisions need to be taken (Loewenstein, 2000).<sup>2</sup> According to behavioural theory, investors view their portfolios as ‘distinct layers in a pyramid of assets’ (Statman, 1999). Instead of integrating financial decisions, they put them into separate mental accounts, for example one for each investment, or one for covering downward risks – for which they use such instruments as bonds – and one for benefiting from the upward potential, for which they use stocks. Portfolio theory predicts that it would be optimal to integrate these elements, but in practice people behave differently. This portfolio behaviour is referred to as mental accounting.

One reason underlying mental accounting may be the wish to exert *self-control*. If the individual keeps separate accounts for different sorts of expenditure, he may be less easily tempted to “use his nest egg for an impulse purchase” (Thaler and Shefrin, 1981). The mental accounting approach is relevant for the field of pension research, as it can be assumed that people have a separate mental account for retirement savings. Moreover, the automatic payment in compulsory pension plans would create a strong element of self-control. Lack of self control does indeed seem to be a problem for retirement saving in defined contribution schemes. Thaler and Benartzi (2004) find that freedom of choice results in a savings rate that is lower than the optimal life cycle savings rate.

Aaron (1999) argues, that many people are myopic, especially when it comes to retirement saving. Economists explain myopia by the finding that discount rates applied to the near future are much higher than discount rates applied to the distant future. In fact, Aaron (1999) mentions several studies that have demonstrated that discount rates decline with time. This so-called hyperbolic discounting is an inconsistency from the point of view of expected utility theory, which assumes exponential discounting at a constant discount rate. This can be illustrated as follows. If people can choose between 10 euro today and 11 tomorrow, they tend to go for 10 euro today, but when they can choose between 10 euro one year ahead and 11 euro one year and a day ahead, they choose 11 euro.<sup>3</sup> Hyperbolic discounting is related to self-control problems and procrastination, the latter being the

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<sup>2</sup> Still, Barsky et al. (1997) find, that measured risk tolerance with respect to labour income is positively related to risky behaviour in other areas, such as smoking and drinking.

<sup>3</sup> Example taken from Loewenstein (2004). Recent research into brain activity when making economic choices reveals that when making choices with immediate rewards the emotional part of the brain is most active, but when rewards are more distant the planning part of the brain takes over. See Glimcher and Rustichini (2004).

tendency to postpone unpleasant decisions (Thaler and Shefrin, 1981). Actually, people seem to be aware that their retirement saving may not be optimal. Thus, Choi et al. (2004) report that two out of three respondents in their sample of participants in a defined contribution scheme think that their savings rate is too low.<sup>4</sup>

There is also a *framing effect* on decision making under risk. This is the phenomenon that decisions under risk are influenced by the way the decision problem is framed. For example, if a decision is formulated in terms of losses, people tend to choose a risky outcome, whereas they tend to avoid risk when the problem is presented in terms of winning. This is due to loss aversion (Prast, 2004). Benartzi and Thaler (1999) confronted participants with three gambles that were identical in the long run, but different in short term losses. Respondents found the gamble with the lowest short term losses the most attractive, which would be consistent with *myopic loss aversion*. Applied to retirement saving, this would imply that workers, if given a choice, would invest more of their retirement contributions in stocks if they are shown long-term rates of returns instead of short-term (one year) rates of return. Framing, combined with extremeness aversion, may imply that people are inconsistent in their choices, tend to avoid outcomes that are presented as extremes, and opt instead for a middle-of-the-road portfolio. Also, people display a status-quo bias, implying that they tend to hold on to what they have got, including their investment portfolio (Samuelson and Zeckhauser, 1988). This is also referred to as the endowment effect (Kahneman, Knetsch and Thaler, 1991) and might imply that even though it may be optimal to periodically adapt one's retirement investment portfolio, people tend to leave it unchanged. Benartzi and Thaler (2001) find that many participants simply divide their contributions evenly among the various options offered in the retirement savings plan, an indication that the investor is not really able to, or does not wish to, use his freedom of choice in selecting an individually optimal investment strategy for his retirement savings. On the other hand, Huberman and Jiang (2004) find that participants divide their investment evenly over a small number (3 to 4) of funds, irrespective of the number of funds offered to them by the pension plan. This suggests investors do have some ability to choose.

## 2.2 Household saving and retirement investment

Several studies have examined household saving and retirement investment decisions empirically, some of them using behavioural finance concepts.<sup>5</sup> Gustman and Steinmeier (1999) study the 1992 Health and Retirement Study and find that households have adequate retirement savings. However, as Thaler and Benartzi (2004) point out, the majority of the pensions in the HRS sample used by

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<sup>4</sup> Mental accounting and the self control problem are used to explain the dividend puzzle, i.e. investor preference for cash dividends. The investor puts capital gains and cash dividends into separate mental accounts to keep control of spending. He worries that, once he decides to finance consumption from spending part of his portfolio, he may spend his savings too quickly. See Statman (1999) and Shefrin (2002).

<sup>5</sup> For an overview of non-behavioural empirical studies on household saving see Browning and Lusardi (1996).



Gustman and Steinmeier are of the defined benefit type with employees not being able to choose their contributions or benefits. Lusardi (1999) finds that in the US wealth varies much more among households than would be consistent with life-cycle theory. According to her study, some households hold more wealth than the life cycle model can explain, whereas most arrive at retirement with too little wealth. Ameriks and Zeldes (2001) find a status quo bias in savings behaviour, as fifty percent of the investors in their sample did not change their portfolio for the ten-year period under consideration, and 14 percent made only one change during this ten-year period. Guiso, Haliassos and Jappelli (2003) find that households' portfolios do not vary with age, whereas one would expect that, given the long-term equity premium, people would invest in stocks when young and switch to bonds when approaching retirement. Banks, Blundell and Tanner (1998) conclude that the consumption of British households after the retirement of the head of the household falls by more than can be explained by the rational life-cycle model. Scholz, Seshadri and Khitatrakun, using a life cycle model conclude that for the US there is little evidence that households save too little for retirement. Instead, they find that 80% of their sample –which consists of households aged 51 - 61 have oversaved. However, as with the study by Gustman and Steinmeier), in their sample wealth consists for a large part of claims to defined benefit pension income and social security.

Benartzi and Thaler (2002) study the investment behaviour of participants in two defined contribution pension schemes. They find that respondents allocate their retirement savings depending on the portfolio choices offered to them. Respondents tend to avoid extremes, either by choosing the middle portfolio when offered three or by allocating their savings over all the portfolios they have been offered. Moreover, they find that respondents are inconsistent in the sense that when offered a number of portfolios, including the one they have actually chosen for themselves, many of the respondents tend to go for the median portfolio, rather than their own.

One of the reasons why it is relevant to study the response of households to changes in pension schemes is that pension reforms may affect private savings and consumption behaviour, affecting macroeconomic performance. Studies into these effects are relatively scarce and have mixed results. Attanasio and Rohwedder (2003) study the response of household saving in the United Kingdom (UK) to three pension reforms (private and state pensions). The reforms affected the pension wealth of participants in pension funds. By studying the response in savings behaviour, Attanasio and Rohwedder examine the substitutability between pension wealth and financial wealth and find that it is high for all age groups except the youngest. This would be an indication of optimal life cycle savings behaviour. Thaler and Benartzi (2004) report the results of the implementation of SMarT, a prescriptive program for retirement savings. Starting from the assumption that individuals suffer from self-control problems, their goal was to see if workers could be helped by a commitment strategy for non-compulsory retirement savings. The program consisted of four elements. First, employees could

commit to a savings plan where the sign-up date would lay far ahead of the actual start-up date. The purpose of the delay was to overcome the hyperbolic discounting problem. Second, workers committed to saving more after each pay rise. Third, contributions would rise slowly until a maximum savings rate was reached. Finally, workers could opt out any time, but not lower their savings rate. Benartzi and Thaler find that the plan was extremely popular with participants, whose savings rate on average increased gradually from 3.5 to 13.6 %. This again indicates that individuals find it hard to save adequately for retirement if there is no commitment mechanism.

### *2.3 Risk attitudes and financial decisions*

Barsky et al. (1997) aim at measuring risk attitudes in various domains by conducting an experiment offering hypothetical choices between uncertain labour income streams. Their panel consists of participants in the Health and Retirement Study aged 50 and older. Respondents are asked to make risky choices in a gamble over lifetime income. In the first round, they must choose between a certain job with fixed income  $Y$ , or a job with a 50% chance of an income of  $2Y$ , and a 50% chance of an income of  $aY$  ( $a=0.67$ ). In the second round, the choice becomes more or less risky ( $a$  equals 0.5 or 0.8). Based on their choices, respondents are divided into four categories of different risk appetite. Barsky et al. find, that their measure of risk tolerance predicts whether individuals choose to purchase health and life insurance, with the expected sign. They do not relate risk tolerance to investment decisions.

Donkers and van Soest (1999) use the CentERdata panel for measuring subjective risk aversion, the rate of time preferences and the interest in financial matters of Dutch households. They investigate whether these individual household preferences have explanatory power for financial decisions, i.e. home ownership, mortgages, and the ownership of risky financial assets. Their findings are in line with economic theory and intuition: the higher the individual's risk aversion, the less likely he is to invest in risky financial assets. Moreover, risk averse home owners live in less expensive houses. Also, respondents who are more interested in financial matters live in more expensive homes and are more likely to invest in risky financial assets. This would suggest that individuals who are, or think they are, better informed about financial matters, are more willing to take risk in order to get a higher return.

Kapteyn and Teppa (2002) assess the explanatory power for individual portfolio choice of three different measures of risk tolerance. They include the gambles-over-lifetime-income approach used by Barsky et al. (1997) and two ad hoc measures based on self-assessment. The ad hoc measures are constructed by the answers to specific questions about investment strategies, and by answers to general (i.e. not typically income and investment related) questions about precaution and risk attitude. Their panel consists of participants in the CentERpanel who are employed and the main breadwinner.

Kapteyn and Teppa conclude, that respondents' self-assessment regarding their risk tolerance and precautionary attitude is a better predictor of portfolio choice than the risk attitude implied by the Barsky-experiment. As far as the interrelationship between the different risk attitude measures is concerned, Kapteyn and Teppa find that risk aversion as measured by the income gamble experiment is positively related to the general risk attitude in life as measured by the individual self-assessment.

#### *2.4 The present study*

Our study contributes to the existing literature on pension preferences in a number of dimensions. First, we use a representative sample of the Dutch population, whereas most studies in the US – see for example Benartzi and Thaler (2002) – only focus on the higher educated and/or higher income categories. Second, the respondents in our sample are not used to the concept of a defined contribution pension system, whereas this type of system is quite common in the US. Third, in the Netherlands, retirement age is not at the discretion of the individual worker but is compulsory and dependent on the pension scheme adopted by the employer. Retirement age varies between 60 and 65, whereas in the US, anti-age discrimination laws forbid a compulsory retirement age. This implies that in the US employees do have the discretion to choose when to exchange labour income for pension income. If the return on their retirement savings falls below their expectation, they may choose, health permitting, to work longer.<sup>6</sup> Fourth, the social security system in the Netherlands is generous, with a state pension of about € 632 per month for every person aged 65 and older. Fifth, the respondents in our panel have recently experienced the stock market decline, whereas those in previous studies were interviewed when the stock market was still booming. For all of these reasons, we feel that our study can provide useful insights both with respect to theory and policy making.

### **3. Methodology and Data**

The data we use in this paper have been collected through an internet-survey among members of the CentERpanel. The panel consists of about 2000 households who are questioned frequently on various issues. The households are given the opportunity to complete the questionnaires during a long weekend (from Friday 5 pm until Tuesday midnight). The questions are answered at home on a personal computer with a modem (households who do not have access to a pc are provided with a set-top-box for their television, so that they can complete the questionnaires via the television set). Participants are not paid for their co-operation. Due to the internet set-up of the survey, respondents are not influenced by an interviewer, do not feel rushed to give an answer and are fully anonymous when answering the questions. In case of attrition of panel-members, CentERdata - the agency that has

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<sup>6</sup> Often, however, there are financial incentives directed at inducing employees to quit working when in their sixties.

been running the panel from 1993 onwards - selects new members as to keep the panel representative for the Dutch population. CentERdata is a survey research institute that is specialized in internet surveys and forms part of the CentER Group at Tilburg University.

### *3.1 The survey*

Our survey comprises two questionnaires that have been answered by respondents throughout the period of April-October 2004. The first questionnaire consists of two blocks of questions focusing on different themes (appendix B contains the most important questions). The first block is on self-assessment of financial knowledge, and on risk aversion. We ask how respondents assess their own financial knowledge, and their risk tolerance in various domains. We also pose some questions to construct a more objective measure of risk tolerance using hypothetical gambles on lifetime income (comparable to Barsky et al., 1997; and Kapteyn and Teppa, 2002). The questions in the second block concentrate on the preferences of people with respect to their pension scheme and ask how they would invest their pension wealth if a defined contribution scheme was in place.

Using the stated preference for stock investment by each respondent we construct an individually tailored future income benefit scheme (a monthly allowance with probability distribution).<sup>7</sup> We present this future income scheme to respondents as part of the second questionnaire and ask them to rate the benefit scheme based on their own investment choice, but do not reveal that it is based on their personal choice of stock investment in the first questionnaire. We also present them with the benefit scheme that is the result of the median choice for stock investment in questionnaire 1, and ask them to rate it. Our purpose here is to assess whether people are consistent in their preferences. Section 4.3 explains the details of this experiment and interprets the outcomes.

Our research aims at people who are, or can be expected to soon become, a participant in a corporate pension scheme. Therefore, we selected the panel members of age 18 and older who have a paid job, are looking for a job or have listed their study as their primary occupation. This leaves us with 1521 people to whom we have presented the first questionnaire.<sup>8</sup> 1314 respondents returned the first questionnaire; a response rate of 86%. 1078 respondents completed the second questionnaire: a response rate of 82% after two attempts. Our regression analysis of pension attitudes (section 4.1

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<sup>7</sup> Some calculations were necessary to construct the benefit schemes for each individual. An In appendix D we elaborate on the Monte Carlo simulations that are used in the construction of the income schemes.

<sup>8</sup> If this first questionnaire was not completed the first time, we offered the questionnaire for a second and if necessary a third time to the group of non-respondents to improve on the response rate (actually some survey weekends fell within typical vacation periods).

below) is based on the 1066 respondents who completed both questionnaires and for whom we have information on their monthly income.<sup>9</sup>

### 3.2 Data and summary statistics

The average age of our sample of 1066 respondents is 42 years, 59% is male and 91% is currently employed. The gross average monthly income is slightly more than € 2800 (€ 2300 for the median respondent). In our analysis we relate the answers on specific questions to several individual characteristics to identify patterns in the risk attitude and pension preferences. The variables that are included to explain individual behaviour are defined as follows:

Age	6 classes from 15-24 years to 65 years and older
Education	6 classes from primary education to university education
Partner	dummy for having a partner (1= yes, 0=no)
Gender	dummy for gender (1=male, 0=female)
Income	12 classes (from gross monthly salary of less € 500 to more than € 7500)
FinExpert	self-assessment financial expertise (7 classes from very low to very high)
RiskTolSubj	self-assessment risk tolerance (7 classes from strongly risk averse to risk tolerant)
RiskTolObj	theoretical measured risk tolerance (6 classes from strongly risk averse to risk tolerant)

The first five variables (from Age to Income) present objective information on individual characteristics of the respondent. The last three variables are based on the self-assessment and gambling decisions of respondents. Financial expertise is measured by the answer on the question: ‘How would you assess your expertise regarding financial decisions, e.g. investments (on a 7-point scale)’.

The majority of the respondents (64%) rate their financial expertise in the three lowest categories and hence do not view themselves as skilful financial decision makers. A minority of 20% ticks in one of the three highest categories and regards themselves as knowledgeable. The self-assessment on risk tolerance reveals that most respondents consider themselves far from risk tolerant. We asked for risk tolerance in general, in financial matters and in the pension domain. The average scores in these categories are 3.2, 2.8 and 2.6 respectively and the differences are statistically significant at all relevant levels of significance. Thus, respondents view themselves as most risk averse in the pension domain. This self-assessment of risk tolerance in the pension domain is included in the regressions. In addition to this subjective measure of risk tolerance, we also constructed a more objective risk preference criterion that is based on gambles on lifetime income. This methodology stems from Barsky et al. (1997) and enables us to rank risk tolerance on an ordinal scale. In fact, our measure of risk aversion closely resembles the extended version of Kapteyn and Teppa (2002) and contains three

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<sup>9</sup> In order to base our empirical analysis on a consistent dataset we do not make use of the respondents that did not respond to the second questionnaire. We have verified that this does not affect the qualitative results. All results are available from the authors upon request.

rounds of gambles instead of two allowing for more dispersion in risk tolerance. The reason to include a subjective and an objective measure for risk tolerance is the debate in the literature on whether simple direct measures do a better job in explaining financial choices than theoretical measures that are well-founded in theory (see e.g. Kapteyn and Teppa, 2002, or Donkers and Van Soest, 1999). Indeed the two measures for risk tolerance appear to be positively correlated but far from perfect. Our estimations show that both measures contain separate additional information for explaining pension preferences and behaviour. In another paper we go into detail on the subject of the measurement of risk preferences, individual risk behaviour and the relation to individual characteristics. At this moment we confine ourselves to the observation that overall the objective measure of risk tolerance supports the picture of the self-assessment. According to both measures most respondents are (strongly) risk averse. Nonetheless, the correlation between the two measures is with 0.24 quite modest.

## 4. Results

In this section, we focus on three related questions. First, we summarize respondents' pension preferences. In particular, we document which type of pension scheme – defined contribution (DC) versus defined benefit (DB) – private consumers prefer, how much certainty they want with respect to their retirement income and to what extent they want to be actively in control of their pension investment portfolio. We then analyse to what extent personal characteristics and – stated – risk aversion are significant determinants of individual pension preferences. Second, we investigate what respondents (say they) would do if they were put in charge of their own pension investments. That is, we investigate the preferred portfolio mix as well as the determinants of initiating and possibly changing this portfolio later on. Again, we link individual responses to personal characteristics and attitudes via a regression analysis. Third, we assess individual consistency in portfolio choice. We ask respondents to choose between two portfolios, one of which is their own preferred portfolio, without revealing this. We analyse whether respondents typically switch to the alternative portfolio or stick with their initial choice.<sup>10</sup>

### 4.1. *What do individuals want?*

In order to get a grip on the respondents' attitude towards compulsory retirement savings, we asked whether they are happy with a compulsory pension scheme, and if so, for what reason. As it turns out,

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<sup>10</sup> Response rates differ considerably across questions. Typically the response rates for “easy” (general) questions, such as the self assessment of risk attitudes and the attitude towards a compulsory employee pension system as the one we have in the Netherlands are higher than those for intricate questions which require more time and thinking.

the majority of our respondents (77%) is in favour of compulsory saving for retirement. 12% is against compulsory retirement savings, 6% is indifferent and 5% answers that they do not know. Of the respondents who are in favour of a compulsory pension scheme, one-third gives as motivation that otherwise they would not save enough for retirement, indicating awareness of a self-control problem. About 60% indicate that thanks to a compulsory system they do not need to spend time and energy on planning retirement savings.

When asked whether they prefer a defined benefit or a defined contribution pension system (question 4 in block 2), 63 percent of our sample (671 out of 1066 respondents) expresses a preference for a defined benefit system, 12 percent (130 respondents) prefers a defined contribution system, 10 percent is indifferent and 15 percent doesn't know which one to choose. Overall, an almost two-third majority apparently wants to keep the currently prevailing pension fund system in the Netherlands. This preference for a defined benefit confirms earlier findings for the Netherlands (Vos, Alessie and Fontein, 1998). To some extent, this result may reflect a status-quo bias: in the questionnaire, we described the DB system by explaining that it is largely comparable to the current system in the Netherlands. We thus may have implicitly suggested that in the Netherlands the current DB system can be maintained with current premiums. Insofar considerable increases in premium size would be necessary to maintain the current system, the DB system may have been presented as too favourable. However, premiums have already increased recently to make up for the reduced values of the asset portfolios backing pension fund liabilities. One possible additional reason why people might prefer the current DB system is that in the Netherlands there is no possibility to postpone the age of retirement. In the US, age discrimination prevents employers from sending their employees to retirement. This enables US employees to use their choice of retirement age as an additional instrument for retirement savings planning.

Table 1 provides a more in-depth view on the personal characteristics behind these pensions system preferences, based on the results of a multinomial logistics regression. In panel A we report the marginal effects of factual personal characteristics on the probability of an individual's choice between DB, DC, indifference and making no choice.<sup>11</sup> The rows show how a unit change in one of the personal characteristics affects the probability of an individual choosing one of the answer categories. T-values are in parentheses. In panel B, three more explanatory variables are included that represent financial expertise and risk tolerance. These latter three variables in a sense are less "exogenous" as they represent an individual's opinion about the own expertise and risk attitude. Possibly, these are determined by the earlier used factual personal characteristics in the same way as the pension preferences themselves. However, in comparing panels A and B, we may be able to shed light on the

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<sup>11</sup> For 0-1 dummies the marginal effects relate to a discrete change in the dummy variable from 0 to 1, for the other independent variables the unit change takes the sample mean as a reference point.

issue whether some of the factual characteristics directly influence pension preferences or only indirectly through – more fundamental – risk preferences. The explanatory power of the regressions is limited – 3.5 and 8.9 percent respectively –, but we are unable to reject a test on the joint significance of all regression coefficients at standard confidence levels.

**Table 1 Determinants of the choice between DB and DC (based on multinomial logit)**

A. Marginal effects on probability for each preference excluding financial expertise and risk attitude

<b>Preference:</b>	<b>DB</b>	<b>DC</b>	<b>Indifferent</b>	<b>Don't know</b>
<b>Age</b>	.039 (2.69)	-.035 (3.56)	.007 (0.85)	-.012 (1.14)
<b>Income</b>	.022 (2.77)	.010 (2.09)	-.015 (3.05)	-.017 (2.85)
<b>Education</b>	.014 (1.21)	.009 (1.23)	-.004 (0.57)	-.019 (2.36)
<b>Gender</b>	-.071 (2.13)	.065 (3.09)	.026 (1.30)	-.020 (0.82)
<b>Partner</b>	-.020 (0.60)	.005 (0.25)	-.010 (0.45)	0.024 (1.05)

B. Marginal effects on probability for each preference including financial expertise and risk attitude

<b>Preference:</b>	<b>DB</b>	<b>DC</b>	<b>Indifferent</b>	<b>Don't know</b>
<b>Age</b>	.021 (1.43)	-.013 (1.50)	.010 (1.14)	-.018 (1.73)
<b>Income</b>	.024 (2.92)	.002 (0.34)	-.014 (2.68)	-.011 (1.87)
<b>Education</b>	.014 (1.26)	.005 (0.69)	-.005 (0.55)	-.015 (1.87)
<b>Gender</b>	-.058 (1.74)	.034 (1.76)	.027 (1.35)	-.003 (0.13)
<b>Partner</b>	-.027 (0.84)	.017 (0.99)	-.008 (0.36)	0.018 (0.76)
<b>FinExpert</b>	.024 (2.28)	.021 (3.90)	-.013 (2.02)	-.032 (4.03)
<b>RiskTolSubj</b>	-.054 (4.42)	.025 (3.68)	.028 (3.82)	.001 (0.17)
<b>RiskTolObj</b>	-.026 (2.27)	.034 (5.56)	.009 (1.25)	-.016 (1.91)

A few issues stand out from Table 1. From panel A, we see that respondents in higher age categories have an increasing likelihood to prefer DB systems over DC systems. The probability of a DC choice goes down significantly, while that of a DB choice goes up. Also, males choose significantly more often for DC systems and less often for DB systems than females. Implicitly, this suggests males are



more risk-tolerant on average.<sup>12</sup> Higher income respondents are less likely to say they are indifferent or don't know. That is, they are more inclined to make a choice. This choice may go either way as both the probability of choosing DB and DC rises. The effect in the direction of DB preference is quantitatively larger, though. Finally, higher education decreases the likelihood of a "don't know" answer. In panel B, three additional indicators are introduced. The significance of the variables in panel A is reduced across the board, suggesting their effect mostly works indirectly through the impact on financial expertise and risk tolerance measures.<sup>13</sup> Most of these now are (marginally) insignificant. Instead, both financial expertise and risk tolerance enter significantly. Hence we find, as do Kapteyn and Teppa (2002), that respondents' self-assessment of risk tolerance is a good predictor. However, it does not perform better than the objective risk attitude measure implied by the Barsky-experiment. Self-assessed financial expertise reduces the likelihood of "don't know" answers as well as "indifference" while increasing the likelihood of preferring DB and DC systems approximately by an equal amount. Apparently, those who are more confident about their own capacity to understand financial issues become more inclined to make a clear-cut choice. Higher (self-perceived) risk tolerance increases the likelihood of choosing a DC system and decreases the likelihood of a DB choice. Interestingly, the risk tolerance indicators appear to be complements rather than substitutes. As pointed out earlier, the issue what type of risk tolerance exactly is measured by either indicator is left for future research.

In a related question (block 2, question 5), we asked respondents to indicate which percentage of their pre-retirement net wage income they would want to have as a guaranteed pension. That is, assuming convex combinations of defined benefit and defined contribution systems would be available, how important should the defined benefit component be. Out of the total of 1066 respondents, 817 gave a numerical answer to this question in the form of a guaranteed income percentage between zero and hundred; 249 persons said they didn't know. The mean preferred percentage was 69 percent, while the median equalled 80 percent. Only 9 percent of the respondents would be satisfied with a guaranteed pension income below 50 percent of their net wage income. Obviously, the willingness to take risks with future retirement income is very low.<sup>14</sup> The answers appear consistent with the direct evidence on risk tolerance about pension income (see appendix C). In table 2, we relate the answers with respect to the preferred pension income guarantee to the individual pension system preferences from the previous question. The "don't knows" with respect to the preferred income guarantee have been excluded from Table 2.

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<sup>12</sup> See Jianakoplos and Bernasek (1998) and Schubert et al. (1999) for research on gender and risk tolerance.

<sup>13</sup> A further analysis is outside the scope of this paper but will be followed up on in the companion paper. Preliminary regressions indeed show strong dependence of risk tolerance measures on factual individual characteristics.

<sup>14</sup> Moreover, people are willing to pay for the security of guaranteed benefits (Van Els et al., 2004).

**Table 2 Preferred income guarantees versus preferred pension system**

Percentages of respondents preferring the specified pension system

Preferred system (# respondents)	Preferred income guarantee percentage				
	<= 50%	>50 and <=60	>60 and <=70	>70 and <=80	>80 and <=90
DB (601)	15.0	7.6	22.1	24.6	30.6
DC (120)	50.8	16.8	20.8	7.5	4.2
Indifferent (77)	39.0	7.8	18.2	24.7	10.4
Don't know (19)	21.1	10.5	10.5	15.8	42.1

As Table 2 clearly shows, the choice for a high (low) guaranteed pension income as a percentage of pre-retirement wage income is strongly positively correlated with the choice for a defined benefit (defined contribution) system. Out of the 601 proponents of the DB system, over 55 percent (24.6 + 30.6) wants a guaranteed pension income of over 70 percent of wage income. Only 15 percent in this group settles for 50 percent or less. On the other hand, only about 12 percent of those who prefer a DC system require a certain retirement income in excess of 70 percent, while over 50 percent in this group is satisfied with an income guarantee of 50 percent or less. An additional regression to link the preferred guaranteed income percentage to factual individual characteristics was not very successful. The explanatory power was around 1 percent and only Age and Gender are individually significant. A higher age increases the preferred guaranteed income percentage, while males on average require 4 percentage points lower guaranteed income than females. Inclusion of financial expertise and risk tolerance indicators significantly improves the explanatory power to over 7 percent. Financial expertise is insignificant, but both higher objective and higher subjective risk tolerance lower the required percentage of guaranteed income.<sup>15</sup>

To assess the desired degree of autonomy in portfolio investments, question 6 in block 2 (see appendix B) asks the hypothetical question whether respondents would want to have control over individualized pension fund accounts or would like to delegate this to the pension fund. Almost half of our sample (48.3%) would leave investment decisions to the pension fund, 26% prefers autonomy, 10% is indifferent and 15% doesn't know. Table 3 summarizes the link with pension system preferences. The set-up is analogous to Table 2. Here all 1066 observations are used. Again, the dichotomy between supporters of DB versus DC systems is clear-cut. A large majority of the former group prefers the pension fund to decide on investments, while an equally large majority of the latter group prefers individual autonomy.

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<sup>15</sup> Detailed regression results are available from the authors upon request.

**Table 3 Preference for investor autonomy versus preferred pension system**

Percentages of respondents preferring the specified pension system

Preferred system (# respondents)	Percentages of respondents preferring the specified pension system			
	Pension fund	Investor autonomy	Indifference	Don't know
DB (671)	61.0	24.0	9.1	6.0
DC (130)	32.3	57.7	7.7	2.3
Indifferent (107)	38.3	24.3	29.0	8.4
Don't know (158)	14.6	9.5	5.1	70.9

The results of a multinomial logistic regression of the preferred degree of investor autonomy on both factual individual characteristics and financial expertise and risk attitude indicators are presented in Table 4. The set up is similar to Table 1. The numbers again are marginal effects on the probability. T-values are in parentheses.

Panel A in Table 4 shows that the probability of respondents preferring the pension fund to control their individual investment increases with age and education. On the other hand, the probability that respondents prefer control over retirement savings investment increases with income and depends positively on being male. When the indicators for financial expertise and risk tolerance are included, most of the earlier significant effects disappear (except for the education effect), indicating again that both self-assessed and measured risk tolerance are important explanatory variables with respect to pension preferences. Self-assessed higher financial expertise is shown to strongly increase the preference of individual autonomy and to marginally reduce the preference for the pension fund to be in control. The second risk tolerance indicator also has a strong positive impact on the probability for investor autonomy. In this respect our findings differ from those by Kapteyn and Teppa (2002) who conclude that self-assessed risk tolerance is more reliable than the objective Barsky measure. Typically, and in line with intuition, higher income, education, financial expertise and risk tolerance all reduce the likelihood that respondents answer “don't know”.

As we have seen, the majority of respondents regard themselves as financially unsophisticated. Respondents with more (self-assessed) expertise, on average, make different choices in the hypothetical situation of investor autonomy in a defined contribution system. In order to see whether offering more financial education to the respondents would change their behaviour, we have asked respondents whether the opportunity to take a course (free of charge) to upgrade their financial expertise would affect their willingness to take control over their retirement savings. 42% of the respondents think that financial education would increase their preference for being in control of their retirement portfolio; another 42% believes it would not, and the remaining 16% do not know. The

answers to this question are correlated with the respondents' preference for a DC system over a DB system: two out of three respondents who prefer a DC system believe that they would take more control over retirement savings investment when offered the possibility to upgrade their financial knowledge. Interestingly, the respondents who are not in favour of the DC system are less willing to take control of their own retirement saving when they become financially more sophisticated.

**Table 4 Determinants of the preferred degree of autonomy (based on multinomial logit)**

A. Marginal effects on probability for each preference excluding financial expertise and risk attitude

<b>Preference:</b>	<b>Pension fund</b>	<b>Investor autonomy</b>	<b>Indifferent</b>	<b>Don't know</b>
<b>Age</b>	.033 (2.14)	-.015 (1.07)	-.008 (0.89)	-.010 (0.97)
<b>Income</b>	.002 (0.21)	.017 (2.45)	-.002 (0.37)	-.017 (2.89)
<b>Education</b>	.033 (2.70)	.004 (0.33)	-.008 (1.12)	-.028 (3.52)
<b>Gender</b>	-.047 (1.31)	.070 (2.29)	-.019 (0.87)	-.004 (0.18)
<b>Partner</b>	.046 (1.31)	-.038 (1.20)	.013 (0.62)	-.021 (0.84)

B. Marginal effects on probability for each preference including financial expertise and risk attitude

<b>Preference:</b>	<b>Pension fund</b>	<b>Investor autonomy</b>	<b>Indifferent</b>	<b>Don't know</b>
<b>Age</b>	.021 (1.32)	.005 (0.39)	-.008 (0.86)	-.018 (1.81)
<b>Income</b>	.007 (0.82)	.004 (0.54)	.000 (0.03)	-.011 (1.89)
<b>Education</b>	.034 (2.79)	-.004 (0.34)	-.008 (1.10)	-.022 (2.88)
<b>Gender</b>	-.030 (0.82)	.031 (0.98)	-.016 (0.69)	.014 (0.63)
<b>Partner</b>	.043 (1.19)	-.028 (0.88)	.013 (0.61)	-0.028 (1.12)
<b>FinExpert</b>	-.019 (1.71)	.065 (7.05)	-.014 (1.96)	-.032 (4.19)
<b>RiskTolSubj</b>	-.011 (0.87)	.009 (.84)	.009 (1.15)	-.007 (0.84)
<b>RiskTolObj</b>	-.017 (1.40)	.036 (3.46)	.005 (0.72)	-.024 (2.88)

Summarising, we can conclude that self-assessed and measured risk attitudes as well as self-assessment of financial expertise are significant predictors of preferences with regard to pension schemes. Respondents who are more inclined to take risk and consider themselves to be financially

sophisticated, are more likely to prefer a pension system where they can choose their own investment portfolio of retirement savings. Keeping financial expertise and risk tolerance constant, we find that the higher educated are more likely to have a pension fund invest their retirement savings than to opt for investor autonomy. Two possible interpretations are that the opportunity cost for the higher educated of time spent on thinking about retirement saving is higher, and/or the higher educated are more aware of their lack in financial sophistication. Our first interpretation is confirmed by an auxiliary regression. As explained before, we also asked the question whether individuals are in favour of the current system of compulsory retirement savings. Regressing the answers to this question on individual characteristics (regression results not shown here), it turns out that education has a significant positive effect on the probability that a respondent answers that he is in favour of the current system because he would have to spend too much time on investment decisions for retirement otherwise.

#### *4.2. What would consumers do in case of investor autonomy?*

In this subsection we focus on the issue what individual consumers (respondents) – say they – would do in case their pension contributions would be deposited in individualized pension accounts. In this hypothetical set up, the accounts are managed by a pension fund, but the individual consumer has to decide which percentage of the account will be invested in stocks.

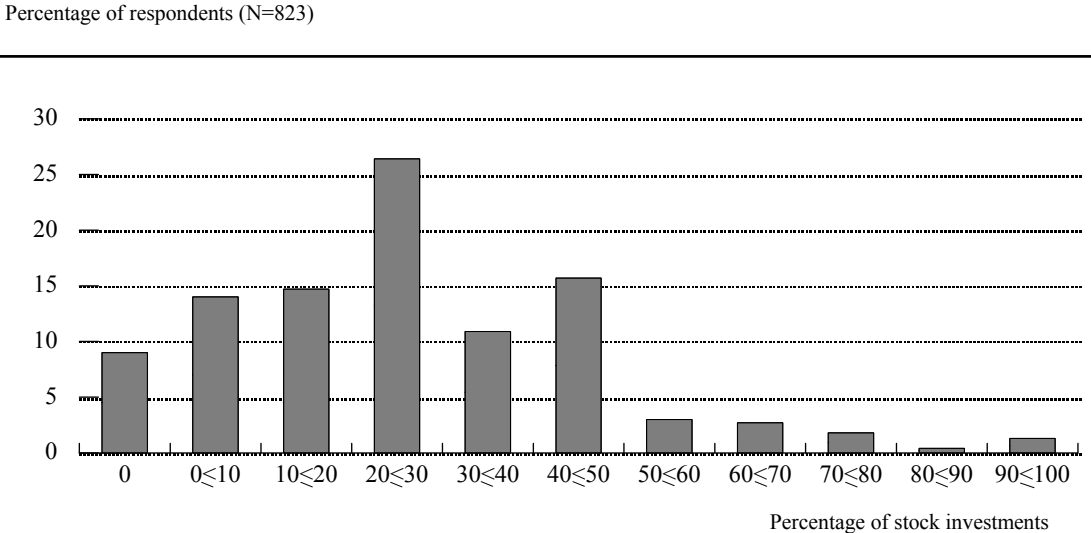
Figure 1 graphically presents the results. Out of 1066 respondents, 823 give a numerical answer. Only those respondents are included in Figure 1. The preferred percentage of stocks in the portfolio ranges from zero (portfolio completely in the form of bonds) to 100 (portfolio completely in stocks) percent. The median response is 30 percent, which also happens to be the mean (30.3 percent) across all respondents. Interestingly, and as was to be expected given their risk attitude, those who earlier expressed their preference for a defined contribution pension system (122 out of 823) on average clearly prefer to hold a larger part of their portfolio in stocks than those who prefer a defined benefit system (568 respondents). The mean response of the former group equals 39.6 percent, while that of the latter equals 28.8 percent. Note, that the mean percentage clearly is below the percentage of stock holdings by Dutch pension funds. In 2002, the five largest corporate pension funds in the Netherlands kept 35.7% in stock. In earlier years the percentage of stock holdings by these funds was, most likely because of the booming stock market, even higher, and up to 45.5% in 1999.<sup>16</sup> The remainder of the pension fund assets is invested in risk free assets and, to a lesser degree, in real estate. The preferred percentage of stock by the respondents in our sample is also below that typically found in US defined contribution schemes where participants choose the composition of their retirement savings portfolio

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<sup>16</sup> Numbers based on Annual Reports. The higher percentage of stock investment of pension funds does not imply that pension funds take more risk than consistent with the preferences of their participants. Intergenerational risk sharing in the current collective system enables pension funds to take more risks than individuals would.

(Benartzi and Thaler, 2002). This could – at least partly – be due to the disappointing performance of stock markets as of 2000.

**Figure 1 Preferred retirement savings portfolio composition: percentage stock in individual portfolio**



**Table 5 Determinants of preferred retirement portfolio composition**

<b>Age</b>	-0.97 (1.38)	.44 (0.65)
<b>Income</b>	.33 (0.87)	-.17 (0.47)
<b>Education</b>	.31 (0.55)	-.10 (0.19)
<b>Gender</b>	5.81 (3.51)	3.08 (1.97)
<b>Partner</b>	-0.74 (0.45)	-.17 (0.11)
<b>FinExpert</b>		2.34 (5.00)
<b>RiskTolSubj</b>		3.45 (6.09)
<b>RiskTolObj</b>		2.39 (4.40)
<b>Constant</b>	28.39 (7.59)	5.48 (1.34)
<b>Adj R2</b>	0.02	0.15

Note: dependent variable is preferred percentage of stocks

In Table 5, we display results for two related regressions. In both cases, the preferred stock percentage in the retirement savings portfolio is the dependent variable. In the first regression, only factual personal characteristics are used to explain the choice of portfolio mix. In the second one, indicators of financial expertise and risk attitude are added. Overall, financial expertise and the willingness to take risks appear the most important factors in determining the preferred portfolio mix. However, even after controlling for subjective and objective risk tolerance and financial expertise being male (female) increases (decreases) the proportion of stock holdings by another 3 percentage points (compared to being female).<sup>17</sup> Although the overall effect is halved, it remains strongly significant. This is consistent with research indicating that women are on average more risk averse (Jianakoplos and Bernasek 1998). However, other studies come to opposite conclusions (e.g. Schubert et al., 1999).

Subsequently, we have asked which factors have played a role in selecting the preferred stock percentage in the initial situation and which factors may play a role in the future in adjusting the percentage of stocks in portfolio through time. Table 6 summarizes the outcomes for the total of 1041 respondents.

**Table 6 Underlying determinants of initial choice and subsequent changes in retirement portfolio composition according to respondents**

Percentage of respondents naming the category

<b>Determinant</b>	<b>Initial composition</b>	<b>Reasons for change</b>
<b>None</b>	11	10
<b>Age</b>	42	22
<b>Family composition</b>	24	18
<b>Personal financial situation</b>	53	49
<b>Accumulated pension wealth</b>	38	32
<b>General economic condition</b>	48	56
<b>Financial market expectations</b>	36	42
<b>Other</b>	3	2

Note: percentages do not add up to 100 as respondents could give several answers

Overall, about ninety percent of the respondents states that either personal circumstances – age, family composition, personal financial position or accumulated pension claims – or general economic conditions and financial markets expectations have played a role in choosing the preferred portfolio mix and will continue to influence future adjustment decisions. About 10 percent regards none of these factors as relevant for the composition of their portfolio. Apart from age, determinants of initial choice of portfolio and determinants of later changes are more or less the same. With respect to age, the percentage of respondents that believes it to be an important factor for their own portfolio choice is 42

<sup>17</sup> The inclusion of expected (future) stock returns as an additional explanatory variable leaves the results qualitatively unchanged. The coefficient on expected returns is very small and only marginally significant at the 10 percent level.

for the initial composition, but only 22 for future adjustments.<sup>18</sup> An explanation might be that age – unlike the other factors – is perfectly predictable. People may choose their optimal portfolio mix now given their (known) time to retirement and may not consider future changes. All the other factors are subject to (unexpected) changes and as such may require portfolio adjustments from the perspective of the respondents.

Not all factors are equally important, though. Especially one’s personal financial situation (49 percent) and the two indicators of general economic circumstances (56 and 42 percent, respectively) apparently are strong drivers of future investment decisions. About half of our respondents would consider changing the own portfolio mix in case of (important) changes in any of these three variables. Assuming that changes in these circumstances are quite likely to happen more than once over, say, a ten-year period, this implies a relatively high degree of activism in portfolio management. Ameriks and Zeldes (2001) find that fifty percent of the investors in their sample did *not* change their portfolio during a ten-year period, and 14 percent made only one change. Moreover, it is well known in financial practice that people tend to make little changes in other financial instruments, e.g. annuities. Possibly, the respondents in our sample overestimate their reactions to changing circumstances, and will fall prey to a status quo bias once they have made their initial portfolio selection (Samuelson and Zeckhauser, 1988). Put differently, we cannot exclude that as a result of procrastination there would in practice be less activism than the survey results suggest.

**Table 7 Determinants of activism (in a logit regression)**

	Initial composition does not depend on economic factors		Change in composition does not depend on economic factors	
<b>Age</b>	0.06 (0.63)	.004 (0.39)	0.02 (0.28)	-0.01 (0.15)
<b>Income</b>	-0.21 (3.56)	-.17 (2.76)	-0.21 (3.50)	-.18 (2.79)
<b>Education</b>	-0.10 (1.35)	-.08 (0.99)	-0.13 (1.63)	-.10 (1.27)
<b>Gender</b>	0.27 (1.21)	0.41 (1.76)	0.33 (1.39)	0.46 (1.92)
<b>Partner</b>	0.12 (0.53)	0.10 (0.43)	0.12 (0.48)	0.08 (0.35)
<b>FinExpert</b>		-0.30 (3.76)		-0.26 (3.19)
<b>RiskTolSubj</b>		-0.01 (0.06)		-0.04 (0.41)
<b>RiskTolObj</b>		0.02 (0.26)		-0.04 (0.51)
<b>Constant</b>		-0.72		-0.35

<sup>18</sup> Interestingly, in a multivariate regression analysis (see table 5) age is insignificant.



		(1.27)		(0.60)
<b>Adj R2</b>	0.033	0.055	0.037	0.057

In Table 7, we report the results of four logistic regressions with the dependent variable being 1 when respondents state that specific individual or general circumstances do *not* influence their choice of portfolio mix and 0 when they state that one or more of the arguments in table 6 play a role in their decision. The explanatory variables again consist of the factual individual characteristics, financial expertise and the two risk tolerance indicators. We report two regressions for the choice of initial portfolio mix and two for the possible adjustment of the mix later on. The first regression each time excludes financial expertise and risk tolerance indicators, while the second one includes these three variables.

From Table 7, we observe that higher financial expertise and higher income both significantly increase the odds of individuals stating their portfolio choice is motivated by economic determinants. Neither of the risk tolerance indicators has a significant effect. Gender has a quantitatively strong – and statistically marginally significant – effect in those regressions that include the expertise and risk tolerance indicators. Taken literally, the result implies that being male increases the probability that portfolio composition and adjustment do *not* depend on quantifiable economic circumstances as perceived by the respondents. This would be somewhat surprising, as it contrasts with the literature on excessive trading, which concludes that men trade significantly more than women, thereby generating a significantly lower return (Barber and Odean, 2001). However, in the regressions excluding the financial expertise and risk tolerance indicators, the gender effect is smaller and insignificant. In our view, the earlier significance therefore probably arises from the interaction between (assessed) financial expertise and gender and can be disregarded. Overall, the explanatory power of the regressions is low.

We performed similar regressions as in Table 7 on a disaggregated level. While we do not report the detailed results here, we do briefly summarize the main findings. Higher financial expertise consistently raises the probability that respondents are willing to act – that is, (re)consider their portfolio allocation – on information in the variable under investigation. Apparently, perceived financial expertise leads individuals to stronger believe in the information in specific economic indicators and/or in their own ability to interpret such information. Thus, increased financial expertise may be an important driving force for people’s willingness to actively manage their portfolio. The effect is strongest for financial market expectations, age and family composition, and weakest for the case of one’s personal financial situation.

### 4.3. Do consumers know what they prefer?

In order to further investigate whether the respondents are well-skilled as regards their investment choices and have well-defined preferences in the sense that they indeed prefer the benefit schemes (i.e. the range of retirement outcomes) that are likely to result from their investment choice, we follow a procedure similar to the one used by Benartzi and Thaler (2002). They confronted colleagues from UCLA (University of California, Los Angeles) and employees of the Swedish American Health Systems, Inc. with three benefit schemes and asked them to rate the attractiveness of these schemes. The benefit schemes were based on participants' actual portfolio choice, on the average portfolio composition and on the median choice of assets within the pension portfolios, respectively. Benartzi and Thaler confront respondents with the 5<sup>th</sup>, 50<sup>th</sup> and 95<sup>th</sup> percentile of benefit schemes. The portfolio mix in their study consisted of cash, bonds, large cap stocks, international stocks and small cap stocks.

We use an approach similar to the one taken by Benartzi and Thaler. However, while they calculated the distribution of retirement income using software of a specialized investment management company, we construct the benefit schemes based on Monte Carlo simulations (details are included in appendix D). We assume a yearly average nominal stock and bond return of 8% and 5% respectively (an average equity premium of 3%). The assumed volatility of annual stock and bond returns equals 18% and 4%, respectively. The choice of these parameters is quite common in ALM analysis of e.g. pension funds. Also from a historical and economic point of view these parameter choices seem plausible. In our sample, the median and the average of the percentage of stock investment coincide; both equal 30%. Thus, we calculate a benefit scheme based on the median percentage of stock investment, and for each individual a scheme based on his preferred asset composition. We did not tell the respondents that one of the two benefit schemes is based on their own investment choice. The respondents have to rate the attractiveness of two benefit schemes on a 5-points scale.

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#### **Box 1 Question on the rating of pension schemes**

Consider two pension schemes without guaranteed pension benefit. The actual benefit depends on for example general economic and financial market developments. The table below presents the retirement benefit you may expect under each benefit scheme. The numbers present gross benefits in euro per month. The pension contributions you have to pay are equal in both arrangements. The numbers are excluding the state pension benefit (this gross benefit equals € 921 per month for singles and € 632 per person each month for married couples and people living together). Any pension plan, you may have arranged on top of these arrangements, is not included. For each benefit scheme we present three possible outcomes (an unfavourable scenario, a favourable scenario and a middle variant).

Economic scenario	Pension scheme I	Pension scheme II
VERY UNFAVOURABLE	610	540
AVERAGE	920	1012
VERY FAVOURABLE	1414	1920

The interpretation of these numbers is as follows. There is a 5% probability of a retirement income above the VERY FAVOURABLE retirement income, there is a 50% probability of a retirement income above the AVERAGE retirement income and there is a 5% probability of a retirement income below the VERY UNFAVOURABLE retirement income.

**QUESTION:** How do you rate these two pension schemes on a scale from 1 to 5 with 5 being ‘very attractive’ and 1 being ‘very unattractive’?

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The box demonstrates how this question is presented to the respondents. The numerical example in the box is based on a gross salary of € 2300 per month for a respondent who did report that he would invest 50% in stocks and 50% in bonds. In fact, pension scheme I is the result of an investment strategy of 30% stocks and 70% bonds and pension scheme II is the result of a portfolio with an equal mix of bonds and stocks. The latter one has a higher upward potential but also more risk on the downside. Note though that the pattern is asymmetric. The extra downside risk of portfolio II is relatively small compared to its extra upside potential. The numbers exemplify the fact that the riskiness of holding stocks is relatively smaller on a long horizon than on a short one.

The results are presented in table 8. In table 8, we explicitly present the distribution of ratings across respondents for both portfolios. We distinguish between the group of respondents that has a preferred percentage of stocks in their portfolio less than or equal to 20 or in greater than or equal to 40 (586 respondents) and the group of respondents with a preferred percentage stocks between 20 and 40 percent (237 respondents). The first group compares its own portfolio and the median portfolio, the second one its own portfolio with the 50 percent portfolio.<sup>19</sup>

**Table 8      Attractiveness of two portfolios**

Percentage of respondents and mean rating

Attractiveness portfolio	20>=%stocks %stocks>=40		20<%stocks<40	
	Median	Own	50 percent	Own
1 (very unattractive)	4.6	6.1	2.5	3.4
2	13.3	19.3	11.0	19.8
3 (neutral)	37.2	37.9	30.4	48.1
4	34.5	27.5	46.0	26.2
5 (very attractive)	9.9	9.2	10.1	2.5
Mean rating	3.3	3.1	3.5	3.0

We first consider the first group of (586) respondents with a preferred stock percentage diverging at least 10 percentage points from the medium percentage of 30. Their average rating of the pension scheme based on the median portfolio is equal to 3.3 as opposed to 3.1 for the pension scheme that

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<sup>19</sup> In fact, for simplicity we approximate individually chosen own portfolios with stock percentages between 20 and 40 percent with the uniform mean portfolio, which has 30 percent stocks.

results from the own choice of the respondents, suggesting an inconsistency in the choices made by the respondents. 43.7 percent of this group prefers the median portfolio to the own portfolio while only 36 percent prefers the own portfolio. 20.3 percent of the group is indifferent between the two portfolios. At first sight, this resembles the result by Benartzi and Thaler who also find a preference shift toward the median. A closer look at our data reveals something different. The relative rating of the median and the personally selected portfolio differs according to whether the respondent had initially selected a low-risk or a high-risk portfolio composition. That is, an asymmetry in responses emerges.

Within this group of 586 respondents, 311 respondents have chosen a significantly more conservative portfolio than the median consisting of 20% or less stocks. This group rates the median portfolio considerably higher than their personally chosen portfolio. The difference is large, with an average rating of 2.8 for the own and of 3.6 for the mean portfolio. 61 percent of this group of conservative investors prefers the median to the own portfolio. On the other hand, 275 respondents have chosen a preferred stock percentage of at least 40 percent. For this group, that favours a relatively risky portfolio, the opposite holds. On average, they rate the median portfolio as less attractive than their own (average ratings of 3.0 and 3.5 respectively). 59.6 percent of the respondents in this group prefer the own portfolio to the median.

Interestingly, the above results are quite consistent with those for the group of 237 respondents that have chosen a preferred stock percentage close to the median (between 20 and 40 percent). They rate their own portfolio on average at 3.0 and the more risky 50 percent portfolio at 3.5. 56.5 percent of this group prefers the 50 percent portfolio to their own original choice.

Our results contrast remarkably with Benartzi and Thaler. Whereas in their sample respondents tend to go for the median portfolio irrespective of their initial portfolio choice, our risk averse panel members seem to be pleasantly surprised by the high return that can be earned by taking a little more risk. In other words, there seems to be a tendency to choose a more risky portfolio when people realize how their choice for a percentage of stocks translates into long-term risk and return patterns. One explanation for this phenomenon – due to Benartzi and Thaler (1999) – , is that our respondents are subject to ‘myopic loss aversion’. Benartzi and Thaler show that people would pick a higher percentage of stocks in their pension portfolio if they are confronted with the (true) distribution of returns over a longer period (in comparison with a confrontation with returns over a one year period). If people focus on the distribution of one-year stock market returns, the probability of a short-term loss may receive too much weight in long-term portfolio decisions. Alternatively, the respondents’ expectations of asset markets differ from ours. For respondents who are more pessimistic on the stock market’s risk return profile relative to the bond market than implied by our assumptions, the

shift towards a more risky portfolio could be consistent.<sup>20</sup> Either way, the results seem to suggest that many consumers lack the skills for investing their own pension wealth, as their choices are either inconsistent or based on an unrealistic assessment of the distribution of bond and stock market returns.

## **5. Summary and conclusions**

This paper has presented the results of a study into pension preferences and the effect of individual freedom of choice on risk taking in the context of pension arrangements. It uses questionnaire replies from about 1000 members of the Dutch Household Panel run by CentERdata. The study focuses on preferences for risk taking in the pension domain and the respondents' attitude toward defined benefit and defined contribution pension schemes. Moreover, it tries to explain portfolio choices for retirement savings by the respondents' individual characteristics, in the hypothetical situation that respondents have investor autonomy in a defined contribution pension system. Finally, we try to assess whether respondents have consistent preferences when it comes to portfolio choices for retirement saving.

Our main conclusions are the following. Risk aversion is domain dependent and highest in the pension domain. The vast majority of respondents is in favour of compulsory saving for retirement and favours a defined benefit pension system. This preference is primarily due to the wish not to spend time on retirement savings decisions and to self-control problems. If offered a combined defined benefit/defined contribution system, the majority of the respondents would like to have a guaranteed pension income of 70% or more of their net labour income. Self-assessed risk tolerance and financial expertise are important explanatory variables of pension system attitude. Respondents are on average conservative in their investment policy. If given investor autonomy, they are willing to change the composition of their retirement savings portfolio in response to their personal financial situation, general economic conditions, and expectations of financial markets. Respondents may be inconsistent in their preferences. Especially respondents who have chosen a relatively safe portfolio (less stock, more bonds) appear to prefer the retirement income streams of the median investment portfolio to their own portfolio choice. This result may well be sensitive to the fact that we have used our own expectations of stock and bond market returns and risk. Finally, the average respondent considers himself financially unsophisticated, but is not very eager to take control of retirement savings investment when offered the possibility to increase expertise.

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<sup>20</sup> A potential problem in the interpretation of the results is that in between the two surveys the information available to respondents may have changed, resulting in seemingly inconsistent choices. Given the lack of major economic developments during the period under investigation, we doubt the quantitative importance of such effect.

What do our results imply for academic theory in the field of pensions, and what are their policy implications? As previous research by Kapteyn and Teppa (2002) has revealed, self-assessed risk tolerance is a significant predictor of financial decision making under risk. However, whereas Kapteyn and Teppa find that self-assessment works better than an objective measure of risk tolerance, our results indicate that both measures perform well. As suggested by the behavioural finance literature, we do indeed find that respondents have (self-assessed) self-control problems when it comes to saving for retirement. Our investigation of the consistency of pension preferences gives mixed results. Respondents do switch to the median portfolio as in Benartzi and Thaler (2002). However, this result may be sensitive to a difference between our expectations of stock and bond market returns and risk and those of the population. Financial market expectations are possibly highly affected by the recent collapse of stock markets, and may be a result of overreaction due to cognitive dissonance and “disaster magnification” (Prast, 2004; Guttentag and Herring, 1986).

As far as the policy implications are concerned, it is obvious that respondents would not be happy with a change over from a defined benefit to a defined contribution system with more freedom of choice. They do not want to and feel that they are unable to control retirement savings. It is somewhat worrying that respondents indicate that in case they were given investor autonomy in a defined contribution system, they would be willing to actively manage their portfolio in response to changes both in personal and general macroeconomic circumstances, including financial market developments despite their low self-assessed financial expertise. This is reason for concern as in general ‘buy and hold’ strategies outperform active trading in the longer term. Offering financial education free of charge would not help. Those respondents who rate themselves as least sophisticated are on average not willing to take more control over retirement savings.

Our findings offer scope for further research. We have found that both self-assessed and measured risk tolerance are significant predictors of attitudes towards and stated behaviour with respect to retirement savings. It is therefore worthwhile to further investigate this issue. In future research, we intend to analyze individual risk attitudes using personal characteristics. Moreover, we will use these and additional data, including those from an additional experiment, to explore the issue of extremeness aversion. The latter focuses on inconsistency in preferences due to framing. Finally, the macroeconomic implications of a changeover to a defined contribution system deserve additional research as well.

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## Appendix A Stylized facts on Dutch pension funds

Absolute numbers and percentages									
	Number of pension funds			Number of non-retired participants			Balance total (mln. Euro)		
	2004	2003	2002	2004	2003	2002	2004	2003	2002
<b>Individual corporate pension funds</b>									
Defined benefits: end wage	50,8	54,0	57,5	26,4	33,1	41,5	37,6	42,4	49,3
Defined benefits: mid-wage	20,8	18,0	15,7	31,4	26,3	23,7	28,3	26,2	25,0
Defined contribution	4,4	4,0	4,4	6,6	6,9	1,6	1,5	1,4	0,9
Combined db/dc	17,4	15,3	13,6	33,7	32,0	31,2	32,2	29,4	24,3
Other	6,6	8,6	8,9	1,8	1,8	2,0	0,4	0,7	0,5
<b>Total</b>	<b>701</b>	<b>744</b>	<b>779</b>	<b>856 691</b>	<b>870 827</b>	<b>792 865</b>	<b>132 233</b>	<b>141 484</b>	<b>143 165</b>
<b>Sector pension funds</b>									
Defined benefits: end wage	17,5	21,6	20,8	10,5	59,9	62,8	8,5	76,8	81,4
Defined benefits: mid wage	71,3	68,9	66,7	85,7	38,6	35,3	91,1	22,9	18,2
Defined contribution	2,5	1,4	1,4	0,0	0,0	0,0	0,0	0,0	0,0
Combined DB/DC	5,0	4,1	4,2	3,4	1,1	1,0	0,3	0,2	0,2
Other	3,8	4,1	6,9	0,4	0,4	0,9	0,1	0,1	0,2
<b>Total</b>	<b>80</b>	<b>74</b>	<b>72</b>	<b>4 756 913</b>	<b>4 521 843</b>	<b>4 276 811</b>	<b>272 786</b>	<b>292 592</b>	<b>294 737</b>

## Appendix B Most Important Questionnaire items

The survey is divided into a number of blocks. This appendix contains the questions that are most relevant for this paper. These questions are drawn from two different parts; that is the blocks on financial expertise and risk attitude, and pension behaviour and preferences.

### BLOCK 1: FINANCIAL EXPERTISE AND RISK ATTITUDE

1) How would you assess your expertise regarding financial decisions, e.g. investments on a 7-point scale; 1 means very low and 7 means very high?

2) How would you, generally, describe your attitude in life? Please fill in on a 7-points scale what characterization most closely describes your attitude; 1 means 'I try to avoid risks as much as possible' and 7 means 'I like to take a chance'.

3) How would you describe your attitude in financial matters? Please fill in on a 7-points scale what characterization most closely describes your attitude; 1 means 'I try to avoid risks as much as possible' and 7 means 'I like to take a chance'.

4) How would you describe your attitude as regards your pension? Please fill in on a 7-points scale what characterization most closely describes your attitude; 1 means 'I try to avoid risks as much as possible' and 7 means 'I like to take a chance'.

Imagine you are currently employed and your doctor recommends that you move because of allergies. You follow his advice. Your new home is that far away from your old job that commuting is not an option. In your new city you are offered the choice out of two possible jobs. Both jobs are equally demanding as regards content and work load, but the income in the one job is much more certain than in the other job.

5) The first job guarantees your current income for the rest of your life. The second job pays with a 50% chance double your current income and with a 50% chance an income of 30% below your current income. What job do you choose?

[ ] The job with my current income for the rest of my life → 8

[ ] The job with equal probability on double and equal probability on 70% of my current income for the rest of my life → 6

6) And if the second job pays with a 50% chance double your current income and with a 50% chance an income of 50% below your current income. What job do you choose?

The job with my current income for the rest of my life → Block 2

The job with equal probability on double and equal probability on 50% of my current income for the rest of my life → 7

7) And if the second job pays with a 50% chance double your current income and with a 50% chance an income of 75% below your current income. What job do you choose?

The job with my current income for the rest of my life → Block 2

The job with equal probability on double and equal probability on 25% of my current income for the rest of my life → Block 2

8) And if the second job pays with a 50% chance double your current income and with a 50% chance an income of 20% below your current income. What job do you choose?

The job with my current income for the rest of my life → 9

The job with equal probability on double and equal probability on 80% of my current income for the rest of my life → Block 2

9) And if the second job pays with a 50% chance double your current income and with a 50% chance an income of 10% below your current income. What job do you choose?

The job with my current income for the rest of my life → Block 2

The job with equal probability on double and equal probability on 90% of my current income for the rest of my life → Block 2

## BLOCK 2: PENSION BEHAVIOUR AND PREFERENCES

This block provides the interviewee with a description of the most important concepts where relevant. In the introduction it is explained that in the current Dutch system pension premiums of participants in a particular pension arrangement of their employer are collectively invested by a pension funds or insurance company. In a number of other countries, for example in the US, it is more common to deposit pension premiums on individual accounts with more freedom of choice as regards the investment of pension wealth in for example stocks and bonds, the so-called 'defined contribution' system. Pension benefits in this system are not guaranteed but depend on investment returns on deposited pension premiums. More investment in stocks may result in higher benefit levels but the uncertainty on the pension benefits also increases: there is a chance on a high as well as a chance on a low pension.

1) Suppose your employer deposits your pension contributions on an individual pension account. The premiums are invested by your pension fund in stocks and bonds. You have to decide yourself which part is invested in stocks and which part is invested in bonds. What percentage would you invest in stocks?

2) You have made a choice for the percentage of stock investment of your pension premiums if deposited on an individual pension account administered by your pension fund. What circumstances are relevant for your choice? You may check all that apply.

- None
- My age
- The family situation
- My personal financial situation
- The accrued pension wealth
- The overall economic situation
- My expectations on financial markets
- Other circumstances

3) You have made a choice for the percentage of stock investment. Circumstances may change over time and you might be willing to adjust the percentage of stock investment. What circumstances could urge you to have the percentage of stock investment changed? You may check all that apply.

- None
- Changes in age
- Changes in the family situation
- Changes in my personal financial situation
- Changes in accrued pension wealth
- Changes in the overall economic situation
- Changes in my expectations on financial markets
- Changes in other circumstances

4) Suppose you have the choice between two pension schemes: a defined benefit or a defined contribution scheme? The defined benefit scheme is based on your wage income during the years of employment with guarantees on the nominal benefit level. The payable pension premiums fluctuate. This system is largely comparable to the current system in the Netherlands. Ideally gross pension income equals 70% of gross wage income (corresponding to 90% of wage income on a net basis). In the defined contribution system pension premiums are deposited in an individual investment account. The pension benefit may end up lower or higher depending upon the investment returns. The pension premiums are fixed but the pension benefit is uncertain. You may choose to influence the decisions on the investment mix but you also may leave this up to the pension fund. Which scheme do you prefer?

- Defined benefit
- Defined contribution
- No preference
- Do not know/ no reply

5) Imagine a pension scheme that combines the defined benefit and the defined contribution system. Part of the pension benefit is guaranteed through collective arrangements but premiums may fluctuate and part of the pension benefits depends upon developments on stock and bond markets but the payable premium is fixed. If you have to choose a combination of these two systems, what percentage of your wage income would you want to be guaranteed as pension benefits? (Your answer may vary from 0% to 90% of the net wage income; 0% means that you want the benefit to fully depend on investment results and 90% means that you choose for a full guarantee of 90% of your net wage income and for pension premiums that fluctuate during the years of employment.

6) Suppose the pension system is altered into a system in which premiums of corporate pensions will be deposited into individual accounts which are automatically used to buy an annuity at the age of 65. Other than that you do not have access to your pension account but you have the opportunity to invest your pension money according to an investment profile offered by your pension fund or to invest your pension money according to your own investment choices. What do you choose?

- Leave portfolio choice to the pension fund
- Exert influence on investment portfolio
- No preference
- Do not know/ no reply

7) The influence you want to exert on your pension investments may depend on your financial expertise and your knowledge and expectations on stock and bond markets. Suppose, you are offered the opportunity to grade up your expertise by way of receiving information and/or attending a high-quality course offered by independent pension experts (free of charge). Do you expect that you are willing to exert more influence on the investment of your pension premiums if that is the case?

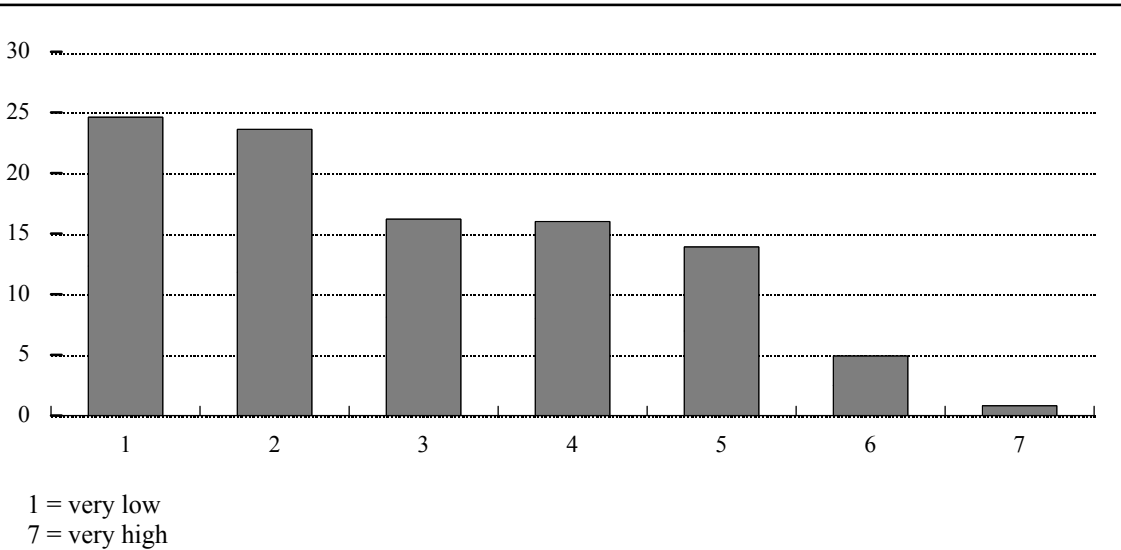
8) Employees in the Netherlands save compulsory for corporate pension benefits supplementing the state pension (AOW). What statement most closely describes your opinion about this obligation?

- I consider it an advantage that pension savings are compulsory, since otherwise I would be tempted not to save enough for retirement
- I consider it an advantage that pension savings are compulsory, since I do not want to think about how much to save for retirement
- I consider it an advantage that pension savings are compulsory for other reasons
- I consider it a disadvantage that pension savings are compulsory, since I want to be able to decide on whether and how much to save for retirement myself
- I consider it a disadvantage that pension savings are compulsory for other reasons
- I am indifferent as to whether pension savings are compulsory
- Do not know/no reply

# Appendix C Summary evidence on financial expertise and risk preferences

## Financial expertise

Percentage of respondents (N=1066)

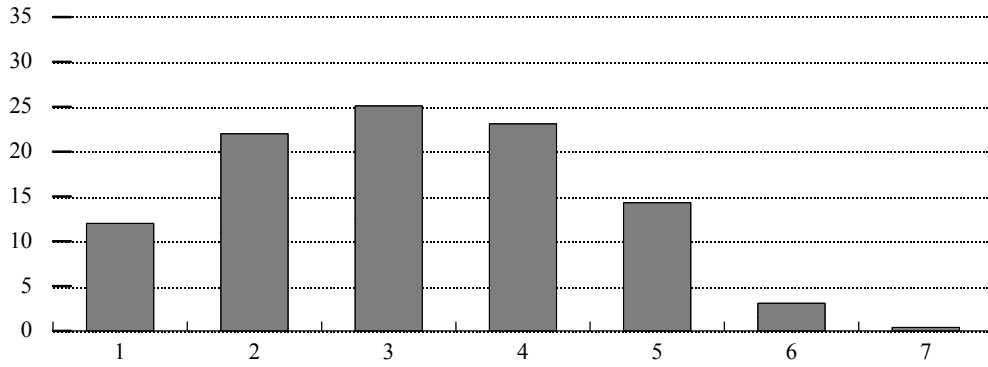


## Risk tolerance

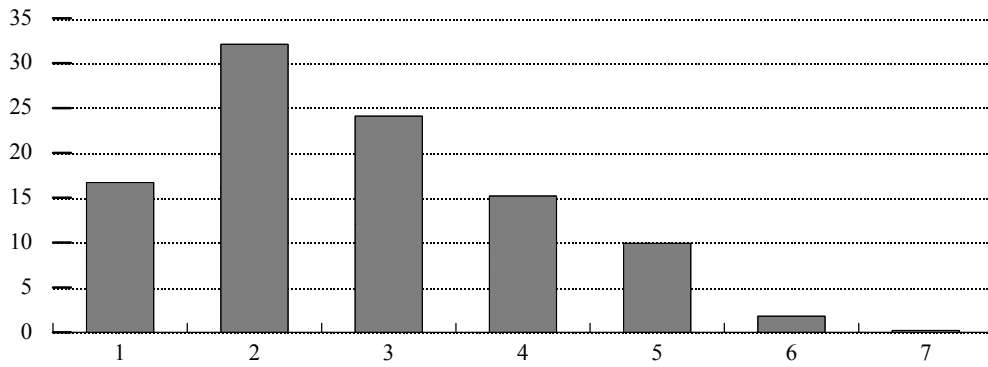
Percentage of respondents (N=1066)

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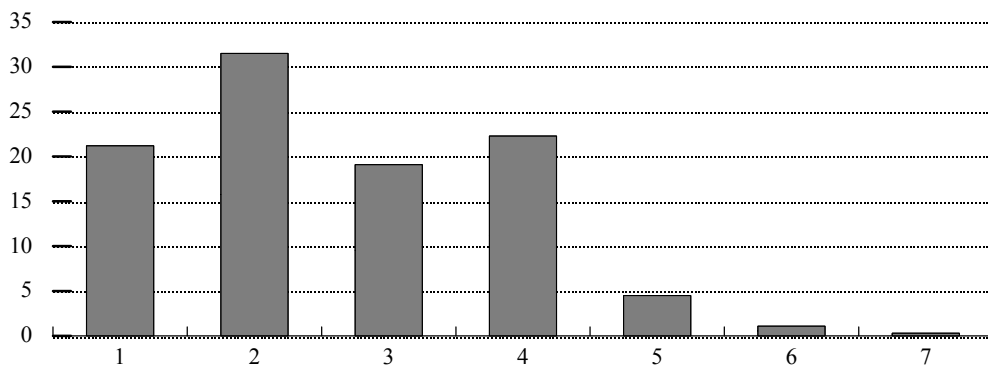
Risk tolerance in general



Risk tolerance in financial matters



Risk tolerance in pension domain



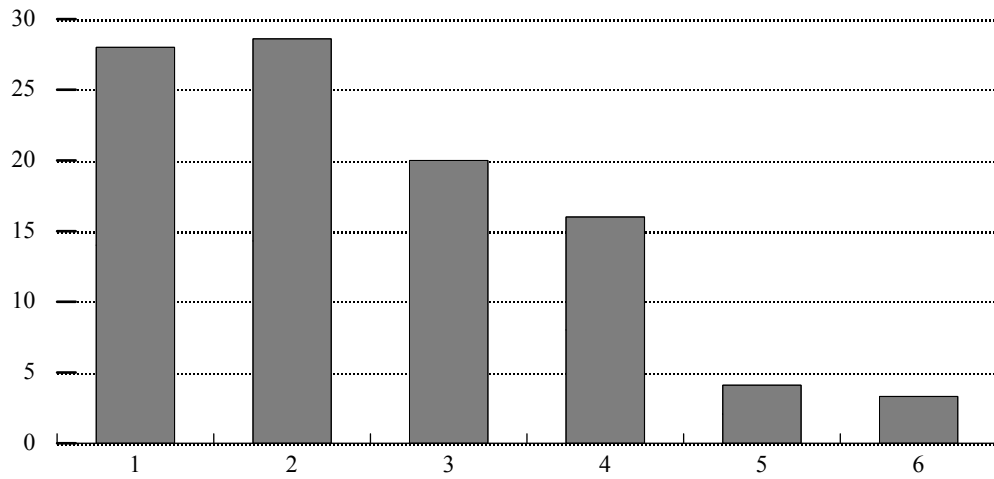
1 = try to avoid risk as much as possible

7 = like to take a chance



## Risk tolerance in a gamble on lifetime income

Percentage of respondents (N=1066)



1 = prefers current lifetime income to a gamble with 50% chance on double the current income and with 50% chance on 90% of the current income.

6 = prefers a gamble with 50% chance on double the current income and 50% chance on 25% of the current income above the current lifetime income.

## **Appendix D The calculation of retirement income distributions**

The distribution of retirement income given the gross salary of the respondent, the percentage of stock investment, and the mean and volatility of bond and stock returns is determined using Monte Carlo simulations. For each choice of parameters we run 1000 simulations to calculate the 5<sup>th</sup>, 50<sup>th</sup> and 95<sup>th</sup> percentiles of the retirement income distribution. We assume that during the period of 40 years before retirement the respondent - and his employer - pays a yearly premium contribution of 13% of the premium base given his gross salary. Calculations suggest that - for the average Dutch pension fund - this is the break-even pension contribution for receiving a typical Dutch old age pension (Van Rooij et al., 2004). The premiums are invested in stocks and bonds (with an average maturity of 5 years) according to the portfolio mix chosen by the respondent. The portfolio is rebalanced at the end of each year as to maintain the chosen mix of stock and bond investment. After 40 years of accumulating pension wealth the respondent buys an annuity. The pension benefit of this annuity equals 1/15<sup>th</sup> of the accrued pension wealth. In fact, the level of the annuity varies between financial institutions offering these products and depends on a number of factors such as the age and the respondent being male or female. The chosen factor (1/15<sup>th</sup>) seems a good approximation though.

We present the respondents the distribution of pension benefits in today's euro. Hence, we base our calculations on real bond and stock returns. The yearly bond returns are based on interest rate movements. The interest rate is driven by interest rate shocks that are normally distributed with mean zero and standard deviation 0.75. We calibrate a gradual adjustment to an equilibrium interest rate to account for the autoregressive nature of interest rate levels (interest rate = 0.25 \* equilibrium interest rate + 0.75 \* interest rate (-1) + interest rate shock). The halftime of interest rate shocks is 2 years and the (real) equilibrium interest rate equals 3%. The calculation of the yearly bond returns is based on the effect of interest rate changes on the valuation of a zero coupon bond. Given the chosen parameters the average bond return equals 3.1% with a standard deviation of 4.1%. The yearly stock returns follow a normal distribution with mean 6% (the expected interest rate plus an equity premium of 3%) and a standard deviation of 18%. Thus, if we assume the annual inflation to be equal to 2%, the nominal bond and stock returns equal approximately 5% and 8%. This choice of the mean and variability of bond and stock return distributions is quite common in Asset and Liability Management analysis of e.g. pension funds. Moreover, also from a historical and economic point of view these parameter choices seem plausible.