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The Effect of Financial Incentives on Retirement Decision Making under Different Schemes of Information Provision: Experimental Evidence

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The Effect of Financial Incentives on Retirement Decision Making under Different Schemes of Information Provision: Experimental Evidence

February 26, 2016

preliminary draft - comments welcome

Abstract

We elicit preferences for retirement timing under two schemes of financial incentives and across information treatments. Individuals are repeatedly asked to decide whether to retire immediately or to continue working in the setting of a laboratory experiment. We alternate two treatment parameters: First, we compare two schemes of financial incentives where the expected present value of pension wealth is either a declining or a constant function of the retirement age. Second, we change the amount of information regarding the expected pension wealth. In line with the common finding of the quasi-experimental literature, we find a considerable delay of retirement once benefit reductions make early retirement less attractive. The striking result is, however, that the amount of available information tremendously affects retirement decisions. Poorly informed individuals tend to make retirement decisions on the grounds of perceived reference points. Such decision criteria, e.g. social norms, may reduce the effectiveness of policies that aim at raising the retirement age.

Keywords: Retirement Age; Financial Incentives; Financial Literacy; Information Treatment; Sequential Decisions

JEL-Classification: C91, H55, J26

1 Introduction

Demographic change is a concern for public pension systems in many industrialized countries. The rise of expected years in retirement across OECD countries (OECD, 2015) is a challenge for retirement security and pension provision.¹ Programs that aim at postponed retirement, such as benefit reductions, can help to balance pension systems but understanding the precise mechanisms of retirement behavior is central to implement such policies successfully.

The purpose of this paper is to examine the impact of financial incentives on the timing of retirement. We focus on the functioning of these incentives under different information treatments. To overcome the problem of selection bias, we establish an ideal experiment where participants (N: 318) are randomly assigned to different schemes of financial incentives and information provision. Alternating the amount of available information on expected total pension incomes (ETPI hereafter) provides unique evidence on the effectiveness of financial incentives in policies that aim at raising the retirement age. To make the experimental situation as realistic as possible, the design is couched into the institutional setting of the German public pension system.² A considerable share ($79/318 \approx 25\%$) of our subject pool consists of actively employed older workers in close distance to retirement.

Our study relates to several strands of the literature. First of all, it adds to the quasi-experimental retirement literature that has found financial incentives to be a fairly reasonable way to influence retirement decisions. The existing literature does not coincide in all details but by and large it agrees to the extent that people respond to incentives. The common finding across countries, data sources and methods is that financial incentives influence the timing of retirement considerably (Fields and Mitchell, 1984; Mitchell and Fields, 1984; Samwick, 1998; Börsch-Supan and Schnabel, 1999; Blundell et al., 2002; Coile et al., 2002; Baker et al., 2003; Asch et al., 2005; Mastrobuoni, 2009; Hanel, 2010; Hanel and Riphahn, 2012; Manoli and Weber, 2015). In line with this literature, we find a large and

¹See e.g. Poterba (2014) for the manifold challenges of an aging population and its consequences for retirement security in the U.S.

²All experiments were conducted in Essen, Germany. Throughout the experiment, payoffs are proportional to average pension benefits in Germany. Also, financial incentives from benefit reductions/premia are anchored to the Germany public pension system.

significant effect of financial incentives on the retirement age. Imposing a benefit reduction rate of 3% for each year of retirement previous to the normal retirement age of 65 and a benefit enhancement rate of 5% for each year of retirement after the normal retirement age induces a delay of retirement by roughly 2 years on average. While principally robust, the estimated effect does differ across information treatments and subject pools. To the best of our knowledge, this type of experimental test of retirement decisions is a novel one.

Second, we find that making an informed retirement decision tremendously affects the observed outcome. Recent studies have stressed that the reaction to financial incentives not only depends on their size but also on their perception (Liebman and Luttmer, 2015) and that misinformed individuals do respond to perceived (but incorrect) pension information (Chan and Stevens, 2008). We provide new evidence on retirement decision making when people are poorly informed about the financial consequences of choosing a specific retirement age. Interestingly, previous research for the U.S. Lumsdaine et al. (1996) has pointed at social norms as an important part of the explanation why so many people retire at specific ages. Contrarily, Asch et al. (2005) argue that social norms seem not to play a role in retirement timing. The striking result from our experiment is that both can be true, depending on whether people know what they do. If no information on the ETPI as a forward-looking measure for social security wealth is available then individuals are significantly more likely to use social norms as decision criterion to determine their retirement age. This means that revealed retirement choices bunch at age 60, 63, 65 and 67 which are commonly known retirement ages in the universe of the German public pension system.³ People who are poorly informed about actuarial considerations of the retirement decision tend to make choices that are anchored to these perceived reference points. In contrast, well-informed individuals react to financial incentives more strongly and rather tend to maximize their ETPI. A lack of information can therefore reduce the effectiveness of policies that aim at raising the retirement age.

Third, our study adds to the literature on financial literacy (see Lusardi and Mitchell,

³These are either early retirement ages or normal retirement ages, depending on pension type and individual characteristics such as employment history and health status.

2014, for a recent review). Many studies have shown a link between financial literacy and retirement planning and wealth accumulation (Ameriks et al., 2003; Lusardi and Mitchell, 2007; Bucher-Koenen and Lusardi, 2011; Lusardi and Mitchell, 2011; van Rooij et al., 2012). The previous literature has also raised concerns whether people are able to calculate forward-looking incentive measures from future earnings and pension benefits (Mastrobuoni, 2011). We shed more light on how retirement decisions depend on grasping basic actuarial principles. In this paper, we examine the ability to understand the concept of ETPI and to calculate it with all relevant information at hand.⁴ We find that financially literate older workers are more likely to behave as benefit maximizers. This result suggests that retirement planning can be improved once people understand the patterns that determine their pension wealth as a function of the retirement age.

Finally, the closest study to ours in terms of experimental design is probably the one by Fatas et al. (2007). They test one-stage retirement decisions in an experimental framework and focus on the distribution of benefits over time (i.e. lump-sum vs. annuity). The link of our design to theirs is twofold. First, the general idea of testing retirement decisions in the laboratory and second, for the sake of robustness, we compare one-stage retirement decisions to sequential decisions. Our finding is that one-stage decisions induce participants to solve the decision problem more analytically and to be more prone to risky choices. Retirement outcomes in this setting differ significantly from more realistic sequential decisions mostly because participants have a stronger tendency to maximize their payoffs from pension benefits. Not only does this proceeding embed our work into the previous experimental literature but it also allows to test for differences of the results between two framings of an otherwise identical decision.

The remainder of this study is structured as follows. Section 2 describes the experimental design, the variation of treatment parameters. Section 2 also provides details on the experimental procedures and the recruitment process of older workers. Section 4 shows the results and section 5 concludes.

⁴To calculate the ETPI, all participants are provided with information on annual benefits as a function of the retirement age and expected years to live conditional on having survived the respective age.

2 Experimental Design

Our experimental design aims to elicit preferences for the retirement age under alternating schemes of financial incentives and information treatments. The experiment is framed as an individual retirement decision of late-career working individuals and conceptually anchored to the option value approach of Stock and Wise (1990). Individuals repeatedly decide whether to retire immediately or to continue working, depending on the present value of expected utility from discounted streams of labor income and pension benefits. Individuals choose to retire when the expected utility from immediate retirement surmounts expected utility from any combination of continued work and later retirement. As long as this condition is not fulfilled, the absorbing state of retirement is not entered and in each future period the decision problem is reevaluated.

We incorporate the concept of retirement decision making upon present values of future streams of income from pension benefits into this experiment. The design implicitly allows for the presence of labor although we do not explicitly model it. This involves the assumption that participating subjects are indifferent between a marginal change in the utility from labor income and disutility from labor.⁵

The point of departure is at the beginning of age 58. Participating subjects are asked whether to work or to retire in the following year. If a subject decides not to work and thus to retire, she will receive pension benefits as of the end of her 58th living year and this annuity will be paid for her remaining lifetime. The length of live of the subjects is determined by a random process based on recent mortality tables for Germany (Federal Statistical Office, 2012). Survival probabilities in the experiment are averaged for men and women (table 12, appendix A). Retirement is considered as an absorbing state and

⁵Simulating disutility from labor in the laboratory environment is principally possible but involves some drawbacks. One shortcoming is that we do not know the relative proportion of utility from labor income (consumption) to disutility from labor (the price of leisure) and thus assuming indifference seems reasonable during the experimental procedure. Another concern is with real effort tasks. While easily implemented, their power in eliciting real preferences is limited to the extent that it remains unclear what type of behavior they reveal. Modeling real effort tasks is usually highly abstract and may influence the outcome (see van Dijk et al., 2001, for a discussion). Work involves multidimensional aspects (e.g. ambition, boredom, excitement, fatigue) and may take effect into manifold directions.

thus no further work is possible after retirement.

If a subject decides to continue working one additional year and survives this respective year she will face the same decision situation (work vs. retirement) in the following year again. The repeated decision situation implies that she has grown one year older and finds herself at the beginning of age 59, having to decide again, whether she wants to work in this year or to retire instead. If a subject decides to work in the following year but does not survive this year, the total sum of pension benefits is zero and the decision situation ends with a zero payoff.⁶

The decision situation recurs as long as the subject keeps working and neither retires nor dies. However, decisions are restricted to the age window from 58 to 69 and thus to a maximum of 12 decisions. At age 69, participants who have not retired before can decide for the last time whether they want to retire immediately or to continue working. If they chose to continue working in this last period, they mandatorily retire at age 70.

Subjects are informed about their survival status after each period. Once subjects have retired, an additional survival year yields one further year of pension benefits. The level of annual benefits is determined as a function of the retirement entry date (the corresponding annuity). After subjects have actively decided upon work and retirement over 12 periods, they passively receive information concerning their survival status and benefit payments. The experiment ends when all subjects have died but we require individuals to live no longer than 100 years.⁷

2.1 The Role of Financial Incentives

Participating subjects are randomly assigned to two pension schemes that differ by their payoff structure. In these two systems, the pattern of benefits evolves differently as a

⁶Subjects may still receive a positive total payoff from correct answers to incentivized questions and a risk aversion test (paired lottery choices) in later parts of the experiment (see section 3).

⁷This assumption is necessary because the most recent mortality tables for Germany end at age 100.

function of the retirement date. Either the ETPI declines over age (table 1, left panel) or the ETPI remains constant (table 1, right panel). The two payoff structures only differ by an adjustment factor which is a 3% reduction rate for every year of retirement previous to the normal retirement age of 65 (i.e. “early retirement”) and a 5% enhancement rate (premium) for every year of retirement after age 65.⁸ To illustrate the difference between the two systems, table 1 provides the payoff sequences for annual pension benefits (annuities in column 3 and 6) and the corresponding expected total pension income (ETPI in column 4 and 7). To make the framing as realistic as possible, we anchor both systems at the 2014 annuity value (28 EUR) of an employee who has contributed to the German pension system for 40 years at average earnings and retires at age 65.⁹

According to table 1, a subject who decides to retire at the beginning of age 58 will receive a pension of 11047.59 token (laboratory units) facing a declining ETPI.¹⁰ The system is not actuarially neutral because after age 60 the ETPI monotonically declines from 280785 token at age 60 to 190934 token at age 70). In contrast, the second pension scheme is an actuarially fair system where the expected total pension income remains constant after age 60. Here, subjects who decide to retire immediately (in the first round of the experiment) receive an annual pension of 8727.60 token. At age 60, the annual pension benefits amount to 10531.97 token which corresponds to an expected total pension income of 238667 token. Subjects who choose to keep working throughout the entire experiment in each of the 12 decisions will mandatorily retire at age 70 and receive an annuity of 14549.34 token (declining ETPI) or 18186.67 token (constant ETPI) for their remaining lifetime.

Under both schemes of financial incentives the ETPI increases between age 58 and 60 and then declines (Factor = 1) or remains constant (Factor > = < 1). This pattern allows

⁸The real adjustment rates from the German public pension system are a 3.6% reduction and a 6% premium per annum respectively. We reduce these adjustment factors by 20% to account for time preferences, since discounting cannot be adequately modeled in the laboratory test. For more details, see section 2.4.1.

⁹This person is a theoretical construct but fairly well approximates typical attributes of German employees. Since average annual labor income is subject to contributions that yield one “earnings point” and the current annuity value in Germany is 28 Euros/earnings point, the calculation is as follows: 40 years x one earnings point x 28 = 1120 Euro of monthly pension benefits. For the full year (x12), pension benefits add up to 13440 Euros.

¹⁰Note that laboratory token reflect real Euro values for average pensions in the German public pension system. To make these numbers feasible for experimental payoffs, we convert them by the factor 1/15000 (students) and 1/10000 (older workers). Please see section 3 for details.

Table 1: Life Expectation, Pension Benefits and Actuarial Adjustments at Age 58.

Age	LE (Years)	Declining ETPI			Constant ETPI		
		Annuity	ETPI	Factor	Annuity	ETPI	Factor
58	24.68	11047.59	272655	1	8727.6	215397	0.79
59	23.84	11681.29	276505	1	9578.66	226734	0.82
60	23.005	12390.55	280785	1	10531.97	238667	0.85
61	22.175	12522.55	271213	1	11019.84	238667	0.88
62	21.36	12687.22	262272	1	11545.37	238667	0.91
63	20.55	12891.48	253901	1	12117.99	238667	0.94
64	19.745	13142.73	246049	1	12748.45	238667	0.97
65	18.945	13440	238667	1	13440	238667	1
66	18.155	13526.06	227302	1	14202.36	238667	1.05
67	17.38	13671.53	216970	1	15038.69	238667	1.1
68	16.595	13895.81	207537	1	15980.18	238667	1.15
69	15.835	14180	198889	1	17016	238667	1.2
70	15.075	14549.34	190934	1	18186.67	238667	1.25

Note: The two payoff schemes (declining vs. constant ETPI) only differ by the adjustment factor. The annuity is equal under both payoff schemes at the reference age of 65 (factor = 1). We assume that the reference person retires at age 65 and has paid contributions at the average earnings level for 40 years, evaluated at the current annuity value of 28 Euros/earnings point ($40 \times 1 \times 28 \times 12 = 13440$ Euro). LE: Life Expectancy; ETPI: Expected Total Pension Income.

to determine whether retirement decisions are only driven by risk-aversion. It enables us to distinguish risk-averse subjects who retire as early as possible (corner solution at age 58) from expected payoff maximizers who retire at age 60 (peak value/unique maximum: declining ETPI) or between age 60 - 70 (non-unique maximum under constant ETPI).

Given that a subject survives her 58th living year and has decided not to retire, she faces a new decision situation as summarized in table 2. Now, at age 59, all values of the ETPI need to be updated, conditional on having survived one additional year.¹¹ As long as individuals keep working and remain alive, this information is updated following the same logic at each subsequent age/period.

Generally, our experimental design aims to investigate how financial incentives affect re-

¹¹The calculation is as follows: $ETPI_a = ETPI_{a-1}/\pi$, where $ETPI_a$ is the expected present value for the current age, $ETPI_{a-1}$ is the expected present value for the previous age and π denotes the specific survival probability. For example, in the second decision round, retirement at age 59 yields an expected present value of $226734/0.9929 = 228355$ (example for constant ETPI).

Table 2: Life Expectation, Pension Benefits and Actuarial Adjustments at Age 59.

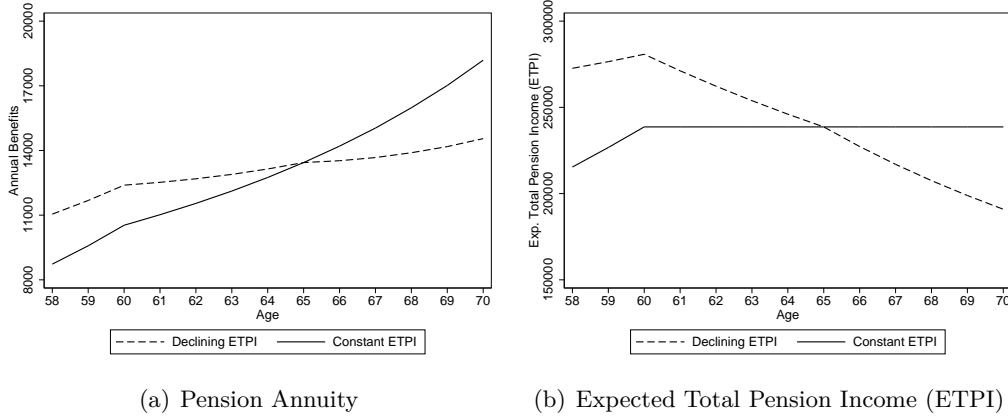
Age	LE (Years)	Declining ETPI			Constant ETPI		
		Annuity	ETPI	Factor	Annuity	ETPI	Factor
59	23.84	11681.29	278482	1	9578.66	228355	0.82
60	23.005	12390.55	282793	1	10531.97	240374	0.85
61	22.175	12522.55	273152	1	11019.84	240374	0.88
62	21.36	12687.22	264147	1	11545.37	240374	0.91
63	20.55	12891.48	255717	1	12117.99	240374	0.94
64	19.745	13142.73	247808	1	12748.45	240374	0.97
65	18.945	13440	240374	1	13440	240374	1
66	18.155	13526.06	228928	1	14202.36	240374	1.05
67	17.38	13671.53	218522	1	15038.69	240374	1.1
68	16.595	13895.81	209021	1	15980.18	240374	1.15
69	15.835	14180	200312	1	17016	240374	1.2
70	15.075	14549.34	192299	1	18186.67	240374	1.25

Note: The two payoff schemes (declining vs. constant ETPI) only differ by the adjustment factor. The annuity is equal under both payoff schemes at the reference age of 65 (factor = 1). We assume that the reference person retires at age 65 and has paid contributions at the average earnings level for 40 years, evaluated at the current annuity value of 28 Euros/earnings point ($40 \times 1 \times 28 \times 12 = 13440$ Euro). LE: Life Expectancy; ETPI: Expected Total Pension Income.

tirement decisions. The underlying question is whether individuals tend to work longer and retire later in the system with actuarial adjustments (constant ETPI, Factor $> = < 1$) in contrast to the system without actuarial adjustments (declining ETPI, Factor = 1). To elicit individual preferences for the retirement age, we vary only one parameter between the two schemes of financial incentives and hold everything else constant. Technically, we alternate the slope of expected total pension income as a function of the retirement age. The fundamental difference between the two schemes of financial incentives is illustrated in figure 1.

The figure shows how payoff sequences for both annual benefits (panel a) and ETPI (panel b) evolve over age. At the reference age of 65 the adjustment factor is equal to one under both schemes of financial incentives. Both systems generate an identical pension annuity at age 65 (13440 Euros) where the payoff profiles intersect.

Figure 1: Pension Benefits as a Function of the Retirement Age.



Source: Own graph.

2.2 Available Information and Financial Literacy

The amount of information about the ETPI differs across treatments. The perception of financial incentives may depend on the information level available to the decision maker. We aim to test, whether making an informed retirement decision influences the choice of the retirement age. For this purpose, we introduce three levels of information provision to examine potential differences.

First, the BASIC treatment provides subjects only with annual pension benefits, life expectation according to each retirement age and conditional survival probabilities. Based on this information, subjects have all relevant information at hand to calculate the ETPI from any perspective. To make a decision based on the ETPI, however, they must be capable to understand the concept and to calculate it.

Second, subjects in the INFO treatment receive similar information as in the BASIC treatment but are additionally endowed with numerical values of the ETPI and a short explanation of how it is calculated (underlined paragraph in the instructions). Providing this key information makes the payoff structure of the two systems transparent. Subjects who are not able to calculate the ETPI by themselves can use this information for the choice of their retirement age.

Finally, we introduce an INFO PLUS treatment. Subjects receive similar information as in the INFO treatment but are additionally endowed with an explanation of the economic meaning of the ETPI. The instructions include an explicit verbal statement on how the payoff structure evolves over age (highlighted paragraph of the instructions). This aims at further facilitating the comprehension also for those subjects who have difficulties to grasp the payoff structure in terms of numbers.

2.3 Sequential versus One-Stage Decisions

So far, we have described the sequential decision structure where people move from one period to another and repeatedly evaluate their retirement decision. We are further interested in testing one-stage retirement decisions in comparison to sequential ones. One-stage decisions not only provide an anchor point to the previous experimental literature (see Fatas et al., 2007, for a comparable design), but also allow to test differences under two framings of an otherwise identical decision.

One-stage treatments differ only to the extent that they involve a modified decision structure, asking subjects to decide upon their retirement age only once and for all. They are offered a menu of retirement ages from 58 to 70 from which to choose. Aside from the one stage (ex ante) choice, everything else (annuities, life expectancy etc.) remains the same in comparison to the sequential treatments. Thus, subjects face the same payoff structure in both one stage and sequential decision treatments under a given scheme of financial incentives.

In total, the experiment consists of 14 treatments as summarized in table 3. The treatment variables split into financial incentives, information provision, and the interaction of the two. Further, the decision structure varies between sequential and one-stage decisions among students. To ensure the functioning of the experimental setting, the payoff parameter (declining vs. constant ETPI) is only varied when holding everything else (i.e.

Table 3: Treatment Overview.

STUDENTS										
Treatment	SEQUENTIAL DECISION						ONE-STAGE DECISION			
	BASIC		INFO		INFO PLUS		BASIC		INFO PLUS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ETPI	dec	con	dec	con	dec	con	dec	con	dec	con
N Subjects	24	24	24	24	24	24	24	24	23	24

OLDER WORKERS (Age 45-58)				
Treatment	BASIC		INFO PLUS	
	(11)	(12)	(13)	(14)
ETPI	dec	con	dec	con
N Subjects	19	20	20	20

Note: dec: Declining ETPI; con: Constant ETPI.

information level and decision structure) constant.

2.4 Further Conceptual Issues

2.4.1 Preferences over Time

Time preferences are an important issue in modeling retirement decisions. The original model of intertemporal consumption relates the preference of present income over future income to impatience as determined by personal factors such as foresight, habit, and self-control (Fisher, 1930). We refer to this early concept in terms of individual discount rates, depending on which receiving one unit of pension benefits (for Germany: one Euro) today is typically valued higher in comparison to receiving it tomorrow. At the same time, actuarial adjustments make one Euro of pension benefits worth less if received today (in comparison to tomorrow). This leaves us with two parameters that offset each other: the discount rate and the adjustment rate.

We explicitly take this offsetting effect into consideration by opposing the time value of money to actuarial adjustments. The real adjustment rates from the German public pension system (annual reduction rate: 3.6%; annual premium rate: 6%) are reduced by

20% respectively, such that we use reduction rate of 3% and a premium rate of 5%.¹²

2.4.2 Risk Preferences

Risk preferences are related to retirement decisions to the extent that survival and thus benefit duration is uncertain. Private information on health status and risky behavior (e.g. smoking) may help individuals to fairly approximate their remaining life expectancy but nevertheless, under uncertainty, two otherwise identical individuals will evaluate their survival prospects differently. In order to maximize the ETPI, a risk-averse individual may choose an earlier retirement date (with higher benefit reductions) compared to a risk-loving individual.

Our concern is about isolating risk preferences from retirement choices. For this purpose, payoff sequences (ETPI as a function of age, see figure 1, panel b) are designed such that a unique peak value occurs at age 60 in the retirement scheme without actuarial adjustments. Delaying this peak value from age 58 to 60 allows to identify whether retirement choices are rather driven by risk preferences or benefit maximization. If the peak value coincided with the first payoff (i.e. the starting age), then we could not differentiate between risk aversion and payoff maximization since retirement at age 58 could be rationally motivated from both risk aversion or benefit maximization.

To control for risk preferences in the empirical analysis, we collect two measures of risk preferences. Revealed risk preferences are taken from a risk aversion test (Holt and Laury, 2002) and stated risk preferences (self-reported) are collected in the final questionnaire.

¹²The 20% reduction is calculated as follows: the average retiree receives benefits for 19 years after entering retirement (see German Federal Pension Insurance, 2014, for the most recent available year 2013) and second, we assume a discount rate of 2%. This results in a discount factor of $df = \sum_{t=1}^T \frac{1}{(1+\delta)^t} = \sum_{t=1}^{19} \frac{1}{(1.02)^t} = 0.83$, where $\delta = 0.02$ is the discount rate and pensions are received for $T = 19$ years.

3 Experimental Procedures

A total of 318 subjects participated in the computer based experiment using z-tree. The experimental sessions were conducted between December 2014 and February 2016. Most of the sessions were conducted at the “Essener Labor für experimentelle Wirtschaftsforschung” (elfe).¹³

3.1 Subject Pool and Recruitment Process

The pool of participants splits into 239 students (bachelor and master level) from the University of Duisburg-Essen and 79 older workers (age 45 - 58) in active employment. Summary statistics in table 14 (students) and table 15 (older workers) show key characteristics of the two groups.

We used the standard electronic recruitment procedures (ORSEE) to collect the subject pool of university students. To recruit older workers, we sent invitation emails to about 3350 employees with workplaces in close distance to the laboratory (in the region of Essen, Germany). This included about 350 non-scientific staff members at the University of Duisburg-Essen¹⁴ and 3000 public administration workers in the cities of Essen, Gelsenkirchen, Bottrop and Oberhausen.¹⁵ We only sent messages to professional email accounts (available on the institutions’ homepages) to ensure that people are actively employed.

The invitation email very generally stated the purpose to recruit older workers for participation in a scientific study on retirement behavior. The message also stated that participants could earn money depending on their individual decision making throughout

¹³Three sessions with older workers (13 subjects) were conducted outside of the laboratory using mobile computers, leaving everything else unchanged. We used polling booths to ensure that participants were isolated from each other throughout the experiment.

¹⁴We sent messages to available email addresses in all areas of administration (e.g. finance and controlling, employment services, student issues, maintenance service and science management).

¹⁵Again, we sent emails to all available addresses of the respective cities and thus from all fields of public administration (e.g. finance department, department for legal matters, public library, museums, communication and public relations department, public construction authority).

the experimental procedure. We made clear that our research is of public interest only, has no commercial background and is conducted on behalf of the German Science Foundation (DFG). We finally asked recipients who fulfill all participation criteria (age 45 - 58, German speaking, in active employment) to respond if they are interested in participation.

We collected responses and then made appointments for the experiment. To raise the participation rate we offered appointments very flexibly, leaving us with about 3 participants per session on average. A few days in advance of each arranged appointment we sent an information email to participants, including a reminder and all relevant details (day, time, location plan). The effective participation rate was 2.4% (79/3350).

While not representative for the German population (see table 15, appendix C, for socioeconomic details), the subject pool of older workers has useful properties for the experiment. First of all, it encompasses a group of older workers in close distance to retirement. In contrast to the typical student subject they are likely to have made some retirement planning. Second, these people are only contacted if they have an active email account in one of the mentioned institutions and are thus actively employed by definition. And finally, respondents do have a basic level of computer literacy which ensures that they are able to go through the computer-based procedure.

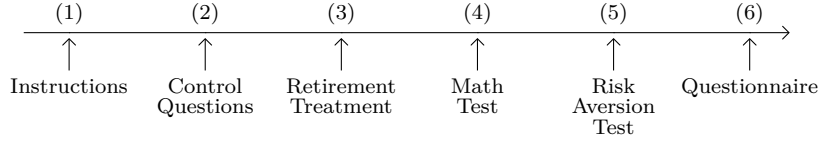
3.2 Sequence of Events

All treatments include the same sequence of events, splitting into six subsequent steps (figure 2). Participants first read the instructions while having the opportunity to pose clarifying questions (part 1)¹⁶. To ensure that everybody understands the instructions and the general proceeding, participants are asked to answer four control questions (part 2). The actual decision part is the core of the experiment (part 3), including different treatment types as summarized in table 3.

The retirement decision part is followed by three incentivized math questions (part 4) to

¹⁶The experimental instructions are provided in the appendix.

Figure 2: Sequence of Events.



test the ability of calculating the ETPI (for details, see appendix G). We use the results from these questions in the subsequent analysis as a measure of understanding actuarial considerations underlying the decision problem. This indicates whether people are able to make payoff maximizing decisions - if they want.

In part 5 we conduct a test to elicit risk preferences of participating subjects. The degree of risk aversion is measured by offering individuals ten paired lotteries ((Holt and Laury, 2002)). Potential payoffs remain constant across decisions and the difference between the two is lower for Option A compared to Option B respectively, i.e. they vary by more in Option B. For both Options A and B, the probability of the high payoff increases while the probability of the low payoff decreases in each subsequent decision. Subjects who choose Option B in the first decision are clearly risk-loving while only risk-averse subjects choose Option B in the second last decision. A risk-neutral individual chooses option A in the first four decisions and switches to Option B thereafter. This is so because Option A yields the higher expected payoff throughout decision 1 - 4 while throughout decision 5 - 10 Option B yields the higher expected payoff (for details, see appendix B).

The final step is a questionnaire on socio-economic questions (part 6). Among students, we asked for age, sex, number of siblings, final school grade (German Abitur), field of studies, number of semesters studied and whether at least one parent is already retired. Among older workers, the questionnaire comprised age, sex, number of children, marital status, education, employment, employment of spouse and household net income. All subjects, both students and older workers, were asked to report their ex-post satisfaction with the experienced retirement system (0 - 10), their risk attitude (0 - 10) and health status (0 - 10). The two subject pools are summarized according to these variables in table 14 (students) and 15 (older workers) in appendix C.

The instructions were handed out to the subjects before the beginning of the experiment without mentioning the existence of the second part. At the end of the experiment, subjects were privately paid with an exchange rate of 15,000 units (students) and 10,000 units (older workers) of laboratory token = 1 EUR (around USD 1.12 at that time). The experiment took less than 90 minutes and the average payoff among students was 18.8 EUR (around 21.1 USD), ranging between a minimum of 1.6 EUR and a maximum of 32.4 EUR. The average payoff among older workers was 28.1 EUR (about 31.5 USD), ranging between a minimum of 1.5 EUR and a maximum of 43.9 EUR. The expected payoffs are real average hourly wages that intend to reflect opportunity costs and are thus 50% higher for older workers. To further ensure a functioning incentive structure, we did not pay a lump-sum amount/show-up fee. Payoffs depended only on retirement decisions, the number of correct answers on math questions, paired lottery choices of the risk-aversion test, and luck concerning the number of survival periods.

4 Results

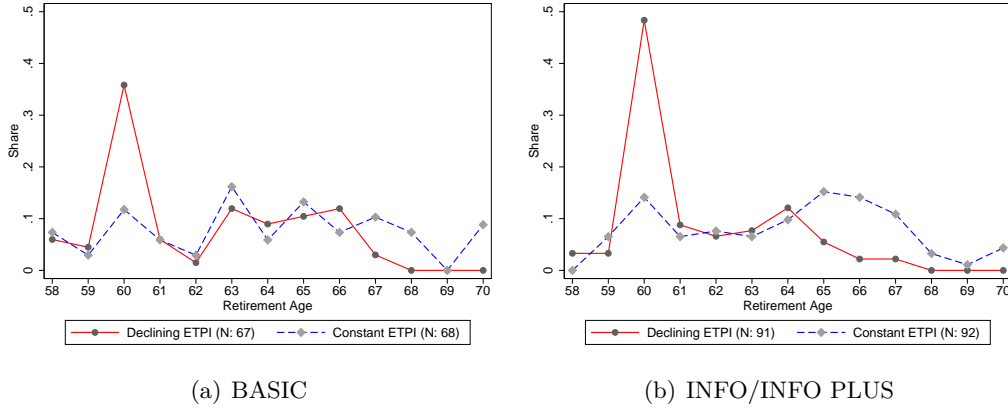
Retirement decision making is summarized graphically in figure 3. The graph shows differences in the retirement age between the two schemes of financial incentives in the BASIC treatments (panel a) and the INFO/INFO PLUS treatments (panel b).¹⁷ Generally, the payoff structure involving a declining ETPI (solid line: red) is characterized by a remarkable peak at age 60 with only few retirement entries after age 65. Under constant ETPI (dashed line: blue) retirement choices are rather evenly distributed across the age window 58 - 70 and are more pronounced at higher ages.

Despite some similarities of the principal patterns across information treatments the amount of available information induces substantial differences in retirement decision making. Not only the peak at age 60 (declining ETPI) is more pronounced in INFO/INFO

¹⁷Detailed graphical evidence of the results is summarized in appendix E (students) and F (older workers).

PLUS treatments but also retirement at higher ages (constant ETPI). Figure 3 also provides graphical evidence on the role of social norms in retirement decision making: if no information on the ETPI as a forward-looking measure for social security wealth is available then revealed retirement choices bunch at age 60, 63, 65 and 67 especially when people face a constant ETPI (BASIC treatment, left panel). The corresponding spikes are commonly known retirement ages in the universe of the German public pension system. People who are poorly informed about actuarial considerations of the retirement decision tend to make choices that are anchored to these perceived reference points. In contrast, well-informed individuals react to financial incentives more strongly and rather tend to maximize their ETPI. In what follows, we further elaborate these differences analytically and show that there are tremendous differences in decision behavior across information treatments.

Figure 3: Retirement Decision Making under two Schemes of Financial Incentives.



Source: Own calculation based on experimental data.

Note: Shares are related to the total number of observations within each group (see legend).

All further results are presented separately for students and older workers. These two groups differ substantially in relevant characteristics. While university students (mean age: 23.8) have not started their working career, older workers (mean age: 51.6) have obtained a fair amount of work experience and are more prone to retirement planning.

4.1 Sequential Decision Structure

4.1.1 Non-Parametric and Parametric Tests

Testing the difference in retirement timing between the two schemes of financial incentives (declining vs. constant ETPI) among students shows a significant difference of 1.9 years in the full sample (table 4, upper panel).¹⁸ However, stratifying the sample by the amount of available information shows that this result is driven by those individuals who are informed about the ETPI and how it is calculated (INFO/INFO PLUS). Among participants in the INFO/INFO PLUS treatments, the difference is large (2.64 years) and significant. Contrarily, the difference is small and insignificant for those in the BASIC treatment without information on the ETPI.

Testing differences in retirement timing among older workers yields insights for a group of people in close distance to retirement. The main finding is strongly consistent to the one among student subjects: older workers facing a constant ETPI choose to retire at higher ages on average compared to those who face a declining ETPI. However, this response to financial incentives is limited to those who are explicitly informed about the ETPI (table 4). Since the difference in retirement timing between the two subgroups (declining vs. constant ETPI) is smaller in magnitude and less precisely estimated, it is worthwhile to shed more light on these results.

In this context, we put a specific focus on financial literacy in terms of grasping the concept of ETPI and the ability to calculate it. We asked all participants to solve three incentivized math problems after the retirement decision, all involving to compute the ETPI. While question one and two are fairly easy, question three is rather difficult (see appendix G for details on these questions). We therefore summarize the ability to answer all three questions correctly as a measure of financial literacy.

¹⁸The table reports the results for a t-test (t-statistic) and a more conservative non-parametric rank-sum test (z-statistic).

Table 4: Non-Parametric and Parametric Tests: Sequential Decisions.

STUDENTS						
	Full Sample		BASIC		INFO/INFO PLUS	
	Declining ETPI	Constant ETPI	Declining ETPI	Constant ETPI	Declining ETPI	Constant ETPI
Mean Ret. Age	61.64	63.54	61.95	62.38	61.48	64.12
N (Group)	66	63	22	21	44	42
Difference	1.90		.43		2.64	
z-stat. (p-value)	3.80(.000)		.61(.545)		4.22(.000)	
t-stat. (p-value)	4.09(.000)		.51(.614)		4.87(.000)	
N (Total)	129		43		86	
OLDER WORKERS						
	Full Sample		BASIC		INFO PLUS	
	Declining ETPI	Constant ETPI	Declining ETPI	Constant ETPI	Declining ETPI	Constant ETPI
Mean Ret. Age	62.69	63.97	63.47	64.11	62.00[61.43]	63.85[64.75]
N (Group)	36	39	17	19	19[7]	20[12]
Difference	1.28		.64		1.85[3.32]	
z-stat. (p-value)	1.34(.181)		.13(.897)		1.79(.074)[2.36(.018)]	
t-stat. (p-value)	1.98(.051)		.67(.509)		2.12(.041)[2.61(.018)]	
N (Total)	75		36		39[19]	

Source: Own calculations using experimental data (students and older workers).

Note: Tests are two-sample Wilcoxon rank-sum test (z-statistic) and two-sample t test (t-statistic). Censored observations are excluded from the sample. Results in squared brackets (INFO PLUS) are for the sub-sample of older workers who have provided three (out of three) correct answers on math questions.

The ability to solve all (three) math problems is distributed very differently across treatments and subject pools, as shown in table 5. In BASIC treatments (without information on the ETPI) it seems virtually impossible to provide three correct answers. Only in INFO/INFO PLUS treatments a considerable share of participants is able to give three correct answers. The table also shows a significant difference in the share among students (74%) and older workers (50%). The lower share of three correct answers among older workers motivates a closer look at this specific group. In fact, testing the difference in

Table 5: Financial Literacy: The Ability to Calculate the ETPI.

	Full Sample		BASIC		INFO	
	Students	Older Workers	Students	Older Workers	Students	Older Workers
3 Correct Answers (%)	.45	.25	.01	0	.74	.50
Difference in Mean	.20		.01		.24	
z-stat. (p-value)	3.06(.002)		.64(.524)		2.91(.004)	
t-stat. (p-value)	3.10(.002)		.64(.526)		2.97(.003)	
N	239	79	96	39	143	40

Source: Own calculations using experimental data from students and older workers.

Note: Results are from incentivized math questions after retirement decisions (calculation of the ETPI). Reported values are shares of the two sub-samples (students and older workers) with three correct answers.

retirement timing for declining vs. constant ETPI only among financially literate older workers (three correct answers) reveals a large and significant difference of 3.3 years (table 4, lower panel, results in squared brackets).

4.1.2 Regression Analysis

OLS estimates on differences in the retirement age for students are shown in table 6. Compared to previous two-sample tests on differences in means, the regressions allow to estimate the treatment effect conditional on a range of potentially important variables. These are risk preferences, health status, family background and education. In all regressions, the dependent variable (retirement age) is assumed to be continuously distributed between 58 - 70. The treatment variable is a dummy = 1 under constant ETPI and = 0 under declining ETPI. All estimation samples are stratified by information level.

The estimated difference between the two payoff schemes ranges between 2.2 and 2.6 years in INFO/INFO PLUS treatments (table 6, upper panel). The estimated treatment effect of the financial incentive is small and insignificant within BASIC treatments (table 6, lower panel). These results resemble the ones from previous tests but estimating the treatment

Table 6: Regression Analysis: Sequential Decisions (Students).

<i>Treatment Variable</i>	INFO/INFO PLUS					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant ETPI	2.313***	2.393***	2.642***	2.371***	2.324***	2.231***
Right-Censored Observation		-1.935**		-1.827**	-1.730*	-2.188**
Revealed Risk Preferences (0-10)				0.108	0.112	0.073
Self-Reported Health Status (0-10)					0.290*	0.296
CONTROLS						✓
Constant	61.438***	61.599***	61.477***	60.974***	58.628***	57.595***
N	96	96	86	96	96	96

<i>Treatment Variable</i>	BASIC					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant ETPI	0.417	0.501	0.426	0.428	0.627	0.678
Right-Censored Observation		-2.019		-2.069	-1.812	-2.596*
Revealed Risk Preferences (0-10)				-0.256	-0.238	-0.219
Self-Reported Health Status (0-10)					-0.259	-0.451
CONTROLS						✓
Constant	61.750***	61.918***	61.955***	63.393***	65.147***	70.861***
N	48	48	43	48	48	48

Source: Own calculations based on experimental data. Note: Reported values are coefficients from OLS regressions. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Censored observations are either excluded from the sample (model 3) or controlled for.

effect conditional on further variables leaves point estimates in a more narrow interval.¹⁹

The estimated difference in the retirement age of older workers between the two payoff schemes ranges between 1.9 and 2.3 years (table 7). As for sequential decisions among students and in line with previous tests, the estimated difference is only significant for those participants who have access to further information on the ETPI (INFO PLUS). The estimated treatment effect is robust against adding variables on family background (model 6), education (model 7), and employment (model 8). Nevertheless, the analysis is limited to the extent that the sample size is rather small ($N = 40$) with only few degrees of freedom which is apparent in model (9) and (10).²⁰

Older workers in the BASIC treatments do not significantly differ across payoff schemes (table 8). If no explicit information on the ETPI is available, participants do not recog-

¹⁹Detailed results with all estimated coefficients are available in table 16, appendix D.

²⁰Detailed results with all estimated coefficients are available in table 18 (INFO PLUS) and table 19 (BASIC) in appendix D.

Table 7: Regression Analysis: Sequential Decisions (Older Workers/INFO PLUS).

	(1)	(2)	(3)	(4)	(5)
<i>Treatment Variable</i>					
Constant ETPI	1.950**	1.850**	1.850**	2.018**	1.977**
Right-Censored Observation		-2.000		-1.316	-1.369
Revealed Risk Preferences (0-10)				-0.382**	-0.392**
Self-Reported Health Status (0-10)					0.056
Constant	61.900***	62.000***	62.000***	63.992***	63.664***
N	40	40	39	40	40
	(6)	(7)	(8)	(9)	(10)
<i>Treatment Variable</i>					
Constant ETPI	2.195**	2.332**	2.200**	1.968	2.626
Right-Censored Observation	-1.125	-0.081	-1.477	-3.909	-3.648
Revealed Risk Preferences (0-10)	-0.480**	-0.246	-0.391**	-0.075	-0.133
Self-Reported Health Status (0-10)	-0.076	0.047	0.009	-0.305	-0.444
CONTROLS:					
Family Background	✓				
Education		✓			
Work & Employment			✓		
All (Income excluded)				✓	
All					✓
Constant	65.092***	63.073***	64.408***	54.078***	56.163***
N	40	40	40	40	36

Source: Own calculations based on experimental data. Note: Reported values are coefficients from OLS regressions. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Censored observations are either excluded from the sample (specification 3) or controlled for.

Table 8: Regression Analysis: Sequential Decisions (Older Workers/BASIC).

	(1)	(2)	(3)	(4)	(5)
<i>Treatment Variable</i>					
Constant ETPI	0.479	0.383	0.635	0.297	0.771
Right-Censored Observation		-1.731		-1.929	-1.406
Revealed Risk Preferences (0-10)				-0.652***	-0.473**
Self-Reported Health Status (0-10)					0.721***
Constant	63.421***	63.603***	63.471***	67.090***	60.466***
N	39	39	36	39	39
<i>Treatment Variable</i>					
	(6)	(7)	(8)	(9)	(10)
Constant ETPI	1.241	0.791	0.838	1.484	1.344
Right-Censored Observation	-0.855	-2.260	-1.632	-2.308	-1.930
Revealed Risk Preferences (0-10)	-0.469**	-0.517**	-0.515**	-0.676**	-0.612*
Self-Reported Health Status (0-10)	0.743***	0.658**	0.729***	0.760**	0.856**
CONTROLS:					
Family Background	✓				
Education		✓			
Work & Employment			✓		
All (Income excluded)				✓	
All					✓
Constant	59.669***	61.603***	61.132***	65.961***	68.246***
N	39	39	39	39	36

Source: Own calculations based on experimental data. Note: Reported values are coefficients from OLS regressions. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Censored observations are either excluded from the sample (specification 3) or controlled for.

nize payoff patterns that are crucial to maximize benefits. This behavior, consistent with student subjects in the sequential decision structure, points at the tremendous impact on information provision in retirement decision making. This corroborates the phrasing “what you don’t know can’t help you” (Chan and Stevens, 2008) from yet another perspective: people are less able to maximize pension benefits when poorly informed about the underlying mechanics. Our laboratory test shows that the functioning of financial incentives is strongly influenced by how these incentives are perceived and understood. Policies that are based on financial incentives and aim at raising the retirement age are more effective once people are instructed about actuarial considerations of the decision problem.

4.2 One-Stage Decision Structure

4.2.1 Non-Parametric and Parametric Tests

The difference in retirement timing between the two payoff schemes is large (about 4 years) and significant when participants face one-stage decisions, irrespective of information provision (table 9). First of all, this indicates a larger response to financial incentives compared to sequential decisions. Second, it also suggests that alternating information provision (INFO PLUS vs. BASIC) does not change retirement outcomes under one-stage decisions. This result is surprising to the extent that knowing the ETPI is essential to maximize benefits. The significant and large difference in the BASIC treatment under one-stage decisions challenges the previous finding of no effect in the BASIC treatment under sequential decisions.

Table 9: Non-Parametric and Parametric Tests: One-Stage Decisions (Students).

	Full Sample		BASIC		INFO/INFO PLUS	
	Declining ETPI	Constant ETPI	Declining ETPI	Constant ETPI	Declining ETPI	Constant ETPI
Mean Ret. Age	61.13	65.02	61.38	65.79	60.87	64.25
N (Group)	47	48	24	24	23	24
Difference	3.89		4.41		3.38	
z-stat. (p-value)	5.54(.000)		4.09(.000)		3.85(.000)	
t-stat. (p-value)	6.83(.000)		5.13(.000)		4.67(.000)	
N (Total)	95		48		47	

Source: Own calculations using experimental data (students).

Note: Tests are two-sample Wilcoxon rank-sum test (z-statistic) and two-sample t test (t-statistic). There are no censored observations in one-stage decisions (ex ante retirement choice).

There is no alternative explanation other than the one-stage decision structure because everything else is left unchanged. Choosing from a menu of retirement ages once and for all seems to allow subjects to make a more global judgment and to solve the decision problem more analytically. To investigate this aspect in further detail, we first test for differences to otherwise identical treatments, i.e. we test for differences between BASIC treatments

under sequential vs. one-stage decisions (students only). Interestingly, the differential response is induced by a significant difference between treatments with constant ETPI (difference: 3.6 years, p-value (rank-sum): 0.000) while there is no significant difference between treatments with declining ETPI (difference: 0.4 years, p-value (rank-sum): 0.553).

Table 10: Differences in Stated and Revealed Risk Preferences across Decision Structures (BASIC Information).

Constant ETPI				
	Stated Risk Pref.		Revealed Risk Pref.	
	SEQUENTIAL	ONE-STAGE	SEQUENTIAL	ONE-STAGE
Risk Preferences (0-10)	4.38	5.50	5.46	5.67
N (Group)	24	24	24	24
Difference		1.12		.21
z-stat. (p-value)		1.78(.076)		.19(.850)
t-stat. (p-value)		1.93(.060)		.41(.680)
N (Total)		48		48

Source: Own calculations using experimental data from students.

Note: Tests are two-sample Wilcoxon rank-sum test (z-statistic) and two-sample t test (t-statistic). Both stated and revealed risk preferences are mapped into a scaling from zero (very risk averse) to 10 (very risk loving).

Facing a constant ETPI means that the expected pension wealth remains constant and thus the only remaining parameter that may vary is the risk attitude. Interestingly, testing for the difference in risk preferences between treatments with sequential versus one-stage decision structure (table 10) yields the following: while stated risk preferences (left panel) do significantly differ this is not the case for revealed preferences (right panel). Under one-stage decisions individuals are thus more prone to take risks in their retirement decision making when facing a constant ETPI.²¹ Since the underlying decision problem is identical in both sequential and one-stage decisions, the very most that we can say is that the perception of the decision structure differs between the two settings. If people are poorly informed about the ETPI (BASIC), they still seem to have an intuitive idea of the payoff structure once the underlying patterns are sufficiently clear (peak value at age 60 under

²¹Taking risks means choosing a higher retirement age, given that the remaining lifetime is uncertain. Choosing a higher retirement age may coincide to a potentially short period of receiving the annuity (until death). At the extreme end, people receive a zero payoff if they die before entering retirement.

declining ETPI, see figure ??). However, once the underlying patterns are not clear, as for the constant ETPI, people rather tend to make risky choices under one-stage decisions. Note, however, that the strong coincidence of self-reported risk and retirement choices is accompanied by no difference in revealed risk preferences, ensuring that participants are randomly assigned to treatments with respect to overall risk preferences (paired lottery choices).

4.2.2 Regression Analysis

Under one-stage decisions, estimates of the difference between the two payoff schemes range between 3.0 and 3.4 years (INFO/INFO PLUS, upper panel) and between 4.0 and 5.8 years (BASIC, lower panel).²² The regression results, once again, resemble findings from previous tests.

Table 11: Regression Analysis: One-Stage Decisions (Students).

<i>Treatment Variable</i>	INFO/INFO PLUS					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant ETPI	3.380***	3.380***	3.166***	3.037***		
Revealed Risk Preferences (0-10)		-0.003	-0.125	-0.009		
Self-Reported Health Status (0-10)			0.356*	0.324		
CONTROLS				✓		
Constant	60.870***	60.888***	58.897***	55.920***		
N	47	47	47	47		
<i>Treatment Variable</i>	BASIC					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant ETPI	4.417***	4.227***	4.448***	5.783***		
Revealed Risk Preferences (0-10)		-0.239	-0.266	-0.088		
Self-Reported Health Status (0-10)			0.415*	0.713**		
CONTROLS				✓		
Constant	61.375***	62.920***	59.738***	59.249***		
N	48	48	48	48		

Source: Own calculations based on experimental data. Note: Reported values are coefficients from OLS regressions. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. There are no censored observations in one-stage decisions (ex ante retirement choice).

²²Detailed results with all estimated coefficients are available in table 17, appendix D.

5 Conclusion

We provide experimental evidence on the effect of financial incentives on the timing of retirement. We analyze the response of these incentives under different schemes of information provision. Alternating the amount of available information on the ETPI (as the relevant measure of pension wealth) provides unique evidence on the effectiveness of financial incentives in policies that aim at raising the retirement age.

Confronting subjects with two different payoff schemes in a sequential decision structure yields large and significant differences concerning the choice of the retirement age. Our preferred estimate of the treatment effect is a retirement delay of 2 years once benefit adjustments are in place (constant ETPI: 3% reduction rate previous to the normal retirement age and 5% premium rate after the normal retirement age). This estimate is consistently obtained for student subjects and older workers in close distance to retirement who are explicitly informed about the ETPI. The information provided comprises the magnitude of the ETPI, how it evolves as a function of the retirement age and its meaning in terms of individual pension wealth. The effect vanishes once people are not informed about the ETPI, having to calculate the expected pension wealth on their own. Not only the size of financial incentives matters but also how they are perceived and understood. This result strongly suggests that information provision is key for the functioning of financial incentives.

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A Survival Probability

Table 12: Conditional Survival Probability

59	60	61	62	63	64	65	66
0.9929	0.9921	0.9915	0.9909	0.9903	0.9893	0.9886	0.9875
67	68	69	70	71	72	73	74
0.9865	0.9856	0.9842	0.9828	0.9811	0.9792	0.9769	0.9738
75	76	77	78	79	80	81	82
0.9706	0.9669	0.9628	0.9576	0.9524	0.9466	0.9398	0.9323
83	84	85	86	87	88	89	90
0.9247	0.9147	0.9043	0.8924	0.8782	0.8647	0.8456	0.8346
91	92	93	94	95	96	97	98
0.8112	0.7972	0.779	0.7603	0.741	0.7213	0.7011	0.6806
99	100						
0.6599	0.6389						

Source: Mortality tables for Germany (Federal Statistical Office, 2012), averaged over men and women.

Note: Each probability in the table reflects the chance of reaching the respective age, conditional on having survived the previous age. Reading example: Conditional on being alive at age 58, the probability to celebrate ones 59th birthday is 99.29%.

B Risk Aversion Test

Table 13: Ten Paired Lottery-Choice Decisions (Students).

Option A				Option B				Expected payoff
Prob.	High Payoff	Prob.	Low Payoff	Prob.	High Payoff	Prob.	Low Payoff	Difference
1/10	2.00	9/10	1.60	1/10	3.85	9/10	0.10	1.17
2/10	2.00	8/10	1.60	2/10	3.85	8/10	0.10	0.83
3/10	2.00	7/10	1.60	3/10	3.85	7/10	0.10	0.50
4/10	2.00	6/10	1.60	4/10	3.85	6/10	0.10	0.16
5/10	2.00	5/10	1.60	5/10	3.85	5/10	0.10	-0.18
6/10	2.00	4/10	1.60	6/10	3.85	4/10	0.10	-0.51
7/10	2.00	3/10	1.60	7/10	3.85	3/10	0.10	-0.85
8/10	2.00	2/10	1.60	8/10	3.85	2/10	0.10	-1.18
9/10	2.00	1/10	1.60	9/10	3.85	1/10	0.10	-1.52
1	2.00	0	1.60	1	3.85	0	0.10	-1.85

Source: (Holt and Laury, 2002). Note: Payoffs shown are for student subjects and inflated by factor 1.5 for older workers (thus: 3.00, 2.40, 5.80 and 0.15 EUR). The share of consistently revealed preferences in the overall sample is 82.5% (i.e. at most one switch between option A and option B).

C Descriptive Statistics

Table 14: Descriptive Statistics: Students

<i>Dependent Variable</i>	Full Sample		By Treatment Status			
	Mean	Min/Max	Mean		Diff.	t-stat(p-val)
			DECLINING ETPI	CONSTANT ETPI		
Retirement Age	62.7	58/70	61.4	63.9	2.5	7.10(.000)
<i>Socio-Demographic Variables</i>						
Male	0.53	0/1	.52	.53	.01	.19(.849)
Age	23.8	18/37	24.1	23.5	.6	1.52(.131)
N Siblings	1.5	0/10	1.45	1.6	.15	1.04(.298)
Parents Retired	0.18	0/1	.17	.18	.01	.31(.758)
Self-Reported Health (0-10)	7.9	1/10	7.8	8.0	.2	.90(.368)
<i>Education</i>						
Grade Abitur	2.4	1/4	2.4	2.4	0	.09(.930)
N Semesters at University	6	1/15	6.2	5.8	.4	.92(.360)
Field of Studies						
Economics	.36	0/1	.37	.35	.02	.32(.752)
Engineering	.08	0/1	.08	.08	0	.22(.827)
Natural Sciences/Math	.13	0/1	.12	.15	.03	.73(.465)
Medicine	.02	0/1	.03	.01	.02	1.36(.174)
Sociology	.04	0/1	.06	.03	.03	1.30(.193)
Humanities	.16	0/1	.13	.18	.05	1.22(.223)
Teaching Degrees	.16	0/1	.14	.16	.02	.15(.880)
Other	.05	0/1	.07	.04	.03	.87(.386)
<i>Risk and Math</i>						
Stated Risk Preferences (0-10)	4.7	0/9	4.5	4.8	.3	1.20(.232)
Revealed Risk Preferences (0-10)	5.7	1/10	5.8	5.6	.2	.89(.372)
Correct Answers Math	2.1	0/3	2.1	2.1	0	.12(.903)
<i>Payoff Experiment (EUR)</i>						
Payoff Part I (Decision)	14.6	0/27.3	15.7	13.6	2.1	2.29(.023)
Payoff Part II (Math + Risk)	4.2	0/6.8	4.5	3.9	.6	2.51(.013)
Total Payoff (Part I + II)	18.8	1.6/32.4	20.2	17.5	2.7	2.80(.006)
N	239		119	120		

Source: Own calculations based on experimental data (students).

Table 15: Descriptive Statistics: Older Workers

Dependent Variable	Full Sample		By Treatment Status			
	Mean	Min/Max	Mean		Diff.	t-stat(p-val)
			DECLINING ETPI	CONSTANT ETPI		
Retirement Age	63.3	58/70	62.6	63.9	1.3	1.95(.055)
Socio-Demographic Variables						
Male	.44	0/1	.38	.50	.12	1.03(.308)
Age	51.6	45/58	51.6	51.5	.1	.07(.942)
N Siblings	1.5	0/6	1.3	1.6	.3	1.20(.232)
N Children	1.5	0/5	1.2	1.8	.6	2.26(.026)
Marital Status						
Married	.67	0/1	.64	.69	.05	.55(.583)
Divorced	.13	0/1	.13	.13	0	.04(.966)
Partnership (Living Together)	.14	0/1	.13	.15	.02	.28(.783)
Single	.06	0/1	.10	.03	.07	1.42(.161)
Self-Reported Health (0-10)	7.3	3/10	7.3	7.4	.1	.24(.813)
HH Net Income/10,000 EUR	4.85	1/10	4.38	5.26	.88	1.77(.080)
Education						
School Type						
13 Yr. School (Abitur)	.62	0/1	.51	.72	.21	1.97(.053)
10 Yr. School (Realschule)	.28	0/1	.39	.18	.21	2.11(.038)
9 Yr. School (Hauptschule)	.10	0/1	.10	.10	0	.04(.970)
Further Education						
University Degree	.46	0/1	.44	.47	.03	.34(.731)
Vocational Training	.50	0/1	.51	.50	.01	.11(.911)
No Further Educ.	.04	0/1	.05	.03	.02	.60(.547)
Employment and Work						
Employment Status						
Employee	.75	0/1	.69	.80	.11	1.09(.277)
Civil Servant	.24	0/1	.28	.2	.08	.85(.400)
Self-Employed	.01	0/1	.03	0	.03	1.01(.314)
Occupation						
Administration/Management	.61	0/1	.61	.60	.01	.14(.890)
Controlling/Finance	.05	0/1	.08	.03	.05	1.05(.299)
Technician/Engineer	.09	0/1	.08	.09	.01	.36(.722)
Other Occupation	.25	0/1	.23	.28	.05	.45(.656)
Leading Position	.39	0/1	.31	.48	.17	1.53(.131)
Full Time Work	.87	0/1	.82	.93	.11	1.40(.167)
Partner Employment						
Full Time	.63	0/1	.64	.63	.01	.15(.884)
Part Time	.17	0/1	.10	.22	.12	1.47(.146)
No Partner	.20	0/1	.26	.15	.11	1.17(.245)
Risk and Math						
Stated Risk Preferences (0-10)	4.4	0/10	4.5	4.4	.1	.30(.761)
Revealed Risk Preferences (0-10)	5.4	0/10	5.3	5.4	.1	.24(.815)
Correct Answers Math	1.5	0/3	1.4	1.6	.2	.71(.481)
Payoff Experiment (EUR)						
Payoff Part I (Decision)	22.4	0/35.2	23.0		21.8 1.2	.56(.579)
Payoff Part II (Math + Risk)	5.7	0/10.3	5.9	5.5	.4	.61(.541)
Total Payoff (Part I + II)	28.1	1.5/43.9	28.9	27.3	1.6	.69(.493)
N		79	39	40		

Source: Own calculations based on experimental data (older workers).

Note: Mean household income is calculated ignoring missing values from refused answers.

D Detailed Regression Results

Table 16: Regression Analysis: Sequential Decisions (Students).

<i>Treatment Variable</i>	INFO/INFO PLUS					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant ETPI	2.313***	2.393***	2.642***	2.371***	2.324***	2.231***
Right-Censored Observation		-1.935**		-1.827**	-1.730*	-2.188**
Revealed Risk Preferences (0-10)				0.108	0.112	0.073
Self-Reported Health Status (0-10)					0.290*	0.296
Male						-0.084
Age in Years						0.009
N Siblings						0.031
Parents Retired						1.146
Final School Grade (1-4)						0.302
N Semesters at University						-0.001
N Semesters at University						0.007
Field of Studies						
Economics						REF
Engineering						0.782
Natural Sciences/Math.						1.062
Medicine						3.648
Sociology						1.781
Humanities						-0.002
Teaching Degrees						0.678
Other						-0.727
Correct Answers (Math Questions)						-0.086
Constant	61.438***	61.599***	61.477***	60.974***	58.628***	57.595***
N	96	96	86	96	96	96

<i>Treatment Variable</i>	BASIC					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant ETPI	0.417	0.501	0.426	0.428	0.627	0.678
Right-Censored Observation		-2.019		-2.069	-1.812	-2.596*
Revealed Risk Preferences (0-10)				-0.256	-0.238	-0.219
Self-Reported Health Status (0-10)					-0.259	-0.451
Male						0.261
Age in Years						-0.175
N Siblings						0.341
Parents Retired						-1.395
Final School Grade (1-4)						-0.942
N Semesters at University						0.150
Field of Studies						
Economics						REF
Engineering						1.117
Natural Sciences/Math.						1.469
Medicine						-1.258
Sociology						2.501
Humanities						0.011
Teaching Degrees						0.223
Other						1.857
Correct Answers (Math Questions)						0.281
Constant	61.750***	61.918***	61.955***	63.393***	65.147***	70.861***
N	48	48	43	48	48	48

Source: Own calculations based on experimental data. Note: Reported values are coefficients from OLS regressions. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Censored observations are either excluded from the sample (model 3) or controlled for.

Table 17: Regression Analysis: One-Stage Decisions (Students).

<i>Treatment Variable</i>	INFO/INFO PLUS					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant ETPI	3.380***	3.380***	3.166***	3.037***		
Revealed Risk Preferences (0-10)		-0.003	-0.125	-0.009		
Self-Reported Health Status (0-10)			0.356*	0.324		
Male				0.269		
Age in Years				0.158		
N Siblings				0.449		
Parents Retired				-2.372*		
Final School Grade (1-4)				-0.296		
N Semesters at University				0.013		
Field of Studies						
Economics				REF		
Engineering				1.085		
Natural Sciences/Math.				-0.670		
Medicine				-1.776		
Sociology				-1.277		
Humanities				-0.879		
Teaching Degrees				0.990		
Other				-0.849		
Correct Answers (Math Questions)				-0.204		
Constant	60.870***	60.888***	58.897***	55.920***		
N	47	47	47	47		
<i>Treatment Variable</i>	BASIC					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant ETPI	4.417***	4.227***	4.448***	5.783***		
Revealed Risk Preferences (0-10)		-0.239	-0.266	-0.088		
Self-Reported Health Status (0-10)			0.415*	0.713**		
Male				0.360		
Age in Years				-0.326		
N Siblings				0.162		
Parents Retired				2.024		
Final School Grade (1-4)				0.126		
N Semesters at University				0.373		
Field of Studies						
Economics				REF		
Engineering				2.480		
Natural Sciences/Math.				6.463**		
Medicine				2.302		
Sociology				0.403		
Humanities				0.191		
Teaching Degrees				1.919		
Other				1.793		
Correct Answers (Math Questions)				-0.200		
Constant	61.375***	62.920***	59.738***	59.249***		
N	48	48	48	48		

Source: Own calculations based on experimental data. Note: Reported values are coefficients from OLS regressions. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. There are no censored observations in one-stage decisions (ex ante retirement choice).

Table 18: Regression Analysis: Sequential Decisions (Older Workers/INFO PLUS).

	(1)	(2)	(3)	(4)	(5)
<i>Treatment Variable</i>					
Constant ETPI	1.950**	1.850**	1.850**	2.018**	1.977**
Right-Censored Observation		-2.000		-1.316	-1.369
Revealed Risk Preferences (0-10)				-0.382**	-0.392**
Self-Reported Health Status (0-10)					0.056
Constant	61.900***	62.000***	62.000***	63.992***	63.664***
N	40	40	39	40	40
	(6)	(7)	(8)	(9)	(10)
<i>Treatment Variable</i>					
Constant ETPI	2.195**	2.332**	2.200**	1.968	2.626
Right-Censored Observation	-1.125	-0.081	-1.477	-3.909	-3.648
Revealed Risk Preferences (0-10)	-0.480**	-0.246	-0.391**	-0.075	-0.133
Self-Reported Health Status (0-10)	-0.076	0.047	0.009	-0.305	-0.444
Male				1.232	0.749
Age in Years				0.212	0.148
<i>Family Background</i>					
N Children	-0.132			-0.244	-0.322
Marital Status					
Married	REF			REF	REF
Divorced	0.279			0.198	0.370
Partnership (Living Together)	2.317			2.417	2.655
Single	0.485			-0.744	-1.009
Partner Activity					
Full Time Employment	REF			REF	REF
Part Time Employment	0.773			-0.391	-0.200
No Partner	-2.239			-2.083	-1.846
HH Net Income					0.063
<i>Education</i>					
School Education					
13 Yrs. School (Abitur)		REF		REF	REF
10 Yrs. School (Realschule)		0.560		-0.798	0.160
9 Yrs. School (Hauptschule)		-2.663		-3.232	-2.737
Further Education					
University Degree		REF		REF	REF
Vocational Training		-0.443		-1.738	-1.881
No Further Educ.		-2.206		0.627	0.022
<i>Employment and Work Environment</i>					
Full Time			-0.273	2.150	3.510
Leading Position			-0.885	-1.296	-1.629
Occupation					
Employee			REF	REF	REF
Civil Servant			0.263	-0.654	0.042
Self-Employed			-1.875	-0.239	1.309
Correct Answers (Math Questions)				-0.202	0.020
Constant	65.092***	63.073***	64.408***	54.078***	56.163***
N	40	40	40	40	36

Source: Own calculations based on experimental data. Note: Reported values are coefficients from OLS regressions. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. Censored observations are either excluded from the sample (specification 3) or controlled for.

Table 19: Regression Analysis: Sequential Decisions (Older Workers/BASIC).

	(1)	(2)	(3)	(4)	(5)
<i>Treatment Variable</i>					
Constant ETPI	0.479	0.383	0.635	0.297	0.771
Right-Censored Observation		-1.731		-1.929	-1.406
Revealed Risk Preferences (0-10)				-0.652***	-0.473**
Self-Reported Health Status (0-10)					0.721***
Constant	63.421***	63.603***	63.471***	67.090***	60.466***
N	39	39	36	39	39
	(6)	(7)	(8)	(9)	(10)
<i>Treatment Variable</i>					
Constant ETPI	1.241	0.791	0.838	1.484	1.344
Right-Censored Observation	-0.855	-2.260	-1.632	-2.308	-1.930
Revealed Risk Preferences (0-10)	-0.469**	-0.517**	-0.515**	-0.676**	-0.612*
Self-Reported Health Status (0-10)	0.743***	0.658**	0.729***	0.760**	0.856**
Male				0.714	-0.293
Age in Years				-0.077	-0.125
<i>Family Background</i>					
N Children	-0.124			-0.095	-0.213
Marital Status					
Married	REF			REF	REF
Divorced	-1.071			-1.569	-1.308
Partnership (Living Together)	-0.244			-0.441	-0.881
Single	0.411			0.642	2.055
Partner Activity					
Full Time Employment	REF			REF	REF
Part Time Employment	0.858			1.306	1.665
No Partner	2.163			3.027	2.733
HH Net Income					0.009
<i>Education</i>					
School Education					
13 Yrs. School (Abitur)		REF		REF	REF
10 Yrs. School (Realschule)		-1.408		-1.734	-1.505
9 Yrs. School (Hauptschule)		-0.815		-1.416	-0.409
Further Education					
University Degree		REF		REF	REF
Vocational Training		0.013		0.115	-0.284
No Further Educ.		3.324		2.941	1.797
<i>Employment and Work Environment</i>					
Full Time			-0.460	-0.470	-1.144
Leading Position			-0.337	-1.368	-0.987
Occupation					
Employee			REF	REF	REF
Civil Servant			0.073	1.412	1.273
Self-Employed			—	—	—
Correct Answers (Math Questions)				-0.663	-0.213
Constant	59.669***	61.603***	61.132***	65.961***	68.246***
N	39	39	39	39	36

Source: Own calculations based on experimental data. Note: Reported values are coefficients from OLS regressions. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. Censored observations are either excluded from the sample (specification 3) or controlled for.

E Histograms: Students

Figure 4: Retirement Decisions across Information Treatments: Declining ETPI.

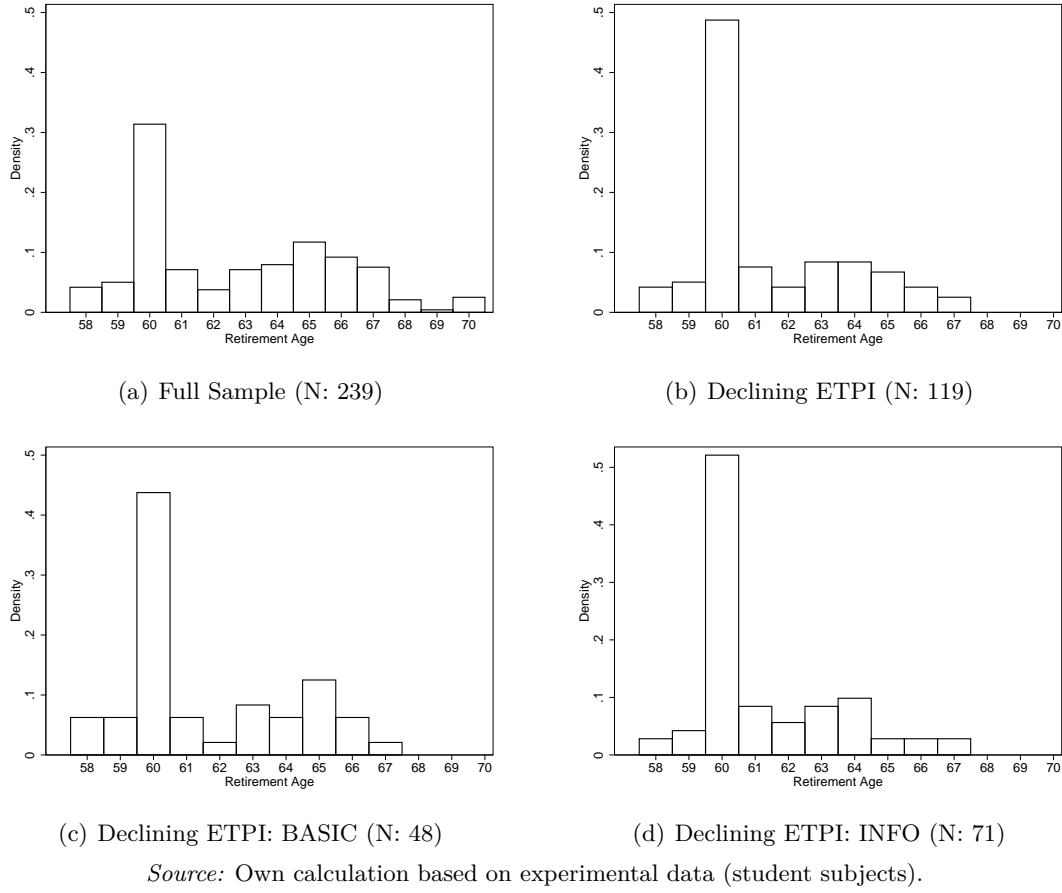
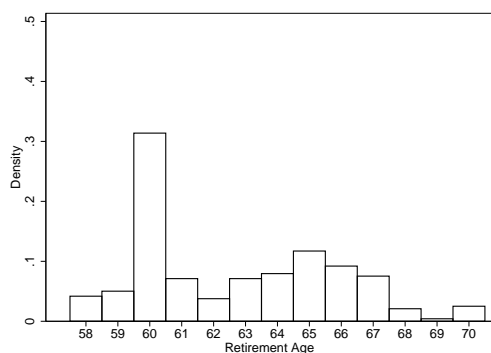
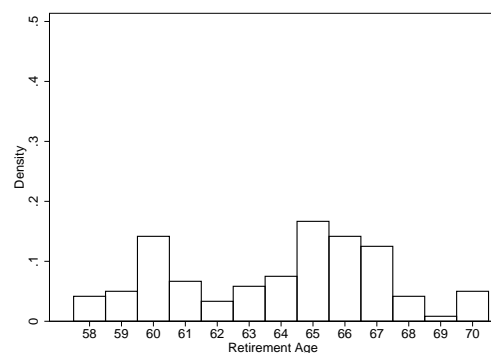


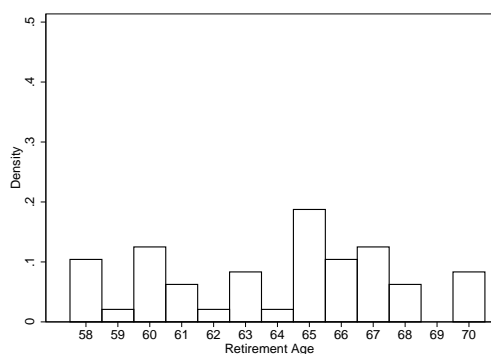
Figure 5: Retirement Decisions across Information Treatments: Constant ETPI.



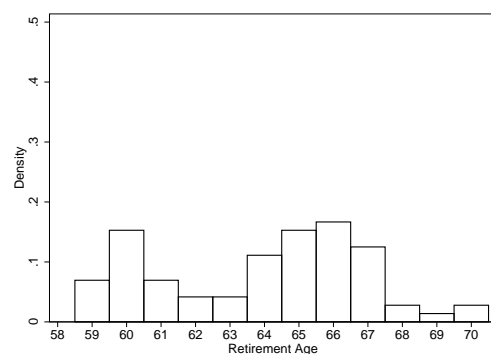
(a) Full Sample (N: 239)



(b) Constant ETPI (N: 120)



(c) Constant ETPI: BASIC (N: 48)



(d) Constant ETPI: INFO (N: 72)

Source: Own calculation based on experimental data (student subjects).

F Histograms: Older Workers

Figure 6: Retirement Decisions across Information Treatments: Declining ETPI.

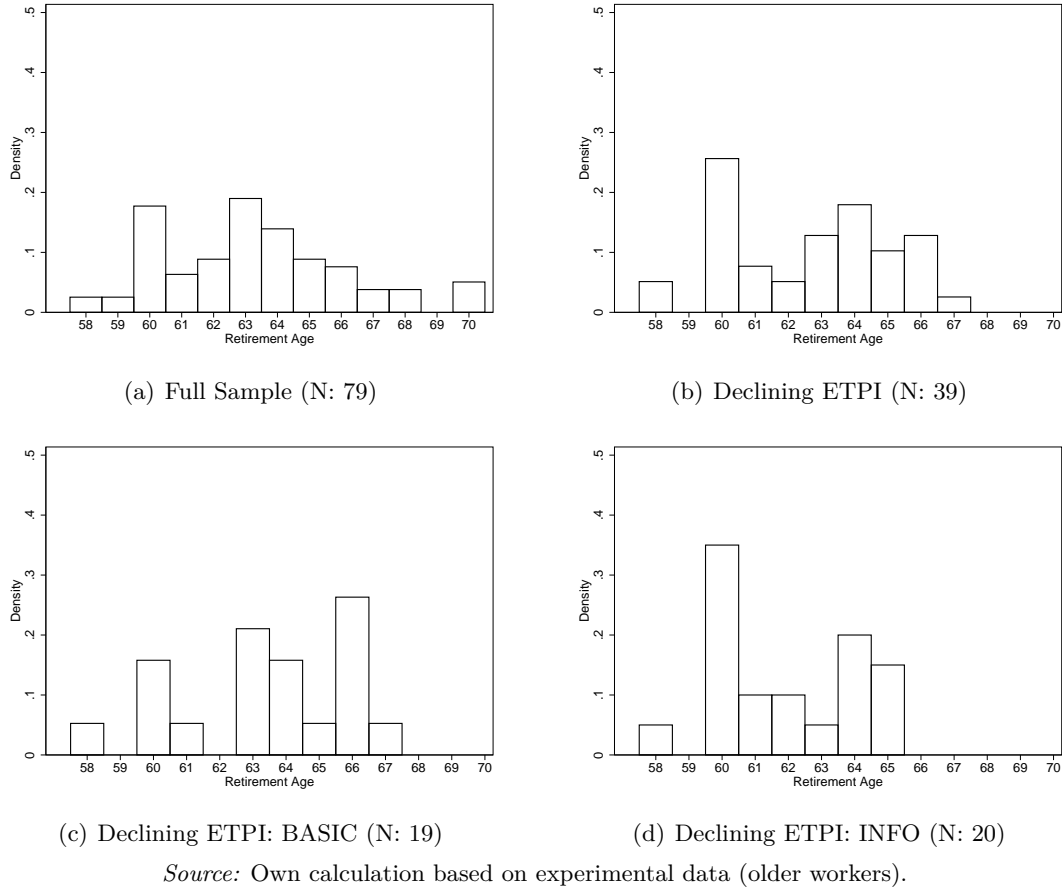
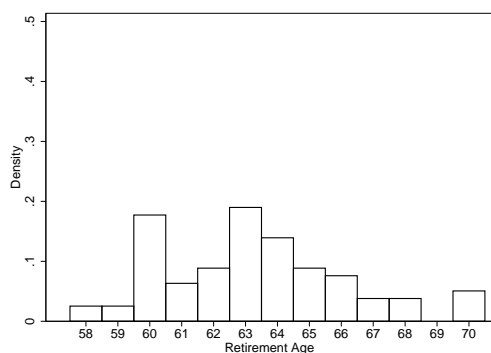
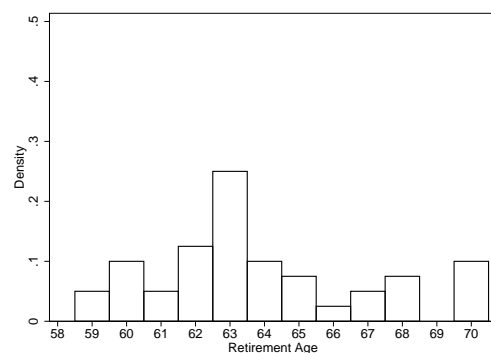


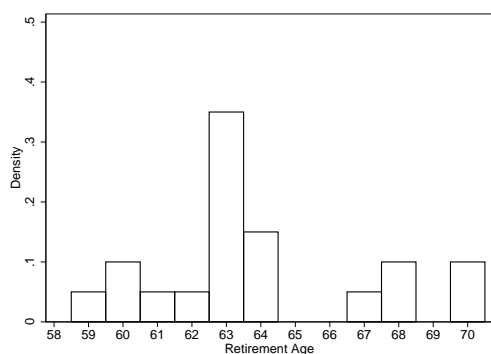
Figure 7: Retirement Decisions across Information Treatments: Constant ETPI.



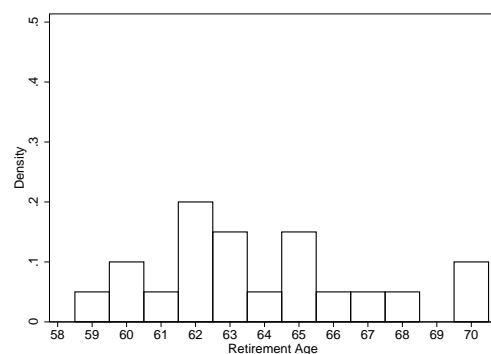
(a) Full Sample (N: 79)



(b) Constant ETPI (N: 40)



(c) Constant ETPI: BASIC (N: 20)



(d) Constant ETPI: INFO (N: 20)

Source: Own calculation based on experimental data (older workers).

G Financial Literacy: Incentivized Math Questions on Computation of the ETPI

After the retirement decision, subjects were asked to solve three math problems. If they provided the correct answer within 120 seconds, they earned 1.00 EUR (students) and 1.50 EUR (older workers) for each question. If the correct answer was not provided within 120 seconds, the payoff was zero. All three questions involved calculating the ETPI from different perspectives:

1. You are 58 years old. What is the exact amount of your ETPI (in experimental token) if you retire immediately? Hint: The ETPI equals the sum of all future pension benefits for the average remaining living years, given that you have reached the specific age (here: 58).
2. You are 61 years old. What is the exact amount of your ETPI (in experimental token) if you retire immediately?
3. You are 58 years old. What is the exact amount of your ETPI (in experimental token) if you plan to retire at age 61?

Table 20: Financial Literacy: Correct Answers in Calculating the ETPI.

	Full Sample		BASIC		INFO	
	Students	Older Workers	Students	Older Workers	Students	Older Workers
0 Correct Answers (%)	.11	.32	.27	.56	.01	.08
Difference in Mean	.21		.29		.07	
z-stat. (p-value)	4.23(.000)		3.21(.001)		2.59(.010)	
t-stat. (p-value)	4.35(.000)		3.33(.001)		2.64(.009)	
1 Correct Answer (%)	.11	.11	.22	.13	.04	.10
Difference in Mean	0		.09		.06	
z-stat. (p-value)	.02(.982)		1.21(.228)		1.42(.155)	
t-stat. (p-value)	.02(.982)		1.21(.230)		1.55(.143)	
2 Correct Answers (%)	.33	.32	.50	.31	.21	.33
Difference in Mean	.01		.19		.12	
z-stat. (p-value)	.16(.871)		2.03(.042)		1.52(.130)	
t-stat. (p-value)	.16(.871)		2.05(.042)		1.52(.130)	
3 Correct Answers (%)	.45	.25	.01	0	.74	.50
Difference in Mean	.20		.01		.24	
z-stat. (p-value)	3.06(.002)		.64(.524)		2.91(.004)	
t-stat. (p-value)	3.10(.002)		.64(.526)		2.97(.003)	
N	239	79	96	39	143	40

Source: Own calculations using experimental data from older workers.

Note: Results are from incentivized math questions after retirement decisions (calculation of the ETPI). Reported values are shares of the two sub-samples (students and older workers).