

The Power of Percentage: Quantitative Framing of Pension Income

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Abstract

We investigate whether the quantitative frame used to communicate future pension income to plan members matters for perceived pension income adequacy. We allocate plan members randomly to one of four pension income framing conditions: annual pension income, monthly pension income, pension income as percentage of current income, pension income as fraction of current income. We find that expressing projected pension income as a percentage of current income significantly increases the probability that a plan member perceives the pension income as too low. This effect is robust to adding household wealth, income, age and education. We find plausible effects of these background variables on perceived pension income adequacy. We conclude that in communication with plan members the pension industry should take account of this framing effect.

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² All opinions expressed in this paper are those of the authors and not necessarily those of De Nederlandsche Bank

1. Introduction

Around the world pension reforms and a shift in pension risk toward employees have made plan members more responsible for saving and investing for retirement. Policymakers and the pension industry use pension communication to create pension awareness, hoping that this will lead to action in case saving is inadequate (e.g. European Commission, 2013). In the Netherlands, pension funds are mandated by law to provide plan members once a year with a projection of their pension income if they will continue working in the same job until retirement. They usually give this projection in terms of annual gross income in euros. However, they could also choose to provide a replacement rate (percentage or fraction) or to give a monthly rather than an annual pension income.

We investigate whether there is an effect of the quantitative frame used to inform plan members about their future pension income on the level of satisfaction of their projected future pension income. A framing effect occurs if descriptions that are logically equivalent have different effects on perception, attitudes, preferences, judgment and/or decisions. We distinguish between four frames: annual income, monthly income, percentage of current income, fraction of current income. We allocate respondents randomly to one of these four framing conditions and provide them with a projected pension equal to 50% of their current income. We then ask them whether they think this pension income will be sufficient. We find that presenting the pension projection as 50% of current gross income significantly increases the probability of perceiving the pension income as insufficient as compared to presenting the projection as annual income, monthly income or fraction (0.5) of current income. This finding is robust to controlling for various background variables, including household wealth. We also find that wealthier households are significantly less likely to report unsatisfactory pensions, which conforms our intuition, as wealthier households need less pension income to maintain their living standard. When controlling for household wealth, gross household income is also significant: higher incomes report less often that the projected pension income is too low. This makes sense too, as higher incomes need a

lower replacement rate. The satisfaction probability also increases with age. That younger respondents perceive the projected pension income as less adequate makes sense because the projection is based on their current income while the young can be expected to earn more when getting older and making a career. Our regressions also show that respondents who declare themselves to be the financially knowledgeable person in the household are less likely to report an unsatisfactory pension income. This is remarkable, as a replacement rate of 50% is generally considered to be too low, and hence judging this income as adequate would seem a “wrong” answer. However, it could be that self-assessed financial knowledge reflects confidence in one’s abilities to earn an income even after the retirement date.

The paper is structured as follows. In the next paragraph we briefly survey the literature on framing effects. Section 3 describes our data and methodology. In section 4 our aggregate findings are presented, compared and interpreted. Section 5 presents the results of our regression analysis. In section 6 we discuss our findings and draw policy implications, and section 7 summarizes and concludes.

2. Framing effects: a bird’s eye view

Framing is the way information is formulated. Framing effects imply that descriptions that are logically equivalent have different effects on attitudes, preferences, judgment and/or decisions. A framing effect may occur through an influence on deliberative and/or affective processes (Loewenstein *et al*, 2001; Loewenstein *et al.*, 2015).

Levin *et al* (1998) distinguish between three categories of framing: attribute framing, risky choice framing, goal framing. In all these three cases, the framing implies that there are two logically equivalent descriptions of which one is positive and the other is negative. For each, an example is illustrative.

Attribute framing implies that an aspect of an object is described with either a

positive or negative frame, and a framing effect occurs if these logically equivalent descriptions lead to different judgments of the object. For instance, a food item can be described as 75% lean (positive frame) or as 25% fat (negative frame) (Keren, 2007). A positive frame has been shown to result in a higher rating of a product by consumers (Levin and Gaeth, 1988).

Risky choice framing involves a description of a choice where the probability and size of outcomes are given. A wellknown example is the choice between two treatments of a disease that without treatment will kill 600 people. Two treatments are possible, and their effectiveness can be framed either in terms of deaths or in terms of lives saved (Tversky and Kahneman, 1981).

Gain frame:

With treatment A, 200 lives will be saved, while with treatment B there is a one-third probability that 600 lives will be saved and a two-thirds probability that nobody will be saved

Loss frame:

With treatment A, 400 people will die, while with treatment B there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die

If the risky choice is framed in terms of losses and their probabilities people tend to prefer risk, while if it is framed in terms of gains and their probabilities people tend to prefer certainty. The risky choice framing effect is explained by prospect theory and loss aversion. People evaluate outcomes in terms of changes with respect to a reference point, and losses are weighed more than twice as large as gains.

Goal framing implies that a choice is framed in terms of either the advantages of taking action, or the disadvantages of not taking action (Levin *et al*, 1998). A negative (disadvantage) frame leads to more action than an advantage frame.

The effect of frames in spending behavior takes place through *mental accounting* (Soman, 2004; Thaler, 1985, 1999). For instance, consumers (and

investors) mentally allocate income sources and spending categories, and this may be influenced by frames (Keren, 2012)

The above framing effects occur through their influence on deliberation. People compare outcomes and anticipated the related emotions, and this deliberation is affected by the frame. These framing effects therefore fit in with a consequentialist model of behavior (Slovic *et al*, 2005; Loewenstein et al, 2015).

Framing effects may also occur through affective processes. A frame may induce affect, which in its turn influences risk perception and return expectations (McGregor *et al*, 2000; Besnier, 1990): this is known as the *affect heuristic* (Tversky and Kahneman, 1974; Andrade, 2005). Positive (negative) *affect*, besides decreasing (increasing) perceived risk, also leads to a higher (lower) estimate of return (Alhakami and Slovic 1994; Slovic *et al*. 2005).³

Research on framing effects of the quantitative format (percentage, fraction, euros) has been done predominantly in marketing and in medical decisionmaking. Research on the effect of information about adverse effects of medication suggests that percentage formats, such as “x percent of patients experience side effects” increase comprehension (and decrease perceived risk) as compared to frequency formats, such as “y out of z patients experience side effects” (Sinayev *et al.*, 2015). Moreover, people are prone to a ratio bias: a low probability event is perceived as more likely if it is quantitatively presented as a ratio with large numbers, for instance 20/100, as compared to an equivalent ratio expressed with smaller numbers, like 2/10 (Kirkpatrick & Epstein, 1999). The ratio bias also affects the attractiveness of a gamble. Slovic *et al* (2007) ask people how much they would pay for two gambles: that 29/36 to win \$2 and 7/36 to win \$9. They also ask people would to rate the attractiveness of these gambles on a scale from 0-20. They find that while the mean price

³ Boggio *et al* (2017) find that most metaphors in stock market language refer to war, battle, force and competitive play, and hypothesize that this may attract men and deter women when it comes to participating in the stock market. See also Sanders et al ()

people are willing to pay for the first gamble is much less than for the second one (which makes sense given the expected pay off), but also that the mean rating of the attractiveness of the first gamble is almost twice as high as that for the second one, and attribute it to the ratio bias with a nominator of 29 being more attractive than one of 7. The ratio bias also explains why a risk of people dying is perceived as higher if it is presented as 3650 deaths per year than as 100 deaths per day. In marketing, Del Vecchio *et al* (2007) find that the effect of a price discount on consumer expectations differs according to whether it is framed in cents or percent, but that this does not apply for a discount that is easy to compute like 50%.

Keren (2012) provides an overview of framing effects in pension communication and finds effects of on, *inter alia*, plan members' risk perception, intention to save for retirement, trust in their pension fund. He finds that risk communication is more neutral when expressed by numerical rather than by verbal probabilities, the reason being that words tend to imply a judgment.

Summing up, there is ample evidence of framing effects. However, these effects have primarily been shown for decisionmaking under risk (which is not the topic of this paper). We have not found any studies into the effect of a percentage versus a ratio frame in pension communication.

3. Data and methodology

Our data have been collected through a survey in June 2017 among participants of the CentERpanel run by CentERdata at Tilburg University. CentERdata is a survey research institute that is specialized in data collection and Internet surveys. The CentERpanel consists of about 2,000 households representative of the Dutch-speaking population in the Netherlands. The questionnaires are answered at home using an Internet connection. Data collected with Internet surveys display higher validity and less social desirability response bias than those collected via telephone interviewing

(Chang and Krosnick, 2003).⁴ The panel has been used in many studies of pension behaviour and attitude among Dutch employees (see for instance Van Rooij *et al*, 2007) and of financial literacy and retirement planning in the Netherlands (see Alessie *et al*, 2011). Panel members fill out short questionnaires via the Internet on a weekly basis. Annually, panel members provide information on individual income, household wealth, health, employment, pensions, savings attitudes, and savings behaviour for the DNB Household Survey (DHS), providing researchers with a rich set of background information on the respondents. The availability of a computer or Internet connection is not a prerequisite of the selection procedure, which is done by a combination of recruiting randomly selected households over the phone and by house visits. Participants did not receive a financial incentive to fill out the questionnaire. For a complete description of the CentERpanel and the DHS, see Teppa and Vis (2012).

Our main focus is to study whether the quantitative framing of the pension income projection matters for the employee's judgment of pension adequacy. We use four different quantitative frames and allocate respondents randomly to one of these framing conditions. The quantitative frame conditions are the following:

- gross annual pension income
- gross monthly pension income
- pension income as % of current income
- pension income as fraction of current income.

In all frames, the projected pension income amounts to 50 % of current income. We chose this percentage for three reasons. First, it is generally assumed to be too low to maintain the living standard at retirement. Second, in the Netherlands people expect to receive around 70% of income, which is

⁴ CentERdata is located at Tilburg University. See also <http://www.uvt.nl/centerdata/en>. Households who do not have access to a pc are provided with a set-top-box for their television. In case of attrition of panel members, CentERdata selects new members to keep the panel representative for the Dutch population. High-income members are somewhat overrepresented. We have verified that this does not affect the descriptive statistics qualitatively. If the 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 the response rate (actually the survey weekends fell within the summer vacation period).

too optimistic as in reality the replacement rate will be closer to 50%. Last but not least, by using a projection equivalent to 50% of current income we avoid potential confusion about what the information implies. If we had used 40%, people may for instance think that it is a fall in income of 40% rather than a fall of 60%.

We can provide respondents with an individual income projection in euros based on their income thanks to the fact that the DNB Household Survey collects this information annually. We vary the framing condition, allocating respondents randomly to one of the following quantitative projected pension income frames.

Our questionnaire was submitted to panel members who are employed in the age range of 16 and above. Retirees are excluded. The response rate of our survey was 66%, which is normal. After removing two outliers - respondents with an income exceeding 1 mln euros - this resulted in a number of 1034 respondents. Table 1 gives the summary statistics of the sample and Table 2 presents the distribution over the conditions.

This is the information that was given to respondents (translated from Dutch):

Imagine you get the following information about your future pension: if you keep on working until retirement you can expect from your retirement date the following pension:

respondents in condition 1: gross ...euros per year⁵

respondents in condition 2: gross... euros per month

respondents in condition 3: 50% of your current gross income

respondents in condition 2: gross... euros per month.

⁵ Please note that the annual income was calculated as 12.95 monthly income because an annual income contains vacation money. Strictly speaking, panel members in this condition received therefore a higher pension projection than the other three categories, as the latter three were all based on monthly income.

The information was followed by this question (translated from Dutch):

Please indicate to what degree you regard this pension income sufficient or insufficient to be able to make a living. Please do not take your partner's income into account.

- More than sufficient
- Sufficient
- Insufficient
- Very insufficient
- Do not know

Table 1 shows the distribution of the respondents over the four framing conditions. The distribution was random except for respondents for whom no income data were available from the DHS. They were allocated randomly over the “50% of your current income” and the “0.5 times your current income” condition, which explains the higher percentage of respondents in those two conditions.

Table 1. Distribution of respondents over framing conditions

Projected pension income	Frequency	Percent	Cumulative
Annual income	223	21.57	21.57
Monthly income	222	21.47	43.04
Replacement rate as percent	293	28.34	71.37
Replacement rate as fraction	296	28.63	100
Total	1,034	100	

Source: constructed by the authors based on the CentER panel data

4. General findings

In this section we present our aggregate findings as well as the findings according to the framing condition.

First of all, it should be remarked that not a single respondent answered “Do not know” to the question. As to perceived pension adequacy, Table 3 shows that the majority of the full sample (759 respondents or 73%) regards the projected pension income as either insufficient or very insufficient. Around a quarter regards it as sufficient and a mere 2 percent is more than happy with the pension projection. This finding is in line with what we expected, given that a 50% replacement rate is generally regarded as too low to maintain one’s living standard, and it should be kept in mind that in the Netherlands pension plan members traditionally expected to receive a gross pension of around 70% of final wage, which would be around 90% after taxes, as tax rates are lower for retirees (AFM, 2012). Moreover, the young expect to end their career with a higher income than their current one, hence for them a 50% replacement rate based on current income would imply an even lower expected final wage replacement rate.

Table 3. Perceived adequacy of projected pension income: full sample

Perceived adequacy of pension income	Frequency	Percent	Cumulative
Very unsatisfactory	199	19.25	19.25
Unsatisfactory	560	54.16	73.40
Satisfactory	250	24.18	97.58
Very satisfactory	25	2.42	100
Total	1,034	100	

Source: constructed by the authors based on the CentER panel data

Of course the most interesting question is whether the quantitative pension income frame matters for perceived pension adequacy. This turns out to be

the case, in the sense that a percentage frame results in a significantly different perception than each of the other frames. The findings according to frame are given in Table 4.

Table 4. Perceived adequacy of projected pension income by frame

Perceived adequacy of pension income	Projected pension income				Total
	Annual income	Monthly income	RP percent	RP fraction	
Very unsatisfactory	19.28	22.07	19.45	16.89	19.25
Unsatisfactory	52.02	50.90	62.12	50.34	54.16
Satisfactory	25.11	26.13	16.38	29.73	24.18
Very satisfactory	3.59	0.90	2.05	3.04	2.42
Total	100	100	100	100	100
Pearson $\chi^2(9)^* = 22.21$ Pr = 0.008					

Source: constructed by the authors based on the CentER panel data

*Pearson's chi-squared for the hypothesis that the rows and columns in a two-way table are independent

If we sum, for each framing condition separately, the first two cells, constructing a variable including very insufficient and insufficient, the following picture emerges (Table 5 and Figure 1):

Table 5. Percentage regarding the pension income as inadequate, by frame

	%
Annual euros frame	71.30
Monthly euros frame	72,79
50% of current income frame	81.47
0,5 times current income frame	67.33

Source: constructed by the authors based on the CentER panel data

Figure 1. Pension income (very)sufficient (left) and (very) insufficient (right)



Source: constructed by the authors based on the CentER panel data

From Tables 4 and 5 and Figure 1 it appears that there is a difference in adequacy judgment between the percentage frame and the other frames, with respondents in the percentage frame considering the projected pension income as less sufficient. Further analysis reveals that this difference between the 50% frame and the other three frames is indeed significant, as shown in Table 6 which gives details about the variables that we will focus on in the regression analysis of which the results will be presented in the next Section. .

Table 6 “Focused” variables – used in the regressions of Section 5
 Projected pension income framed as replacement rate as fraction of gross income vs any other frames
 Perceived adequacy of pension income: (very) unsatisfactory vs (very) satisfactory

Perceived adequacy of pension income	Projected pension income		Total
	Replacement rate as fraction	Any other frame	
(Very) Unsatisfactory	81.57	70.18	73.40

(Very) Satisfactory	18.43	29.82	26.54
Total	100	100	
Pearson chi2(1) = 13.96 Pr = 0.000			

Source: constructed by the authors based on CentER panel data

Hence the conclusion of this simple analysis is that if people are informed about their future pension, the quantitative frame matters: a % income replacement frame leads to a significantly higher percentage of respondents judging their future pension as being too low as compared to a euro income frame or a replacement ratio.

Insofar a 50% replacement rate of end wage can be deemed insufficient, this applies even more to current income, especially for those who expect wage increases until their retirement date. In that sense, judging the projected pension income as (very) insufficient seems to be the closest to being a correct answer. Hence if information provision is meant a “wake up call” for plan members, our analysis suggests that providing an outlook in terms of a percentage replacement rate is the effective way to get the message across. The next section presents the results of regression analysis to investigate which background variables influence the (in)adequacy judgment, and to see whether the frame remains significant in a multivariate context.

5. Regression analysis

In this section we present the results of a regression analysis of the whole sample to see whether the framing effect is robust after adding potentially relevant background variables. Our dependent variable is the probability that a respondent judges the individual projected pension income as (very) unsatisfactory. Our framing condition enters as an explanatory in the regression, where this takes on value 1 for it the percentage frame, and value 0 for other.

First, we have run regressions adding to the focused variables the background characteristics that we had at our disposition on the basis of our own current

questionnaire. In this case, the number of observations is 1034 as we have the information available for all respondents. Next, we added variables from the DNB Household survey because we felt they had to be included to check for robustness to adding wealth. The DNB Household Survey includes information on total household wealth, household financial wealth, and net total household wealth (taking account of household debts). The merging of these two datasets results in a fall in the number of observations, from 1034 to 715.

Table 7 gives summary statistics of the variables used in the regression analysis.

Table 7. Summary statistics of variables in regression equations

Variable	Mean	Std.Dev.	Min.	Max.	N.Obs.
Unsatisfaction	0.734	0.442	0	1	1,034
Pension as % income	0.283	0.451	0	1	1,034
Gross pers. Income	4,424	3,008	0	40,000	1,034
Total hh wealth	252,560	234,344	30	3,324,771	715
Financial hh wealth	40,627	122,672	0	2,874,771	715
Net fin. hh wealth	34,776	125,297	-227,775	2,874,771	715
Age 18-20 yrs	0.099	0.298	0	1	1,034
Age 30-39 yrs	0.260	0.439	0	1	1,034
Age 40-49 yrs	0.280	0.449	0	1	1,034
Age 50-59 yrs	0.242	0.428	0	1	1,034
Age 60+ yrs	0.117	0.321	0	1	1,034
<i>Education:</i>					
Primary	0.012	0.111	0	1	1,034
Prevocational	0.147	0.354	0	1	1,034
Selective secondary	0.080	0.271	0	1	1,034
Applied science 1	0.333	0.471	0	1	1,034
Applied science 2	0.277	0.448	0	1	1,034
University degree	0.148	0.356	0	1	1,034
Have a partner	0.715	0.451	0	1	1,034
FKP	0.718	0.449	0	1	1,034
Homeowner yes/no	0.770	0.420	0	1	1,034

Source: author's calculations based on CentER panel data

The results of the regression analysis are given in Table 8. First of all, Table 8 shows that the framing effect is significant in the multivariate context in all specifications and at the 1% level. Column (1) gives the regression before

merging our dataset with the DHS, hence it includes all 1034 observations but does not contain wealth variables. It shows that the framing condition remains significant in a multivariate context, with the percentage frame condition increasing the probability of finding the projected pension income significantly (at the 5% level) unsatisfactory. Column (1) also shows that the probability of finding the pension inadequate falls with age, which makes sense as the projection is based on current income, which normally increases with age because of career steps: keep in mind that the projected pension income is expressed in terms of current income. In column (1) there is also an effect of education: people with a university degree have a significantly lower probability of judging the projected pension as inadequate. However, this could reflect an effect of wealth, which is not included in this column. This explanation is confirmed in the regressions that add various measures of wealth to the regression equation (columns 3-5). Once wealth is added having a university degree becomes insignificant, suggesting that a degree was a proxy for wealth, and total household wealth (column 3), household financial wealth (column 4) and household total net wealth become significant, with each decreasing the probability that the projected pension income is deemed inadequate. This of course makes sense, as financial and other wealth provide households with additional consumption possibilities, both by generating an income stream and because wealth can be drawn down at retirement. Controlling for wealth moreover makes income become significant with the expected negative sign: higher income reduces the possibility that respondents judge the projected pension income as too low. This makes sense because higher incomes need a lower replacement rate, as the inflexible part of their consumption is a smaller fraction of income. We find a small effect of being the financially knowledgeable person (FKP) in the household. A possible interpretation is that the knowledgeable household member is more confident in being able to add to pension income after retirement; with men being (self assessed) more often the FKP, this could also reflect overconfidence. We did not find an effect of gender in any of the regressions and left this variable out.

Table 8. Regression results. Dependent variable: projected pension (very) inadequate

	(1)	(2)	(3)	(4)	(5)
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Controls	Marg.Eff. (Std.Err.)	Marg.Eff. (Std.Err.)	Marg.Eff. (Std.Err.)	Marg.Eff. (Std.Err.)	Marg.Eff. (Std.Err.)
Pension as % inc.	0.100*** (0.029)	0.156*** (0.034)	0.161*** (0.033)	0.154*** (0.034)	0.156*** (0.033)
Gross hh income	-0.014 (0.009)	-0.033** (0.016)	-0.033** (0.016)	-0.033** (0.016)	-0.034** (0.016)
Total hh wealth			-0.023*** (0.009)		
Fin. hh wealth				-0.069** (0.029)	
Net tot. hh wealth					-0.021** (0.008)
Age 30-39 yrs	0.034 (0.055)	0.065 (0.072)	0.092 (0.070)	0.073 (0.072)	0.070 (0.071)
Age 40-49 yrs	-0.101* (0.060)	-0.087 (0.080)	-0.054 (0.080)	-0.075 (0.080)	-0.079 (0.080)
Age 50-59 yrs	-0.166*** (0.063)	-0.163* (0.084)	-0.120 (0.084)	-0.134 (0.085)	-0.137 (0.084)
Age 60+ yrs	-0.181** (0.074)	-0.171* (0.095)	-0.111 (0.094)	-0.126 (0.095)	-0.135 (0.094)
Prevoc education	-0.320 (0.215)	-0.262 (0.242)	-0.312 (0.241)	-0.307 (0.243)	-0.283 (0.243)
Selective secondary education	-0.247 (0.224)	-0.218 (0.250)	-0.266 (0.251)	-0.256 (0.253)	-0.241 (0.252)
Vocational education	-0.250 (0.195)	-0.211 (0.226)	-0.259 (0.227)	-0.258 (0.230)	-0.236 (0.227)
Applied sciences	-0.315 (0.201)	-0.260 (0.219)	-0.291 (0.218)	-0.291 (0.220)	-0.280 (0.220)
University degree	-0.398* (0.208)	-0.303 (0.237)	-0.319 (0.236)	-0.327 (0.237)	-0.325 (0.236)
Have a partner	-0.012 (0.035)	-0.022 (0.045)	-0.011 (0.046)	-0.018 (0.046)	-0.011 (0.045)
FKP	-0.037 (0.032)	-0.074** (0.037)	-0.068* (0.037)	-0.070* (0.037)	-0.073* (0.037)
Be homeowner	-0.040 (0.035)	-0.042 (0.046)	0.012 (0.054)	-0.032 (0.047)	-0.017 (0.049)
Observations	1,034	713	713	713	713
Pseudo R-squared	0.054	0.069	0.079	0.081	0.078
Joint sign. age (p)	0.000	0.001	0.001	0.001	0.001
Joint sign. edu (p)	0.061	0.563	0.705	0.654	0.564

The table reports marginal effects and standard errors in parentheses of probit regressions.

*** p<0.01, ** p<0.05, * p<0.1 The dependent variable is an indicator of whether the respondent is (very) unsatisfied with his/her projected pension income (value 1) or (very) satisfied (value 0). Gross hh income is household gross income per month in logs. Wealth variables are expressed in 100,000 euros. Age, education levels, have a partner, FKP, be homeowner are indicator variables each. FKP denotes financially knowledgeable person in the household. Age 18-29 yrs. serves as reference category for age; basic education serves as reference category for education levels. Regression (1) excludes household wealth and it is estimated on the full sample (1,034 obs.). Regressions (3)-(5) includes alternative measures of household wealth and are estimated on the restricted subsample of respondents merged with the DHS 2016 wave (713 obs.). Regression (2) has the same specification as Regression (1), without household wealth, but it is estimated on the restricted sample

6. Discussion

Our findings indicate that the quantitative frame matters when informing plan members about their future pension. Logically equivalent frames used to inform people about their future pension have a different impact on perceived pension adequacy. Framing the pension as a percentage of current income has a significantly larger impact than a frame in annual euros, monthly euros, or in pension income as a fraction of current income. Note that our analysis is restricted to a situation in which people are informed about a pension which will be 50% of their current income. This was a deliberate choice, as this enables us to rule out that people are confused about whether to interpret the quantitative information as a reduction with respect to current income or as a replacement rate.

Our findings is in line with the literature that shows that logically equivalent frames may matter for preferences, judgment and decisionmaking. Moreover, evidence abounds that many people fail to solve the simple ratio and decimal problems that are often used in for instance risk communication. However, in a number of respects our analysis differs from previous studies. We do not present a risky choice, and neither do we use a positive or a negative frame. Moreover, we do not ask people to choose between alternatives. As far as we know, no previous studies have been published that measure the effect of a quantitative pension income frame on perceived pension income adequacy. In medical decision making research there is some evidence, however, that percentage formats increase comprehension (and decrease perceived risk) as compared to frequency formats (Sinayev *et al.*, 2015).

We can only speculate as to why the quantitative frame matters in pension projection. The fact that a replacement rate – be it in percentage or as a fraction – could be more effective as a “wake up call” for pension saving adequacy can be explained by assuming that people find it easy to imagine what it would mean, in terms of consumption, to be left with half of their current income. In the end, pension is not about euros, but about consumption. Also, people may not know exactly their current income, which would make a euro amount less salient in terms of what it means for consumption. Whatever the explanation for our findings, their implication is

that in communication about pensions attention should be paid to the quantitative framing of projected pension income. Our research could be extended to situations where projected pension income is lower or higher than the 50% that we used.

7. Summary and conclusions

We find that the quantitative frame in which future pension is presented matters for perceived pension income adequacy. If expressed as a percentage of current income, the probability that respondents regard the pension income as too low is higher than if it is expressed as a fraction of current income or as an annual or monthly euro amount. This at least is the finding in case the replacement rate is 50% of current income. The other determinants of perceived pension adequacy are in line with intuition: perceived adequacy falls with wealth and income and rises with age. To our knowledge, this is the first study into framing effects in information about the future pension income. This finding is not only of academic importance. Policy makers, financial supervisors and the pension industry aim at communicating with plan participants in order to make them aware of their future pension and its adequacy, hoping this will help plan members to take action if needed. They put a lot of energy in finding out how to reach plan members by making information understandable and made to measure. Paying attention to subtle framing effects and using them effectively could provide useful.

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