



Network for Studies on Pensions, Aging and Retirement

Raising pension awareness through letters and social media

Evidence from a randomized
and a quasi-experiment

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in cooperation with Pensioenlab*

DESIGN PAPER 147

NETSPAR INDUSTRY SERIES

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Netspar Design Paper 147, April 2020

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Aknowledgements

This project is funded by Pensioenlab, the Netspar Topicality Grant "Raising pension awareness", and Instituut GAK. We gratefully acknowledge the input

received from Rob Alessie, Elisabeth Beusch, Lisa Brüggem, Bas Donkers, Justine Feitsma, Jessica Hootsen, Eduard Ponds, Femke Sipkema, Anna van der Schors, Jeroen van der Vaart, Arthur van Soest, and two anonymous Netspar referees.

We also thank the participants of the Netspar workgroup "Flexible pensions and pension awareness", the Netspar Pension Day 2017, the Dutch Economist Day 2017, the International Association for Applied Econometrics 2018, the Netspar International Pension Workshop 2019, and seminar participants at Ca'Foscari University of Venice. We thank PanelWizard for collecting the data.



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Abstract

This paper analyzes the effectiveness of an informative letter versus a Facebook ad, and the effectiveness of arousing curiosity versus arousing fear to raise pension awareness. Pension awareness is measured by 1) basic knowledge of the pension system, and 2) actions undertaken to get an overview of one's accrued pension entitlements. To identify the causal effect of a letter, we rely on a randomized field experiment using a representative sample of about 4,000 individuals in the Netherlands. Randomization is involved in 1) receiving an informative letter, and 2) the framing of the letter (arousing curiosity or fear). To identify causal effects of a Facebook ad with the same content, we use an Instrumental Variables approach with Facebook usage as an instrument. This quasi-experimental approach avoids ethical issues with experiments on social media platforms. We find that the Facebook ad is very cost-effective in increasing basic knowledge and the number of logins on the pension overview website. An informative letter is less cost-effective than a Facebook ad, but in itself a letter with fear appeal is almost twice as effective as a Facebook ad in raising the knowledge of the pension system, even six weeks after receiving the letter.

Nederlandse samenvatting

Nederland is bezig met belangrijke hervormingen in de tweede pijler. De maatschappelijke houdbaarheid van een nieuw pensioencontract staat of valt met de communicatie ervan. Een algemene trend is dat mensen meer keuzes krijgen en dat het aantal zelfstandigen toeneemt. Deze ontwikkelingen vergroten het belang van pensioenbewustzijn. Om goed te kunnen communiceren over pensioenmaterie is het belangrijk om meer inzicht te krijgen in de mate waarin de Nederlandse bevolking pensioenbewust is en hoe pensioenbewustzijn meest effectief verhoogd kan worden.

In dit paper onderscheiden we twee vormen van pensioenbewustzijn: a) het juist kunnen beantwoorden van basisvragen over het pensioenstelsel; b) het inloggen bij mijnpensioenoverzicht.nl om meer te weten te komen over de eigen situatie. We onderzoeken of jongeren en ouderen op een andere manier benaderd zouden moeten worden. Voor zover wij weten is de effectiviteit van sociale media in pensioencommunicatie niet eerder onderzocht.

We hebben een gerandomiseerd experiment uitgevoerd om het effect van brieven en de 'framing' ervan op pensioenbewustzijn te testen. De helft van de brieven roept nieuwsgierigheid op ('curiosity appeal'), terwijl de andere helft appelleert aan angst ('fear appeal'). Naast de brieven hebben we samen met Pensioenlab een bericht op Facebook geplaatst, gericht op mensen tussen de 20 en 40 jaar. We benutten informatie over Facebook-gebruik om het causale effect van een bericht via sociale media op pensioenbewustzijn te meten.

De resultaten laten zien dat de pensioengeletterdheid in het algemeen laag is. Met onze onderbuik wisten we dat al, maar door het met cijfers te onderbouwen krijgen we er meer gevoel voor. Zo denkt bijvoorbeeld ruim 60% dat de AOW-premies (deels) belegd worden en bijna een derde dat alleen gepensioneerden te maken krijgen met pensioenkortingen. Informatieve brieven die appelleren aan angst verhogen de basiskennis over het pensioenstelsel, zelfs zes weken na ontvangst van de informatie. Dit effect is niet significant verschillend voor mensen tussen 20-40 en 40-64 jaar. Jongeren en ouderen kunnen dus met dezelfde framing benaderd worden. De brieven die aan angst appelleren hadden significant meer impact dan de brieven die een appel doen aan nieuwsgierigheid. Het voorgevoel dat mensen een brief die aan angst appelleert mogelijk minder zouden lezen omdat ze negatieve informatie vermijden, blijkt in dit experiment ongegrond. Een nadeel van het appelleren aan angst kan zijn dat we mensen onnodig bang maken. Echter, we zien dat mensen die zo'n brief ontvangen hadden niet meer bezorgd waren over hun pensioen dan mensen zonder zulke brief. Hoewel een brief ongeveer twee keer zo effectief is in het verhogen van

pensioengeletterdheid dan een Facebook-bericht, is dit laatste vanwege de relatief lage kosten wel meer kosteneffectief. Daarnaast is een Facebook-bericht effectiever in het verhogen van het gebruik van *mijnpensioenoverzicht.nl*.

Wanneer de overheid, pensioenfondsen, verzekeraars en sociale partners mensen willen informeren over pensioen mogen ze er rekening mee houden dat informatie uit een brief die aan angst appelleert beter beklijft dan informatie uit een brief die nieuwsgierigheid tracht op te roepen. De kosteneffectiviteit van een bericht via sociale media is hoog en zo'n bericht is meer geschikt dan een brief om mensen door te verwijzen naar een website.

1. Introduction

The aging of the population that many Western countries are experiencing has resulted in a wide range of pension reforms aimed at sustaining the public finances of these countries. Furthermore, occupational pension systems in many countries are shifting from defined benefit plans to defined contribution plans (Atkinson et al. 2012). Whereas pension plans were traditionally an employer's paternal responsibility, they have increasingly become an individual responsibility. Pension reforms and the increased personal responsibility raise concerns about how pension information can best be communicated, so as to ensure that individuals understand their options and can be guided towards sensible and adequate retirement savings decisions. Pension communication is the concern of governments as well as private pension funds and insurance companies, and it is of particular interest because pension reforms are high on the policy agenda of many countries. Furthermore, it has potentially major implications for retirement savings (McKenzie and Liersch, 2011).

A vast amount of recent literature has shown that numerous people are ill-informed about pension matters and lack the basic knowledge to make well-informed financial decisions (Lusardi and Mitchell, 2014).¹ This applies to a wide range of countries that have different pension systems.² Financial illiteracy is particularly severe among women and among low-educated, low-income, unemployed, and young individuals (Lusardi and Mitchell, 2014). Financially illiterate households are generally found to make worse financial decisions than their financially literate counterparts, which has consequences for the adequacy of income during retirement (Van Rooij et al. 2012).

Although acquiring financial knowledge can be costly at the individual level (Delavande et al. 2008; Lusardi et al. 2017), it may be socially optimal to increase financial literacy. Especially as ill-informed individuals are less responsive to incentives in the pension system because of misperceptions (Chan and Stevens, 2008; Mastrobuoni, 2011; Van Rooij and Teppa, 2014; Liebman and Luttmer, 2015). Also, for sound political decisions it is crucial that voters understand the basic concepts of the pension system (Fornero, 2015). Furthermore, understanding the basic concepts

1 Studies in various academic disciplines confirm this (Lynch, 2011).

2 E.g. Agnew et al., 2013; Alessie et al., 2011; Almenberg and Säve-Södenberg, 2011; Van Rooij et al., 2011; Arrondel et al., 2013; Beckmann, 2013; Boisclair et al., 2015; Fornero and Monticone, 2011; Klapper and Panos, 2011; Crossan et al., 2011; Bücher-Koenen et al., 2011; Sekita, 2011; Brown and Graf, 2013; Landerretche and Martinez, 2013; Lusardi and Mitchell, 2011.

may increase the confidence that people have in the pension system.³ This paper aims to increase our knowledge on how information can best be made available, by investigating the effectiveness of specific framing (fear versus curiosity appeal) and by analyzing two different communication channels (letters and social media) on raising pension awareness.

Framing is an important concept in behavioral economics. Behavioral insights play an important role in stimulating (or discouraging) economic behavior (Hossain and List, 2012; Thaler et al., 2012; Ferraro and Price, 2013). Such insights can help overcome myopia in long-term decisions such as in savings behavior (Thaler and Benartzi, 2004). Karlan et al. (2016), for example, showed how certain reminder messages by banks lead to higher savings in committed savings accounts.

Research shows that framing affects perceived risk and risk-taking behavior (Lehner, 2000; Steul, 2006; Diacon and Hasseldine, 2007). In addition, Eberhardt et al. (2017), building upon the *prospect theory* of Kahneman and Tversky (1979), found that an assurance frame (the loss alternative) can be twice as effective compared to an investment frame (the gain alternative) in engaging participants to click on a video link that explains changes in their pension scheme. Likewise, Van Putten et al. (2018) found that loss frames lead more people to change their pension profiles online than gain frames or neutral frames. Framing also affects social security benefit claiming decisions (Brown et al., 2016).

In this study we compare fear appeal and curiosity appeal. A recent meta-study found that framing that appeals to fear can be highly effective in influencing behavior (Tannenbaum, 2015). Although such fear appeal is generally effective in inducing pension saving (Block and Keller, 1995; Agnew et al., 2008; Montgomery et al., 2011; Bateman et al., 2015; Bockweg et al. 2017), it may also scare participants off (Eberhardt et al., 2017). Furthermore, the effectiveness of the specific type of framing may well differ between groups of people, such as the young and the old. Charles et al. (2003) found that older people are more likely to remember information that is positively framed than negatively framed information, while such an effect is not found among the young. The effect of positive framing is particularly strong when it concerns health-related information (Shamaskin et al., 2010) and invitations to exercise (Nolthoff and Carstensen, 2014).

3 For example, in The Netherlands many young people are concerned that no pension will be left for them by the time they reach retirement. With a better understanding of the pension system, they would know that, with low interest rates, a relatively large amount of pension assets are reserved for younger people.

In addition to these behavioral measures, Bauer et al. (2017) suggest that monetary strategies remain important. They find that people are more likely to inform themselves about their individual pension situation with a small financial incentive than with nudging. Carpena (2017), on the other hand, found that financial incentives do not increase the results of financial education.

Research shows that households collect pension information through different channels (Johansen, 2013). This paper compares an old communication channel (a letter) with a new channel (social media). In Western countries, where access to the internet is nearly universal, the vast majority of young adults use social media.⁴ Aside from companies being able to communicate directly with their customers, social media enable consumer-to-consumer communication (Mangold and Faulds, 2009). This type of communication is found to affect purchasing decisions (Wang et al., 2012). Research also suggests that Facebook, which has dominated the social media market for over a decade, can be an effective instrument for finding a job (Gee et al., 2017). Social media are not only reserved for commercial products; nonprofit organizations also increasingly use social media to expand public awareness (Waters et al., 2009). This takes the form of government bodies communicating with citizens regarding numerous topics pertaining to public safety (Kavanaugh et al., 2012). The public strategy of informing citizens through social media is also promising in health communication (Househ et al., 2014). The use of social media appears to be an emerging trend for patients who are looking for health information, and Chou et al. (2009) show that also more disadvantaged groups can be reached this way. However, these studies are mainly exploratory, and issues concerning the causality of findings are postponed. In this paper we aim to deal with causality and to test whether social media provide an opportunity to increase pension awareness.

This paper analyzes both the effectiveness of different pension communication channels and of framing in raising pension awareness. Here, pension awareness is defined in terms of two components: 1) pension literacy and 2) logging in on a national website⁵ to obtain an overview of one's accrued pension rights (referred to as the "pension check" in the rest of this paper). The first component measures the general knowledge of people (with five basic questions about the pension system), while the second component measures whether people inform themselves about their personal pension situation.

⁴ <https://ourworldindata.org/rise-of-social-media>.

⁵ In the Netherlands a national website, mijnpensioenoverzicht.nl, launched by the Dutch pension sector, provides individuals a combined overview of their public and occupational pensions (possibly from several pension funds).

First, we analyze the effectiveness of sending an informative letter. The letter consists of information regarding the pension system and provides a link to the pension check (in Dutch: *mijnpensioenoverzicht.nl*). To identify the causal effect of the letter on pension awareness, we rely on a randomized field experiment with a representative sample of about 4,000 individuals in the Netherlands (thus avoiding problems related to correlational studies of financial literacy, as explained by Fernandes et al., 2014). Second, since randomization takes place both in sending a letter and in the framing of the letter (curiosity or fear appeal), we are able to analyze the effectiveness of curiosity versus fear appeal on pension literacy and doing the pension check. Third, we analyze the extent to which Facebook is an effective communication channel to increase pension awareness. To do this, we approached 770,134 individuals between the ages of 20 and 40 with a Facebook ad. We focus on the effectiveness of using Facebook as a communication channel for spreading important information and convincing people to visit a website. As no randomization takes place in viewing the ad, we use an instrumental variable approach with Facebook usage as an instrument.

The contribution of this paper to the literature is threefold. First, whereas other researchers investigated the effect of framing on outcome measures such as risk perception, annuity choices, social security claiming, retirement saving intentions, or clicking on a video about pensions, this paper investigates the effect of framing on pension awareness. As far as we know, this is the first paper on pension communication that investigates whether people have a better knowledge of the pension system six (!) weeks after receiving a letter.⁶

Second, we are the first to investigate whether social media can play an effective role in raising pension awareness. Specifically, we apply a quasi-experimental approach to identify causal effects of interventions through social media. Earlier papers, such as Kramer et al. (2014a), used experiments through Facebook, which has led to discussions regarding the ethics of such experiments (Kramer et al., 2014b). We propose an instrumental variable approach with social media usage as an instrument. In this way, we can avoid ethical concerns.⁷ This paper shows that being a Facebook user is a strong instrumental variable in a quasi-experimental IV-framework. This variable can easily be used also in other studies on different topics.

6 Liebman (2015) examines knowledge on key Social Security features even one year after sending a brochure.

7 Ethics of data usage in the social media era are under a magnifying glass since the incident with Cambridge Analytica, where the data of 87 million users may have been used to target voters on behalf of the Trump presidential candidacy and the Brexit referendum.

Third, our respondents are representative of the overall Dutch population, instead of being specifically targeted (like the often-used setting of company-specific employees or pension fund-specific participants). With our representative dataset we even have a sufficiently large number of observations to investigate heterogeneous effects between large subgroups with respect to age, gender, and education level; this may be important as Lusardi and Mitchell (2014) argue that there is substantial heterogeneity in both financial literacy and financial behavior. Finally, the Netherlands is an interesting case as most of the retirement savings are mandatory (Knoef et al., 2016), which implies less incentive to invest in financial literacy (Jappelli and Padula, 2013). Our conclusions yield new insights in communication strategies for governmental policy setting and for pension funds and insurance companies for important lifecycle decisions.

The main findings indicate that a Facebook ad is a very cost-effective method to activate respondents to log in on a website to view their personal pension overview. Letters that attempt to arouse curiosity do not have any significant effect on pension literacy six weeks later, but fear appeal increases pension literacy significantly. The Facebook ad, however, is much cheaper than a letter and more cost-effective in this regard. We do not find significant heterogeneous effects with regard to age, gender, and education level. These results are robust to a variety of specifications.

The structure of the paper is as follows. Section 2 describes the randomized field experiment regarding the informative letters as well as the quasi-experiment using the Facebook ad. Data and descriptive statistics are described in Section 3. Estimation results are presented in Section 4. Finally, we present our conclusions in Section 5 and provide some additional discussion of the results in Section 6.

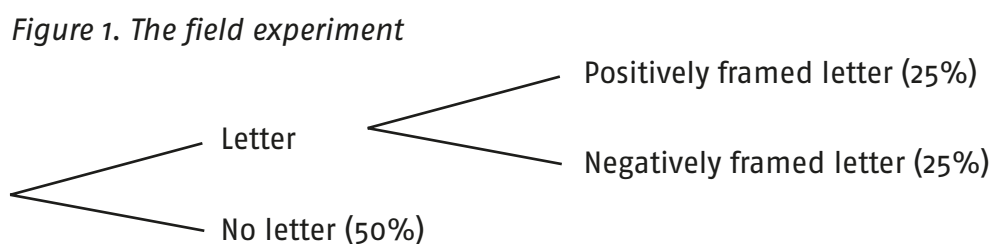
2. Method

This section first describes the design of the field experiment to analyze the effectiveness of an informative letter and of framing to increase pension awareness. Section 2.2 explains the quasi-experimental design used to investigate the effectiveness of a Facebook ad to increase pension awareness.

2.1 Letter

To test whether an informative letter increases pension awareness we set up a field experiment. In this experiment we designed a letter consisting of three parts. The first part is the introduction, which is framed to arouse either curiosity or fear. The letter that is meant to arouse curiosity asks the readers whether they aren't curious about their pension. The letter with fear appeal asks them if they want to know whether they have saved enough, given the gloomy media reports about pensions.⁸ The second part of the letter asks the reader to do the pension check (i.e. logging in on the personal pension registry to see one's personal pension entitlements). To reduce the hassle involved with logging into the personal pension overview, the information was sent at the time of the yearly tax return, where the same password is needed to file taxes. The third part shows seven basic facts about the pension system.

We use a panel of representative individuals and randomly assign them to one of the following three groups:



The letter was sent on March 17, 2017. As from May 1 the panel received an online questionnaire which they could fill out until May 19.⁹ To measure pension literacy, we rely on the financial literacy literature and test basic pension knowledge by means of five

⁸ Appendix A shows the two letters.

⁹ The letter was sent in name of Pensioenlab, a Dutch organization that aims to increase pension awareness. Six weeks later the questionnaire was sent in name of Leiden University to an online panel that regularly answers questionnaires on a wide variety of topics. We asked a general question about the pension check and did not refer to Pensioenlab anywhere in the survey. Therefore, we expect that it was unlikely that panel members would have realized that the letter and the questionnaire related to each other.

general questions, all based on the information presented in the letters (for details, see Section 3). Second, we asked people about the pension check.

To analyze the effects of a letter on pension awareness, we compare individuals who received a letter (the treatment group) to individuals who did not receive a letter (the control group). We thus estimate the intention to treat (instead of a lab experiment, where respondents are forced to read a letter). We estimate the following equation by Ordinary Least Squares (OLS):

$$y_i = \alpha_1 + \beta_1 D_i + \varepsilon_i \quad (1)$$

where y_i is pension literacy for individual i , α_1 and β_1 are regression coefficients, D_i is a dummy variable indicating whether individual i received a letter, and ε_i is the error term. As a robustness check we also estimate (1) using control variables such as gender, education, household composition, age, and work situation. However, since the letters were randomly sent this should not change the results.

To differentiate between letters that arouse curiosity and those that arouse fear, we estimate

$$y_i = \alpha_2 + \beta_2 D_i + \delta_1 D_i^+ + u_i \quad (2)$$

where D^+ is a dummy variable, which is equal to one for individuals who received a curiosity-framed letter and zero for all other individuals. β_2 measures the effect of the letter with fear appeal. The sum of β_2 and δ_1 measures the effect of a curiosity-framed letter.

To analyze the probability of doing the pension check, we estimate a model with the same variables as specified above. However, to take into account the binary nature of the outcome variable, we estimate a probit model using Maximum Likelihood, instead of OLS. Whether people did the pension check is a self-reported variable.¹⁰ Social desirability may lead to overestimation of the number of people doing the pension check. However, we do not expect this to bias our results, because we do not expect the treatment to affect the self-report bias. That is because the letter was sent in name of Pensioenlab (a Dutch independent organization that aims to increase pension awareness). Six weeks later the questionnaire was sent in name of Leiden University to an online panel that answers questionnaires on a regular basis. We asked a general question about the pension check and did not refer to

¹⁰ We ask the following question: "Did you (or your partner, if applicable) log in on mijnpensioenoverzicht.nl in the past six weeks?". This is the fourth question in the survey and is asked prior to the questions related to pension literacy.

Pensioenlab anywhere in the survey. Therefore, the treated individuals did not know that the letter and the questionnaire related to each other.

2.2 Facebook ad

To test whether social media is an effective channel to increase pension awareness, we published a Facebook ad on April 4, 2017 that informed people about the pension system and asked them to do the pension check (see appendix B). The ad did not contain the first framing part of the letter (and was thus framed in a neutral way). Furthermore, since Facebook is not made for large messages, we reduced the amount of information, as well as the number of pension literacy questions in the analysis, from five to three. The ad targeted people in the Netherlands between the ages of 20 and 40 years. This does not mean that people over 40 were unable to see the ad since members of their network may 'like' the ad, but the chances of that were small. The ad appeared on people's Facebook timeline, like a regular ad, regardless of whether they subscribed to specific groups and/or pages. Hence, seeing or not seeing the ad was independent of a person's preferences and behavior.¹¹ However, only the Facebook users had the opportunity to see the ad. In the online survey (using the same panel as in the field experiment with the letters explained above) we asked whether respondents had noticed the Facebook ad.

Since it is not possible to randomize a Facebook ad,¹² just regressing our outcome variables on whether the Facebook ad was noticed by the respondent may yield results that suffer from endogeneity. For example, there could be third factors, such as interest in pensions, that influence both pension awareness and viewing the Facebook ad. It may be that only persons who are interested in pensions and are already relatively pension-aware noticed the Facebook ad (only a selective sample noticed the ad), or that especially those who did see the Facebook ad *and* became more aware of their pension and the pension system remembered that they had seen the ad (selective measurement error in the self-report of having seen the ad). This would lead OLS to overestimate the effect of the Facebook ad on pension awareness. On the other hand, it could be that especially those who were relatively unaware of pensions remembered the Facebook ad, while those who are already aware of pensions did not pay attention anymore and scrolled further without noticing the ad

11 That is because, when publishing the ad, we only asked Facebook to select users between the ages of 20 and 40. We did not use any other targeting options.

12 In 2014, Kramer et al. studied emotional contagion with a Facebook experiment in the US among 155,000 Facebook users. After the study was published, ethical concerns were expressed by the media, and PNAS published an "Editorial Expression of Concern" (Kramer et al., 2014b).

consciously. They may have been confronted with the ad but without remembering it anymore. In that case OLS underestimates the effect of the Facebook ad on pension awareness.

To identify causal effects of the Facebook ad on pension awareness we use an Instrumental Variables approach. We asked respondents about the average time that they spend on Facebook per week and use this information to identify whether the respondent is a Facebook user or not.¹³ Respondents who use Facebook more than zero hours per week are defined as Facebook users; we use this information as an instrument. Being a Facebook user is likely to be correlated with noticing the Facebook ad (*relevant instrument*), but being a Facebook user is unlikely to be correlated with pension awareness other than through the Facebook ad (*valid instrument*). This approach has the advantage of avoiding ethical concerns regarding randomized experiments on Facebook (Kramer et al., 2014a; 2014b). To measure the true effect of complying with the treatment (that is remembering having seen the Facebook ad) on pension awareness¹⁴, we estimate

$$y_i = \alpha_3 + \theta_1 FB_i + \beta_3 D_i + \delta_2 D_i^+ + X_i \gamma_1 + v_i \quad (3)$$

$$FB_i = \alpha_4 + \theta_2 T_i + \beta_4 D_i + \delta_3 D_i^+ + X_i \gamma_2 + \mu_i \quad (4)$$

where y_i is pension literacy or doing the pension check for individual i (as specified before), FB indicates whether a person noticed the Facebook ad (one if the ad was noticed and zero otherwise), and X_i is a vector of control variables such as age, gender, education level, and household composition. T is a dummy variable indicating whether individual i is a Facebook user, D is a dummy variable indicating whether individual i received a letter (as specified before), and D^+ is a dummy variable indicating whether an individual received a curiosity-framed letter. v and μ are unobserved zero-mean errors, and the correlation between v and μ is presumably non-zero. When y_i is pension literacy, we estimate a linear 2SLS model.¹⁵ We assume that the error terms are independent of (X, T, D, D^+) and that T is correlated with FB , but not with the error term v . When y_i is the pension check, we estimate a linear 2SLS model (ignoring the binary nature of the outcome) and a bivariate probit model. In

13 Specifically we asked: "How much time do you usually spend reading messages from your timeline on Facebook per week?". This question is the third one asked in the survey, prior to the question about the pension check or the questions related to pension literacy.

14 This is comparable to research where people are asked to read a letter and afterwards to answer questions on the content. Other types of research may investigate how Facebook ads should be designed, such that they are remembered by people.

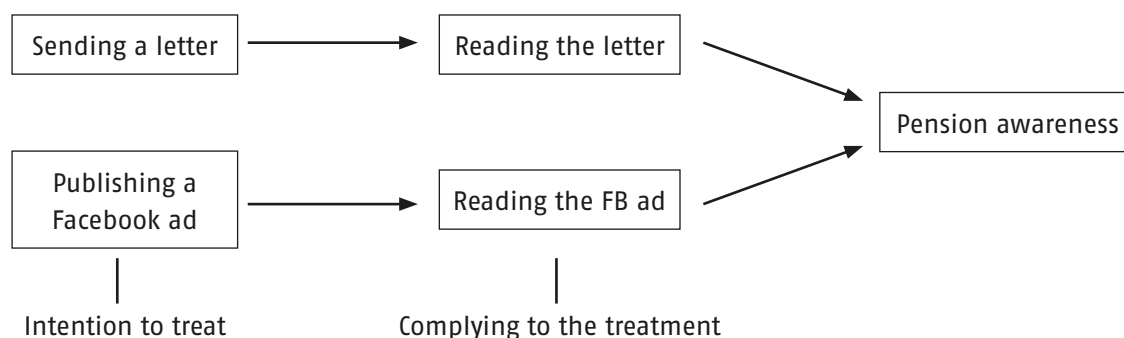
15 Maximum Likelihood gave similar results.

the bivariate probit model, v and μ are assumed to be independent of (X, T, D, D^*) and to be drawn from a standard bivariate normal distribution with zero means, unit variances, and correlation coefficient ρ . This model is estimated by Maximum Likelihood.

A threat to identification may be that people who use Facebook do not take the time anymore to read a newspaper and may thus be less informed about the pension system. If this is the case, our method would underestimate the true effect of the Facebook ad on pension literacy. Another threat to identification may be that those who spend many hours on Facebook have more online skills and would therefore have logged in more often on the pension overview website. However, 97.5% of our target group of individuals between the ages of 20 and 40 are active internet users (Statistics Netherlands, 2018). We therefore expect all of them to be able to access the pension check website, independent of whether they are active Facebook users or not.¹⁶

Note that the effects of letters and of Facebook should be interpreted differently. For the letters we estimate the intention to treat. That is, the result is based on receiving a letter and not on the letter eventually being read. For the Facebook ad, on the other hand, we estimate the effect of the ad on pension awareness to be conditional on complying with the treatment (Figure 2). To be able to compare the effectiveness of the letters and of Facebook, Section 4.3 provides a back-of-the-envelope cost-benefit analysis, where these differences are taken into account.

Figure 2. Intention to treat versus complying to the treatment



16 As a robustness check, we do include information about the self-reported ability to find pension information (measured on a 5-point scale). Despite the fact that this variable is highly significant, the conclusions do not change.

3. Data

3.1 Sample

We collected data online using a panel of PanelWizard.¹⁷ The planned sample size after non-response was 4,000 individuals, of which 50% are between 20 and 40 years old, and 50% between 41 and 64 years. The panel consisted of 4,560 individuals aged 20–40 and 3,387 individuals aged 41–64. These sizes were based upon expected non-response rates, which are higher for young than for old people. Within the two age groups we have a stratified sample that is representative of the Dutch population with regard to age, gender, household composition, labor market participation, and education. Details on the actual survey sample can be found in Table 1. This table shows that the sample consists of 4,297 respondents, of whom 4,164 completed the

Table 1. Sample

	Letter		
	Curiosity	Fear appeal	None
<i>Sample aged 20–40^a</i>			
Gross sample	1,145	1,124	2,291
Non-response	583	573	1,229
Completed surveys	542	536	1,027
Incomplete surveys	20	15	35
Response rate	49%	49%	46%
<i>Sample aged 41–64</i>			
Gross sample	883	727	1,777
Non-response	346	217	702
Completed surveys	528	493	1,038
Incomplete surveys	9	17	37
Response rate	61%	70%	60%

a To study the effect of the Facebook ad, we use the sample of people aged 20–40 only.

¹⁷ The survey pool of PanelWizard consists of respondents who actively enrolled in the panel. PanelWizard screens potential respondents on the basis of several tests that should indicate the seriousness of the potential respondent. If admitted to the panel, respondents receive a remuneration per survey question of 10 eurocents that they can use to sponsor a self-chosen charity. Although PanelWizard ensures that the survey pool is representative with respect to the Dutch population in terms of observed characteristics such as age, education, and labor market status, the self-enrollment might induce self-selection in the panel if enrollees have different unobserved characteristics than non-enrollees. However, for our purpose of finding an effect between a control group and a treatment group, this is not too problematic as long as the control and treatment groups are on average the same in terms of unobserved characteristics. *A priori* there is no reason to believe that unobserved factors are correlated with the treatment.

Table 2. Descriptive statistics

	Letter					
	Curiosity		Fear appeal		None	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Female	0.47	0.50	0.45	0.50	0.44	0.50
Low edu. level	0.18	0.38	0.17	0.37	0.17	0.38
Median edu. level	0.47	0.50	0.46	0.50	0.49	0.50
High edu. level	0.35	0.48	0.37	0.48	0.34	0.47
Single household	0.28***	0.45	0.23***	0.42	0.18	0.38
Children	0.20***	0.40	0.34	0.48	0.32	0.47
Full-time work	0.40	0.49	0.38*	0.49	0.41	0.49
Age 20-24	0.07	0.26	0.07	0.26	0.08	0.27
Age 25-29	0.12	0.33	0.12	0.32	0.12	0.33
Age 30-34	0.14	0.35	0.14	0.35	0.13	0.31
Age 35-40	0.17	0.38	0.18	0.39	0.16	0.37
Age 41-49	0.21	0.41	0.20	0.40	0.22	0.41
Age 50-59	0.22	0.42	0.23	0.42	0.11	0.41
Age 60-64	0.06	0.23	0.06	0.23	0.06	0.24
Facebook ad	0.01	0.12	0.02	0.13	0.01	0.11
Observations	1,092		1,051		2,154	

	Facebook ad				Facebook user				Total	
	No		Yes		No		Yes		Mean	S.D.
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Female	0.49	0.50	0.42	0.50	0.32	0.47	0.51***	0.50	0.45	0.50
Low edu. level	0.13	0.33	0.11	0.32	0.11	0.31	0.13	0.34	0.17	0.38
Median edu. level	0.48	0.50	0.56	0.50	0.50	0.50	0.48	0.50	0.48	0.50
High edu. level	0.39	0.49	0.33	0.48	0.39	0.49	0.39	0.49	0.35	0.48
Single household	0.22	0.41	0.16	0.37	0.18	0.39	0.22	0.42	0.22	0.41
Children	0.30	0.46	0.33	0.48	0.36	0.48	0.29**	0.46	0.29	0.46
Full-time work	0.40	0.49	0.51	0.51	0.30	0.46	0.41***	0.49	0.40	0.49
Age 20-24	0.15	0.36	0.24*	0.43	0.08	0.27	0.16***	0.37	0.08	0.27
Age 25-29	0.24	0.42	0.40**	0.50	0.21	0.40	0.24	0.43	0.12	0.33
Age 30-34	0.28	0.45	0.09***	0.29	0.34	0.47	0.26**	0.44	0.14	0.35
Age 35-40	0.34	0.47	0.27	0.45	0.38	0.49	0.33	0.47	0.17	0.38
Age 41-49	-	-	-	-	-	-	-	-	0.21	0.41
Age 50-59	-	-	-	-	-	-	-	-	0.22	0.42
Age 60-64	-	-	-	-	-	-	-	-	0.06	0.24
Facebook ad	0.00	0.00	1.00	0.00	0.00	0.00	0.02	0.15	0.01	0.12
Observations	2,121		45		273		1,902		4,297	

* Denotes significant differences with "None/No" at 10% level, ** at 5% level, and *** at 1% level.

whole survey.¹⁸ In the 20–40 age group, response rates are not significantly different across type of letter received ($p=0.186$). In the 40–64 age group the response is 9 percentage points higher for those who received the letter with fear appeal than for those who received no letter ($p=0.000$).

The composition of the sample across letter types and 'no letter' is, however, rather similar with regard to observed characteristics. Table 2 shows that only singles, people with children, and full-time workers show significant differences between the three groups (receiving a curiosity-framed letter, a fear-framed letter, or no letter). These differences, however, are not very large. For most of the other characteristics, the randomization process has not led to significant differences between groups. The Facebook ad reached 770,134 individuals in the Netherlands, without regard to preferences for pages or groups. We use a self-reported measure of seeing the Facebook ad in the survey.¹⁹ Forty-five of the individuals in our sample remembered seeing the Facebook ad. The percentage of respondents that noticed the Facebook ad is quite similar among the groups that received a curiosity-framed letter, the fear-framed letter, or no letter.

3.2 Graphical evidence

Pension awareness is measured by combining two sets of information from the survey. First, we measure *pension literacy* based on five questions regarding the current pension system. If people read the letter and remember the content, they should be able to answer the questions correctly. Details on these five questions are presented in Table C1 of the Appendix. We also asked people how confident they were about their answer (on a scale from 1 to 5). Table C1 shows that the percentage of respondents who gave the right answer to a question ranges from 28 to 82 percent. Respondents who gave a correct answer were more confident about giving the correct answer. Second, we measure whether people obtained insight into their own pension situation, based on whether the respondent logged in on the national pension website.

18 With 95% confidence level this sample does not deviate more than 4.2% of the actual composition of the population with respect to age, gender, household composition, labor market participation, and education. We thus conclude that the sample is representative for the Dutch population at least with regard to these observed variables.

19 Specifically we asked: "Do you remember an advertisement asking to log in on mijnpensioen-overzicht.nl in the past six weeks?". Respondents received several false options such as through radio/tv and newspaper and the true option through Facebook. Our sample consists of 45 respondents who confirmed remembering the advertisement through Facebook.

To get a first impression of the effect on pension awareness of the letters that arouse curiosity and fear, we present in Figure 3a the average number of correct answers to the pension literacy questions (bars) and the 95% confidence intervals (lines). This figure shows that, on average, not more than two out of five questions are answered correctly in the three different groups that received a curiosity-framed letter, a fear-framed letter, or no letter. With an average of about 2.1 correct answers, the group without a letter performs poorest. The group that received a curiosity-framed letter performs slightly better. The group that received a letter appealing to fear gives the most correct answers (about 2.2). The difference between receiving a letter appealing to fear and receiving no letter is statistically significant, with a p-value of 0.01. The pension literacy of those receiving a curiosity-framed letter is not significantly different from those receiving no letter (p-value=0.54), and weakly significantly different from those receiving a letter appealing to fear (p-value=0.07).

Similarly, Figure 3b shows the pension check by the type of letter received or receiving no letter. Thirty percent of the respondents without a letter logged in on their pension overview. For the respondents with a curiosity-framed letter this is somewhat more, namely 32%. Those with a letter appealing to fear logged in most (33%), although the differences are modest and not statistically significant (p-values are 0.30, 0.12, and 0.66, respectively).

Next to the letters, we used the Facebook ad to raise pension awareness. As the Facebook ad only included information with regard to three questions (1, 4, and 5), the pension literacy scale for the Facebook ad runs from 0 to 3. Figure 4a shows that only 0.8 out of 3 questions were answered correctly by persons that did not see the ad. Persons who saw the ad answered 0.93 out of 3 questions correctly. The difference is not statistically significant (p-value=0.28).

Figure 4b shows the percentage of respondents doing the pension check, broken down by viewing the ad (note that this does not represent a causal effect, since seeing the ad may not be random). In the group that did not see the ad, only about 15% of the people logged in. In the group that saw the ad this percentage is much higher (54%). Even though the number of respondents who saw the ad is low, the difference is statistically significant with a p-value of 0.00. Section 4 tests the aforementioned causal relationships in detail by estimating the models.

Figure 3a. Pension literacy.

Number of correct answers (0-5) to pension knowledge questions by type of letter.

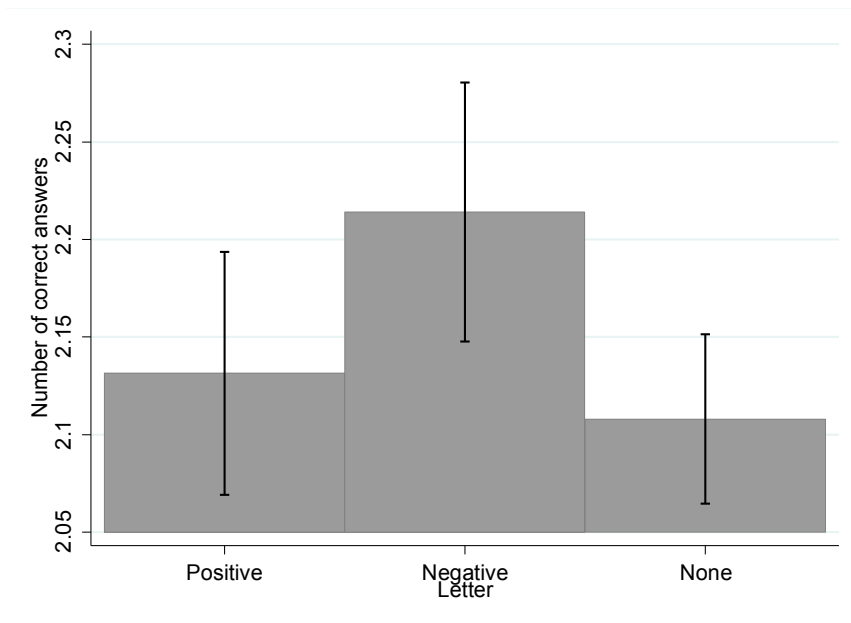


Figure 3b. Pension check.

Fraction logged in by type of letter.

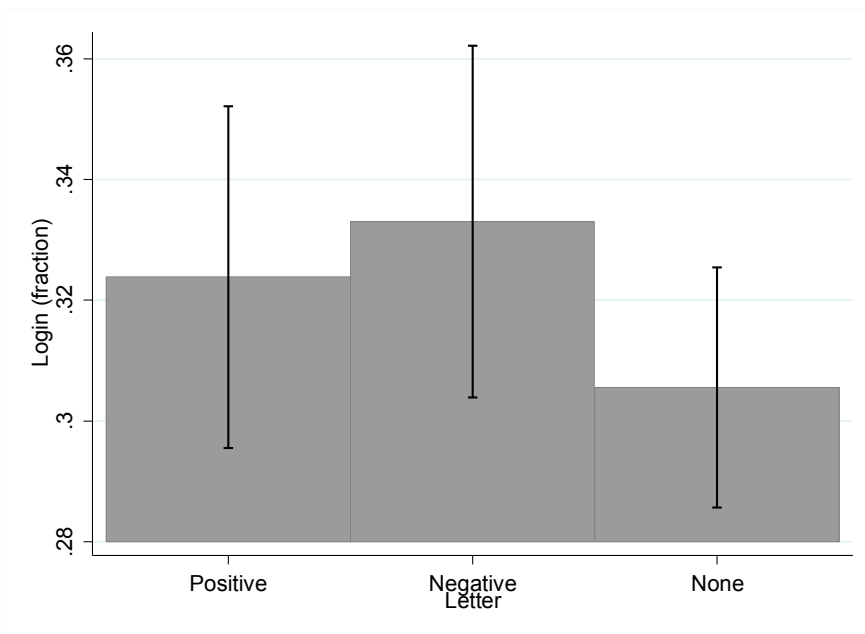


Figure 4a. Pension literacy.

Number of correct answers (0-3) to pension knowledge questions by viewers of Facebook ad.

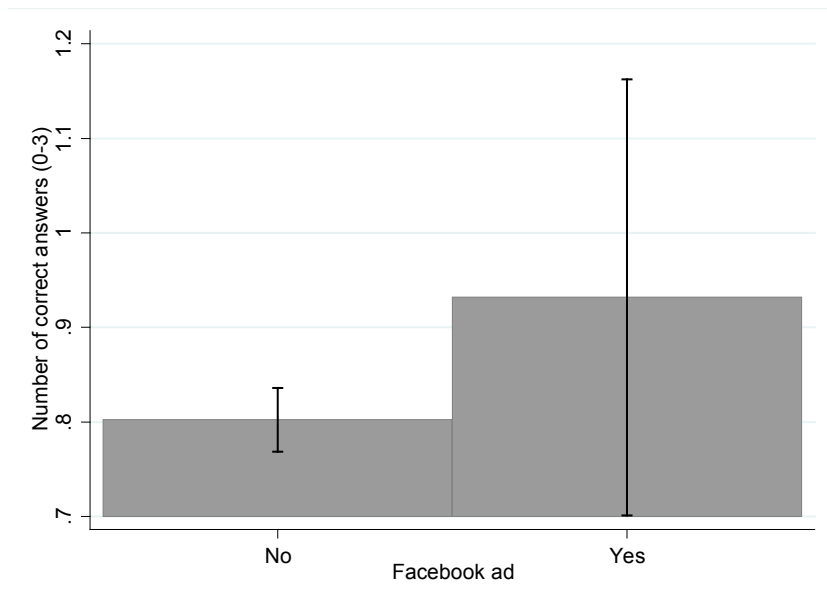
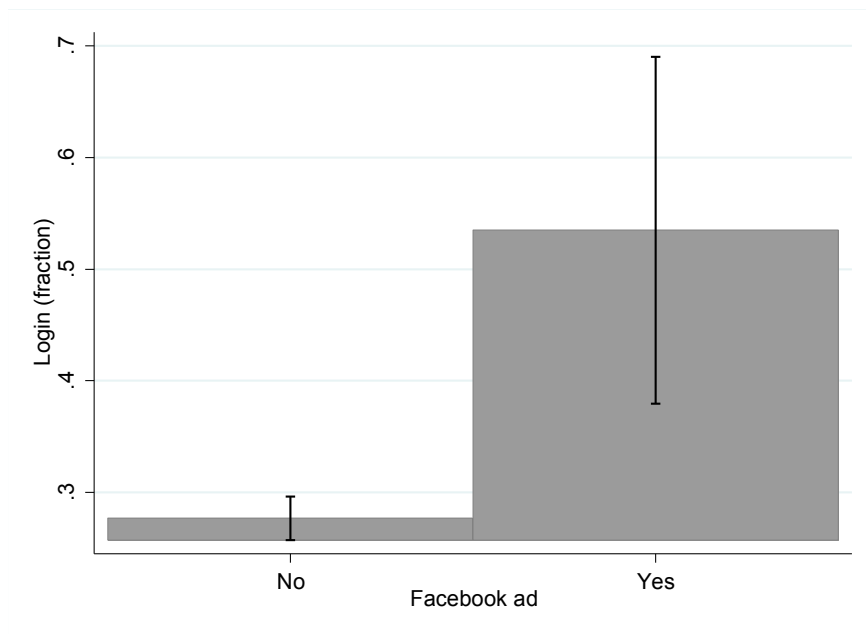


Figure 4b. Pension check. F

raction logged in by viewers of Facebook ad.



4. Estimation results

4.1 Letters

Model 1 in Table 3 shows that receiving a letter increases the number of correct answers significantly by 0.06. Model 2 suggests that this effect is primarily due to receiving a letter that arouses fear: receiving such a letter significantly increases the number of correct answers by 0.11. This result is in line with the psychological literature, which finds that negative information tends to influence decisions more strongly than positive information (Ito et al., 1998). In practice, this means that, after sending the letter arousing fear to a group of people, on average 1 out of 10 persons give an additional correct answer to the pension questions (compared to the situation of not receiving the letter).²⁰ This is a remarkable result as the questions are asked six weeks after the receipt of the letter. A curiosity-framed letter does not significantly increase pension literacy.²¹ After conditioning on gender, education, household composition, work, and age, the treatment effects remain virtually the same (as expected because of the random assignment of the letters).²²

Table 3. Effects of randomized letters on pension awareness

	Pension literacy (0-5)				Pension check (0,1)			
	Model 1		Model 2		Model 3		Model 4	
	OLS		OLS		Probit		Probit	
	Coeff.	S.E.	Coeff.	S.E.	AME	S.E.	AME	S.E.
Letter	0.06**	0.03	0.11***	0.04	0.02	0.01	0.03	0.02 ^a
Curiosity letter			-0.08*	0.05			-0.01	0.02
Constant	2.11***	0.02	2.11***	0.02	0.32***	0.01	0.32***	0.01
Observations	4,212		4,212		4,124		4,124	

Robust standard errors are presented, * denotes significant at 10% level, ** at 5% level, and *** at 1% level. AMEs are the average marginal effects. a p-value of 0.12.

²⁰ In Table C3 in the Appendix we do the same analysis for the five pension literacy questions separately. This shows us that the increase in pension literacy as a result of the letter with fear appeal is primarily because of better scores on question 1 and 4 (for details, see Table C1 in the Appendix). This demonstrates that the increase in pension literacy is due to better scores on both a relatively simple and a more advanced question about the pension system.

²¹ Testing $H_0: \beta_2 + \delta_1 = 0$ in Model 4 gives a p-value of 0.55.

²² We evaluated the questions and answers with pension experts from Netspar. Some mentioned that the correct answer of the question "What is roughly the percentage of earnings that is on average used to pay pension contributions (by all parties)" depends on the interpretation of the question. People pay a premium of about 20% of their pensionable salary, which is only part of their full salary because of a state pension offset. This could result in 10, 15 and 20% being correct answers. We did robustness checks of the estimation results when marking 10 and/or 15% also as correct. Conclusions are highly robust.

Table 4. Heterogeneous effects of randomized letters

	Dependent variable: Pension literacy (0-5)					
	Model 1		Model 2		Model 3	
	OLS		OLS		OLS	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Letter (β_2)	0.13**	0.06	0.13**	0.05	0.07	0.05
Letter · Age 20-40 (β_2^{age})	0.06	0.08				
Letter · Female (β_2^{fem})			-0.08	0.08		
Letter · High edu. (β_2^{edu})					0.08	0.08
Curiosity letter (δ_1)	-0.12*	0.06	-0.14**	0.06	-0.06	0.06
Curiosity letter · Age 20-40 (δ_1^{age})	0.07	0.09				
Curiosity letter · Female (δ_1^{fem})			0.13	0.09		
Curiosity letter · High edu. (δ_1^{edu})					-0.04	0.10
Observations	4,212		4,124		4,212	

	Dependent variable: Pension check (0,1)					
	Model 4		Model 5		Model 6	
	Probit		Probit		Probit	
	AME	S.E.	AME	S.E.	AME	S.E.
Letter (β_2)	0.02	0.02	0.03	0.02	0.01	0.02
Letter · Age 20-40 (β_2^{age})	0.02	0.03				
Letter · Female (β_2^{fem})			-0.01	0.04		
Letter · High edu. (β_2^{edu})					0.04	0.04
Curiosity letter (δ_1)	-0.02	0.02	0.00	0.03	0.00	0.03
Curiosity letter · Age 20-40 (δ_1^{age})	0.02	0.04				
Curiosity letter · Female (δ_1^{fem})			0.00	0.04		
Curiosity letter · High edu. (δ_1^{edu})					-0.01	0.04
Observations	4,124		4,124		4,124	

Robust standard errors are presented, * denotes significant at 10% level, ** at 5% level, and *** at 1% level. AMEs are the average marginal effects. The models include variables for gender, education, household composition, work, and age. Extended estimation results can be found in appendix C.

- $H_0: \beta_2 + \beta_2^{age} = 0$ gives p-value=0.21 (Model 1) and p-value=0.12 (Model 4).
- $H_0: \delta_1 + \delta_1^{age} = 0$ gives p-value=0.52 (Model 1) and p-value=0.88 (Model 4).
- $H_0: \beta_2 + \beta_2^{age} + \delta_1 + \delta_1^{age} = 0$ gives p-value=0.61 (Model 1) and p-value=0.08 (Model 4).
- $H_0: \beta_2 + \beta_2^{fem} = 0$ gives p-value=0.35 (Model 2) and p-value=0.38 (Model 5).
- $H_0: \delta_1 + \delta_1^{fem} = 0$ gives p-value=0.94 (Model 2) and p-value=0.80 (Model 5).
- $H_0: \beta_2 + \beta_2^{fem} + \delta_1 + \delta_1^{fem} = 0$ gives p-value=0.35 (Model 2) and p-value=0.53 (Model 5).
- $H_0: \beta_2 + \beta_2^{edu} = 0$ gives p-value=0.03 (Model 3) and p-value=0.06 (Model 6).
- $H_0: \delta_1 + \delta_1^{edu} = 0$ gives p-value=0.20 (Model 3) and p-value=0.70 (Model 6).
- $H_0: \beta_2 + \beta_2^{edu} + \delta_1 + \delta_1^{edu} = 0$ gives p-value=0.48 (Model 3) and p-value=0.15 (Model 6).

Models 3 and 4 show the average marginal effects of the probit models. From Model 4 we conclude that receiving a letter that arouses fear increases the probability of doing the pension check by 3 percentage points. However, this effect is not significant at the 10% significance level (the p-value is 0.12). Also, the effect of a curiosity-framed letter is not significantly different from zero.²³ To ensure that the Facebook ad does not interfere with our estimated results for the informative letters, we present some robustness checks in Table D1. In the robustness checks, we estimate the baseline regression on the sample of persons aged 41–64 years who were not targeted with the Facebook ad. However, theoretically they still might have seen the ad because of their network liking the ad. Therefore, we also present estimation results for those people who do not use Facebook. The results are robust to our conclusions from the baseline regression. Interestingly, among the respondents who do not use Facebook, we find a much stronger effect of the letter arousing fear on pension literacy than for the total sample. On average almost three out of ten non-Facebook users give an additional correct answer to the pension question (compared to the situation without a letter).

Heterogeneous effects of the letters with regard to age, gender, and education level are analyzed in Table 4. The effect of the letter on pension literacy is not significantly different for people in the 20–40 and 41–64 age groups (Model 1). This also applies for the pension check (Model 4). For the 20–40 age group, however, we do find that a curiosity-framed letter increases the pension check by 4 percentage points (Model 4, table note c). We do not find heterogeneous effects for gender and education levels. We do find that the letter arousing fear significantly increases pension checks of highly educated individuals by 5 percentage points (Model 6, table note g).

4.2 Facebook ad

Table 5 shows the estimation results of the quasi-experiment with the Facebook ad (equations (3) and (4)). As the Facebook ad was targeted at people between the ages of 20 and 40, we restrict the sample to individuals in the same age category.

A simple OLS estimate (Model 1) shows no significant effect of the Facebook ad on pension literacy.²⁴ However, these coefficients might be biased due to non-random-

²³ Testing $H_0: \beta_2 + \delta_1 = 0$ in Model 8 gives a p-value of 0.18.

²⁴ Note that the pension literacy indicator runs from 0 to 3 here, because the information provided in the Facebook ad only provides the reader with the information for answering three of the five questions (for details see Section 3). Table C2 in the Appendix uses the same set of questions for the analysis of the letters. Conclusions are highly comparable using three or five pension literacy questions.

ness in the probability of seeing the Facebook ad. Therefore, Model 2 shows estimates of the IV model using an instrumental variable indicating someone to be a Facebook user.²⁵ The instrument (dummy of Facebook use) significantly explains the probability of having seen the Facebook ad. The probability of having seen the ad increases by 2 percentage points if one uses Facebook. The F-statistic (36.4) for excluding this instrument shows that the instrument is highly relevant in explaining the visibility of the Facebook ad (its value is greater than the rule of thumb of 10). Correcting for potential endogeneity changes the coefficient of the Facebook ad (from 0.13 to -2.16) although both are insignificant.²⁶ Note again that the Facebook ad was targeted at all people between the ages of 20 and 40. Seeing the ad was independent of people's preferences or behavior on Facebook.

From Model 3 we conclude that those who saw the Facebook ad did the pension check more often. We find an increase of about 27 percentage points. In Model 4 we exploit the instrument (Facebook use) in a linear 2SLS framework. The results show an insignificant but unreasonably high effect of the Facebook ad on the pension check. The coefficient is 1.21, such that predictions are no longer between 0 and 1. In Model 5 we explicitly take into account the dichotomous nature of the dependent variables. Using a bivariate probit model we find an effect of 72 percentage points.²⁷ Comparable to Model (2), the instrument (being a Facebook user) significantly increases the probability of having seen the Facebook ad. This probability increases by about 2 percentage points for Facebook users and is highly significant. The results are very robust for different specifications of Facebook usage as an instrument. That is, when we use time spent on Facebook in hours per week, we find an effect of 71 percentage points. When we use a semi-parametric approach for Facebook use, using dummies for the percentiles of time spent on Facebook as instruments,²⁸ we also find an effect of 71 percentage points.

25 Estimation results are highly robust to using the total time spent on Facebook in hours per week as an instrumental variable.

26 Adding an interaction effect between the letter and having seen the Facebook ad shows a coefficient that is not significant and does not change the main conclusions (not reported here).

27 Adding an interaction effect between the letter and having seen the Facebook ad shows a coefficient that is negative and significant (at the 1% level). If a person received a letter and was aware of the Facebook ad, there is a 62.6% probability of logging in.

28 1st percentile: 0, 2nd percentile: 0-0.17, 3rd percentile: 0.17-1, 4th percentile: 1-1.02, 5th percentile: 1.02-2, 6th percentile: 2-2.5, 7th percentile: 2.5-4, 8th percentile: 4-6, 9th percentile: 6-10, 10th percentile: 10+.

Table 5. Effects of Facebook ad on pension awareness

Dependent variable: Pension literacy (0-3)				
	Model 1 OLS		Model 2 2SLS	
	Coeff.	S.E.	Coeff.	S.E.
<i>Second stage</i>				
Facebook ad	0.13	0.12	-2.16	2.29
Letter	0.04	0.04	0.06	0.05
Curiosity letter	-0.03	0.05	-0.02	0.05
Female	-0.02	0.04	-0.04	0.05
Low edu. level	0.00	0.05	-0.01	0.06
High edu. level	0.07*	0.04	0.07	0.04
Single household	0.03	0.05	0.01	0.05
Children	0.05	0.01	0.07	0.05
Full-time work	0.01	0.04	0.03	0.05
Age 25-29	0.00	0.06	0.00	0.06
Age 30-34	0.00	0.06	-0.06	0.09
Age 35-40	0.05	0.06	0.01	0.07
Constant	0.70***	0.05	0.80***	0.09
<i>First stage</i>				
FB user			0.02***	0.00
Control variables			yes	
F-stat. instrument			36.2	
Observations	2,128		2,128	

Dependent variable: Pension check (0,1)						
	Model 3 Probit		Model 4 2SLS		Model 5 Biv. Probit	
	AME	S.E.	AME	S.E.	AME	S.E.
<i>Second stage</i>						
Facebook ad	0.27***	0.07	1.21	1.24	0.72***	0.01
Letter	0.04	0.02	0.03	0.03	0.03	0.02
Curiosity letter	0.01	0.03	0.00	0.03	0.00	0.03
Female	-0.09***	0.02	-0.08***	0.03	-0.07***	0.02
Low edu. level	0.04	0.03	0.04	0.03	0.03	0.03
High edu. level	0.07***	0.02	0.07***	0.02	0.06***	0.02
Single household	-0.06**	0.03	-0.05**	0.03	-0.06**	0.02
Children	-0.01	0.02	-0.01	0.03	-0.01	0.02
Full-time work	-0.04**	0.02	-0.05**	0.03	-0.04**	0.02
Age 25-29	0.11***	0.03	0.09***	0.03	0.10***	0.03
Age 30-34	0.13***	0.03	0.14***	0.04	0.13***	0.03
Age 35-40	0.10***	0.03	0.10***	0.04	0.10***	0.03
Constant	0.28***	0.01	0.19***	0.05	0.29***	0.01
<i>First stage</i>						
FB user			0.02***	0.00	0.02***	0.00
Control variables			yes		yes	
F-stat. instrument			36.0			
Observations	2,067		2,067		2,067	

Robust standard errors are presented, * denotes significant at 10% level, ** at 5% level, and *** at 1% level. AMEs represent Average Marginal Effects. For example, an AME of 0.27 indicates that the pension check is increased with 27 percentage points. In the first stage, Facebook use (1: Yes – 0: No) is expressed in percentage-point increases in the probability of seeing the Facebook ad. Thus, 0.02 indicates that a Facebook user increases the probability of having seen the ad by 2 percentage points. The reported statistic for the instrument in the first stage of the probit model presents the value of the Chi-square test.

Summarizing our empirical evidence, we find that the Facebook ad was very strong in activating respondents to do their pension check. The coefficient for pension literacy is not significant. Sending an informative letter leads to higher occurrence of the pension check among highly educated individuals and raises pension literacy for all groups. However, this is only true if the informative letter arouses fear. Letters that attempt to arouse curiosity did not have an effect on pension awareness.

4.3 Cost-effectiveness

As explained in Section 2.2 (Figure 2), for the letters we measure the intention to treat, while for Facebook we measure the effect of the ad conditional on having seen the ad (so, we find the effect for those complying with the treatment). Therefore, it is difficult to compare the estimated effects in Sections 4.1 and 4.2. Furthermore, the cost of sending a letter versus publishing a Facebook ad is very different. Hence, this section provides a back-of-the-envelope calculation to compare the cost-effectiveness of the letter with fear appeal versus the Facebook ad.

Our results suggest that the letter with fear appeal has a significant effect on pension awareness. 1,051 persons received a letter with fear appeal (see Table 1). The cost of sending these letters was €504.48. The letters that arouse fear increased the number of correctly answered questions by 0.11 (on a scale of 0 to 5). In total, 116 additional questions were answered correctly because of the letter ($0.11 \times 1,051$). So, €4.35 ($504.48/116$) was spent for each additional correct answer.

We do not find a significant effect of the letter on the probability of logging in; however, the point estimate is 0.03 (p-value of 0.12). When we take the point estimate, the letters that arouse fear increased the number of logins by 32 ($1,051 \times 0.03$). Thus €15.77 was spent for each additional person that logged in ($504.48/32$). Table 6 summarizes the cost benefit analysis for the letter with fear appeal.

The Facebook ad was targeted at individuals between 20 and 40 years. The Dutch population includes 4,206,639 individuals between 20 and 40 years. 87% of the

Table 6. Cost benefit analysis of letter with fear appeal

a	Number of persons who received a letter with fear appeal	1,051
b	Cost of sending the letters with fear appeal	€504.48
c	Marginal effect of the letter on the number of correct answers	0.11
d	Number of correct answers because of the letter with fear appeal (a*c)	116
e	Cost per additional correct answer (b/d)	€4.35
f	Average marginal effect of the letter on pension checking	0.03
g	Additional number of logins because of the letters with fear appeal (a*f)	32
h	Cost per additional login (b/g)	€15.77

Table 7. Cost benefit analysis of the Facebook ad

a	Number of people between the ages of 20 and 40 in the Netherlands	4,206,639
b	Share of Facebook users in the 20–40 age group	87%
c	Number of people reached with the FB ad	770,134
d	Share of FB users reached with the FB ad ($c/a*b$)	21%
e	Number of FB users in our sample	1,902
f	Estimate of number of FB users who were reached in our sample ($d*e$)	398
g	Number of respondents who remembered having seen the ad	45 (=11%)
h	Marginal effect of the FB ad on the number of correct answers	0.52
i	Number of correct answers because of the FB ad ($g*h$)	23
j	Cost of publishing the FB ad, targeting all people between 20–40 years	€1,939.76
k	Cost of the FB ad relative to our sample ($j*(e/a*b)$)	€1.00
l	Cost per additional correct answer (k/i)	€0.043
m	Average marginal effect of the FB ad on pension check	0.72
n	Additional number of logins because of the FB ad ($g*m$)	32
o	Cost per additional login (k/n)	€0.031

respondents in this age category report a positive number of hours spent on Facebook per week.²⁹ We therefore expect about 3,678,633 individuals in the Netherlands between 20 and 40 years to use Facebook actively ($0.87*4,206,639$). Facebook statistics indicate that we reached 770,134 individuals aged 20 to 40. This means that we reached 21% of the active Facebook users ($770,134/3,678,633$). Our sample contains 1,902 active Facebook users between 20 and 40 years. So, when we assume a reach of 21%, about 398 individuals in our sample were reached (21% of 1,902). Eleven percent of these ($45/398$) complied with the treatment (they reported having seen the ad). For them, we find a 71 percentage point higher probability of logging in and answering 0.52 additional questions correctly (on a scale of 0 to 3). In total this means about 32 ($0.72*45$) additional persons logging in and 23 ($0.52*45$) additional correct answers. €1,939.76 was spent on the Facebook ad to reach the Dutch active Facebook users between the ages of 20 and 40. Proportionally on our sample, 1 euro was spent ($€1,939.76*(1,902/3,678,633)$). This means that for each additional correct answer 4.3 cents were spent ($1/23$), and for each additional person logging in 3.1 cents were spent ($1/32$). Table 7 summarizes the cost benefit analysis for the Facebook ad.

Comparing Tables 6 and 7, we find that the effect of the intention to treat on the number of correct answers is 0.11 for the letter with fear appeal and 0.06 for the Facebook ad (i/f in Table 7). The letter is thus almost twice as effective in increasing

29 This is very similar to the number found by Newcom Research in its Dutch Social Media Report, namely that 89% of the population between the ages of 20 and 39 uses Facebook.

<https://www.marketingfacts.nl/berichten/jongeren-keren-facebook-massaal-de-rug-toe>

financial literacy compared to the Facebook ad. However, since the Facebook ad is much cheaper than sending a letter, the Facebook ad is much more cost-effective. The effect of the intention to treat on the pension check is 0.03 for the letter with fear appeal and 0.08 for the Facebook ad (n/f in Table 7). The Facebook ad is thus almost three times more effective in increasing the pension check than the letter with fear appeal. This may be caused by the fact that Facebook users only need to click on the link, whereas readers of the letter must first grab their smart phone, tablet or computer to surf to the website. Since the Facebook ad is more effective and cheaper than the letter with fear appeal, the cost-effectiveness is higher for the Facebook ad. Note that the costs of the Facebook ad are very low compared to the letter. This makes Facebook a very useful communication channel when one wants to target a group of people with information.

4.4 Insight, confidence, interest, power to act and worries

The focus of this paper is on pension awareness, which we define as a combination of pension literacy and doing the pension check. Ultimately, however, we want people not just to log in to see their pension entitlements, but also to have more insight and confidence after the login, so that they know what to do (power to act) and in the end become more interested in their pension.³⁰ To gain some insight into this, we present some statements to the respondents who did the pension check. Table 8 shows the results. Assuming that categories 4 and 5 reflect positive effects, insight increased for over 57%³¹ of the respondents and confidence for 34%.³² Fifty percent³³ of the respondents feel that they know better what to do, and 43%³⁴ have become more interested in their pension.

Our results show that fear appeal is more effective in increasing pension awareness than arousing curiosity. However, one may be concerned that fear appeal will backfire and cause people to have greater worries about their pension. In the end, we do not want to make people anxious. In Figure 5 we compare worries about pensions, among those who got a fear-framed letter, a curiosity-framed letter, or no letter. People are asked to report their worries on a 5-point scale, from completely no worries (1) to lots of worries (5). Figure 5 shows that the levels of worry are very similar between the two

30 Using a natural experiment, Mastrobuoni (2011) showed that more knowledge does not always lead to a change in behavior.

31 $37.15 + 20.32 = 57.47$

32 $23.70 + 10.33 = 34.03$

33 $35.35 + 15.12 = 50.47$

34 $29.38 + 14.06 = 43.44$

types of letter, which is confirmed by statistical tests showing that the average level of worrying does not differ between a curiosity-framed letter or fear-appealing letter compared to receiving no letter (p-value = 0.49 and p-value = 0.67, respectively). Neither does the average level of worrying differ between receiving a curiosity-framed letter and a fear-appealing letter (p-value = 0.83).

Figure 5. Worries about pensions (1: none – 5: lots) by letter and type of letter (in %).

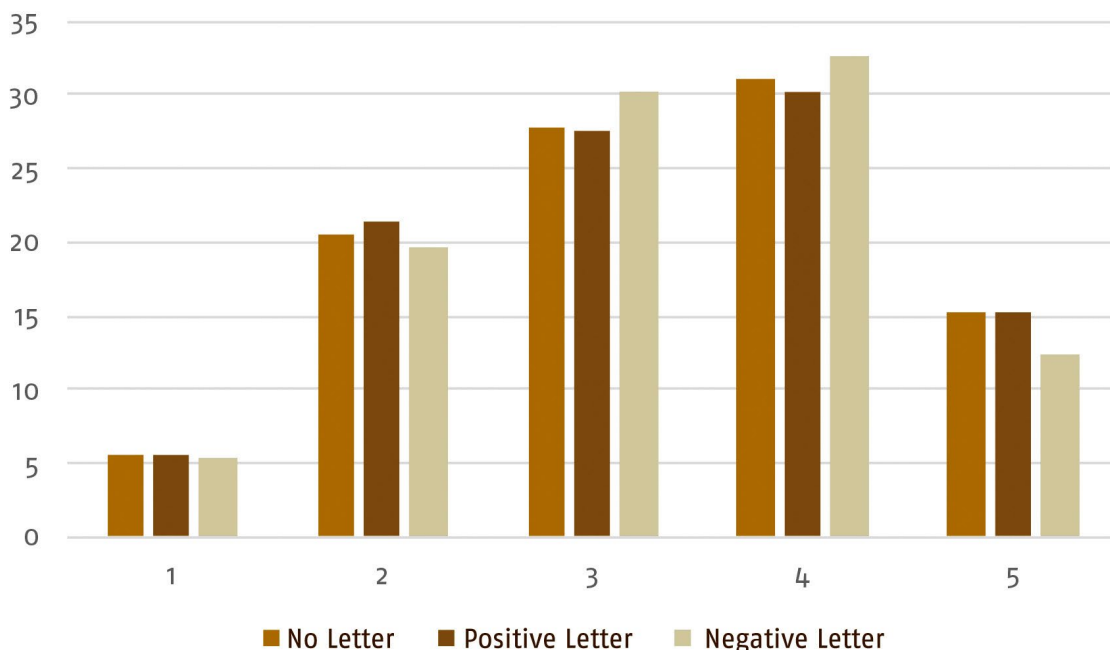


Table 8. Consequences of the pension check

Did logging in increase... (1-5)	1 (not at all)	2	3	4	5 (fully agree)	Obs.
<i>Insight</i> in personal pension situation?	5.22%	7.98%	29.33%	37.15%	20.32%	1,265
<i>Confidence</i> in personal pension situation?	8.73%	21.46%	35.79%	23.70%	10.33%	1,249
<i>Interest</i> in personal pension situation?	5.97%	14.85%	35.74%	29.38%	14.06%	1,273
<i>Actions</i> that can be taken with the information?	5.20%	12.99%	34.34%	35.35%	15.12%	1,270
<i>Awareness</i> of having insufficient accrued pension rights?	24.49%	22.04%	23.46%	17.85%	12.16%	1,266

Descriptive statistics of respondents who did the pension check, regardless of treatments.

5. Conclusion

This paper analyzes the effectiveness of different communication channels and of framing on raising pension awareness. More specifically, we analyze the effectiveness of an informative letter versus a Facebook ad, and the effectiveness of arousing curiosity and fear to raise pension awareness. Pension awareness is measured by 1) knowledge of the Dutch pension system, and 2) actions undertaken to gain information regarding one's personal financial situation. Both are important for governments, private pension funds and insurance companies, as pension reforms are high on the policy agenda of many countries. As far as we know, we are the first to investigate the effect of framing on pension awareness six weeks after the information is presented.

To identify the causal effect of a letter, we rely on a randomized field experiment involving a survey administered to a representative sample of about 4,000 individuals in the Netherlands. Randomization takes place in 1) receiving a letter with information regarding the pension system as well as detailed information on where to find information about one's personal situation, and 2) the type of framing of the letter (arousing curiosity or fear). To identify the causal effects of a Facebook ad with a selection of the same content, we use an Instrumental Variables approach that uses self-reported time spent on Facebook as an instrument. This instrument appears to be promising (also for other researchers) to investigate the effect of a Facebook ad on diverse outcome variables. This approach bypasses ethical issues that experiments on social media platforms may involve.

The results show that pension literacy is low. The Facebook ad is very strong in activating respondents to log in on the webpage of *mijnpensioenoverzicht.nl* to see their personal financial situation, and it is relatively cheap (3.1 eurocents per login). An informative letter with fear appeal is less effective in stimulating active logging in on a website but more effective in raising 'long-term' pension literacy. Letters, however, are also more expensive, such that the Facebook ad wins when it comes to cost-effectiveness. Curiosity-framed letters did not raise pension awareness significantly. Finally, we do not find significantly heterogeneous effects with regard to age, gender, and education level.

6. Discussion

Although estimation results are highly robust to different specifications and estimators, we should remain aware of the possible drawbacks of our approach in this paper and take these into account when interpreting the results. In this paper, pension awareness consists of two elements. The first is objectively measured by several questions regarding the pension system. The second, however, is not whether people have taken action to log in but whether they say that they have taken the action. There might be a difference between what people do and what they say they do. We assume in this paper that there is no difference, or at least that the differences are random across the control and treatment groups, but future research might focus on revealed instead of stated actions, by merging administrative data about logins.

A second point of discussion is the small percentage of respondents that mentioned being aware of the Facebook ad. Since only 45 out of the 2,166 targeted respondents remember seeing the Facebook ad, identification of the effect of the Facebook ad relies on a small sample of respondents. Another issue is the representativeness of the panel. PanelWizard stratifies the sample of survey respondents in such a way that the panel is representative of the Dutch population with regard to age, gender, education level, and labor market status. However, it should be kept in mind that the panel only consists of internet users. This may lead to overestimation of the effect of the Facebook ad. However, in the group aged 20–40 years, for whom we test the Facebook ad, internet coverage is very high in the Netherlands (12–24 years: 98.7% / 25–44 years: 98.2%)³⁵. It should, therefore, be safe to draw conclusions from our estimation results.

This study shows that fear appeal is effective in attracting people's attention to pensions (and we do not leave them with more worries). In addition, a Facebook ad is effective when it comes to activating people to log in on a website for their pension information. One could of course combine these results, using a Facebook ad that arouses fear to stimulate people to do a pension check.

³⁵ <https://www.cbs.nl/nl-nl/nieuws/2016/22/acht-procent-van-de-nederlanders-nooit-op-internet>

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Appendix A Letters that attempt to arouse curiosity and fear

Below we attach the letters that were sent. To explain the content of the letters, we highlighted some text in green, yellow, or red (we did not do so in the real letters). The text that we highlighted in green attempts to arouse curiosity; the text in red attempts to arouse fear; the blue boxes (in both letters) show a roadmap to do the pension check; the yellow text (in both letters) contains basic information about the Dutch pension system.

Curiosity (green) translation:

“What can you do?

Imagine: After years of hard work, the moment has arrived. You can retire. All of a sudden there is plenty of time for that trip around the world, the hobby you never had time for, or growing geraniums. No matter what, all this costs money. Maybe more than the benefits you receive from your state and occupational pensions. Are you curious about how much you have saved already? And what you can do with these savings in retirement? Have a look at the website *mijnpensioenoverzicht.nl* (“my pension overview”) after you have completed your yearly tax return, because then you already have your DigiD (your digital government ID) at hand to log in! This is how it works:”

Fear (red) translation:

“Are you worried?

Gloomy messages reach us in the media about the pension system. “We will be unable to keep funding the state pension”, “Pension funds prepare participants for lower pensions”, “Government warns about lower pensions.” It is not surprising that eight out of ten people are insecure about their retirement income or think that they do not build up enough pension.

Have you taken care of your pension? Do you want to know whether you have sufficient pension money to get by during retirement? Have a look at the website *mijnpensioenoverzicht.nl* (“my pension overview”) after you have completed your yearly tax return, because then you already have your DigiD (your digital government ID) at hand to log in! This is how it works:”

Wat kun je doen?

Stel je voor: Na jaren werken is het zover, je mag met pensioen. Er is ineens tijd voor die wereldreis, die leuke hobby waar je nooit tijd voor had, of toch de geraniums verplanten? Hoe je het ook wendt of keert, dit kost allemaal geld. Misschien wel meer geld dan de uitkering die je krijgt vanuit de AOW en je aanvullende pensioen.

Ben jij benieuwd hoeveel je nu al gespaard hebt? En wat voor leuke dingen je daar later mee kan doen? Kijk dan op www.mijnpensioenoverzicht.nl nadat je de belastingaangifte hebt gedaan dit jaar, want dan heb je jouw DigiD toch al bij de hand! Zo doe je dat:

- 1) *Je doet je belastingaangifte*
- 2) *Dan klik je door naar www.mijnpensioenoverzicht.nl*
- 3) *Log in met je DigiD (die je toch al bij de hand hebt voor de belastingaangifte)*
- 4) *Geef jezelf inzicht in je inkomen voor later*

Waarom zou ik dit doen?

Pensioen heeft niet alleen te maken met “later”, maar ook met nu. Pensioenpremies betalen, een huis kopen, trouwen, scheiden, kinderen krijgen, een jaar er tussenuit of eerder stoppen met werken. Dit heeft allemaal te maken met je financiële planning en je pensioen.

Wist je dat:

- + 20% van je loon naar je pensioen gaat? Dat is gelijk aan 1 dag werken per week.
- ✗ De AOW premie die je nu betaalt volledig gebruikt wordt om de AOW uitkeringen van de huidige ouderen te betalen?
- ✗ De meeste werknemers bouwen verplicht een werknemerspensioen op, bovenop de AOW.
- ✗ Werknemers en werkgevers meestal allebei premies betalen voor het werknemerspensioen? Deze premies worden belegd en daar wordt later de pensioenuitkering van betaald.
- + Als een pensioenfonds er slecht voor staat moeten pensioenen verlaagd worden. Dit raakt niet alleen gepensioneerden, maar ook de pensioenopbouw van werknemers.
- ✗ Een pensioenfonds uitkeringen alleen aanpast aan stijgende prijzen wanneer de financiële positie van het fonds goed genoeg is? Dit wordt *indexatie* genoemd.
- + Iemand die 20 uur per week werkt de helft minder werknemerspensioen opbouwt dan zijn/haar collega die 40 uur per week werkt?

Maak jij je zorgen?

In de media lezen we sombere berichten over het pensioenstelsel. “De AOW wordt onbetaalbaar”, “Pensioenfondsen bereiden deelnemers voor op verlaging pensioen” en “Kabinet waarschuwt voor lager pensioen”. Het is geen wonder dat 8 op de 10 Nederlanders onzeker is over hun inkomen voor later of denken dat ze te weinig pensioen opbouwen.

Heb jij je pensioen eigenlijk wel goed geregeld? Wil je zeker weten dat je genoeg inkomen hebt als je later met pensioen gaat? Kijk dan op www.mijnpensioenoverzicht.nl nadat je de belastingaangifte hebt gedaan dit jaar, want dan heb je jouw DigiD toch al bij de hand! Zo doe je dat:

- 1) *Je doet je belastingaangifte*
- 2) *Dan klik je door naar www.mijnpensioenoverzicht.nl*
- 3) *Log in met je DigiD (die je toch al bij de hand hebt voor de belastingaangifte)*
- 4) *Geef jezelf inzicht in je inkomen voor later*

Waarom zou ik dit doen?

Pensioen heeft niet alleen te maken met “later”, maar ook met nu. Pensioenpremies betalen, een huis kopen, trouwen, scheiden, kinderen krijgen, een jaar er tussenuit of eerder stoppen met werken. Dit heeft allemaal te maken met je financiële planning en je pensioen.

Wist je dat:

- + 20% van je loon naar je pensioen gaat? Dat is gelijk aan 1 dag werken per week.
- ✗ De AOW premie die je nu betaalt volledig gebruikt wordt om de AOW uitkeringen van de huidige ouderen te betalen?
- ✗ De meeste werknemers bouwen verplicht een werknemerspensioen op, bovenop de AOW.
- ✗ Werknemers en werkgevers meestal allebei premies betalen voor het werknemerspensioen? Deze premies worden belegd en daar wordt later de pensioenuitkering van betaald.
- + Als een pensioenfonds er slecht voor staat moeten pensioenen verlaagd worden. Dit raakt niet alleen gepensioneerden, maar ook de pensioenopbouw van werknemers.
- + Een pensioenfonds uitkeringen alleen aanpast aan stijgende prijzen wanneer de financiële positie van het fonds goed genoeg is? Dit wordt *indexatie* genoemd.
- + Iemand die 20 uur per week werkt de helft minder werknemerspensioen opbouwt dan zijn/haar collega die 40 uur per week werkt?

Appendix B Facebook-ad



PENSIOENLAB

Vind ik leuk · Delen · Bewerkingen voorstellen · ...

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4 april om 2:26 · €

Als jij je belastingaangifte dit jaar doet, kijk dan ook meteen hoeveel je al gespaard hebt voor je pensioen door met je DigiD in te loggen op www.mijnpensioenoverzicht.nl

Want wist je dat...

- * 20% van je loon nu al naar je pensioen gaat?
- * De AOW premie die je nu betaalt volledig gebruikt wordt om de AOW uitkeringen van de huidige ouderen te betalen?
- * Iemand die 20 uur per week werkt de helft minder werknemerspensioen opbouwt dan zijn/haar collega die 40 uur per week werkt?



Appendix C Pension literacy questions

Table C1. Pension literacy questions and answers

		%	Confidence (1-5)
Q1	<i>"What happens with state pension contributions?"</i>		
a)	Invested for my pension benefits after retirement	12.18	2.77
b)	Used to pay pensions for current retirees	37.94	3.39
c)	Partly invested and partly used to pay pensions for current retirees	49.88	3.10
Q2	<i>"Who pays contributions to employer-related pensions?"</i>		
a)	Usually employees only	9.72	2.70
b)	Usually employers only	8.56	2.86
c)	Usually both employees and employers	81.73	3.63
Q3	<i>"When the financial condition of a pension fund is poor, the pension fund needs to cut pensions. Which pension fund participants are hit by a pension cut?"</i>		
a)	Retirees	32.87	3.32
b)	Active employees	20.42	2.86
c)	All employees (both past and active) and retirees	46.70	3.34
Q4	<i>"What is roughly the average percentage of earnings that is used to pay pension contributions (by all parties combined)?"</i>		
a)	10%	34.03	2.43
b)	15%	39.23	2.36
c)	20%	20.00	2.57
d)	30%	6.74	2.67
Q5	<i>"Anne and Jane are colleagues with the same hourly wage and pension plan. Anne works 20 hours per week and Jane 40 hours per week. How high is Anne's employment-related pension?"</i>		
a)	Half of Jane's pension.	27.66	2.81
b)	Less than half of Jane's pension.	13.84	2.83
c)	Depends on the pension plan.	58.50	2.87

Table C2. Pension literacy with Facebook information only.

	Dependent variable: Pension literacy (0-3)							
	Model 1		Model 2		Model 3		Model 4	
	OLS		OLS		OLS		OLS	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Letter	0.05*	0.02	0.07**	0.03	0.05*	0.02	0.07**	0.03
Curiosity letter			-0.05	0.04			-0.05	0.04
Control variables included	No		No		Yes		Yes	
Observations	4,212		4,212		4,212		4,212	

Robust standard errors are presented, * denotes significant at 10% level, ** at 5% level, and *** at 1% level.

Table C3. Pension literacy questions separately as dependent variables.

	Dependent variable: Pension literacy questions 1 to 5									
	Q1		Q2		Q3		Q4		Q5	
	OLS		OLS		OLS		OLS		OLS	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Letter	0.03*	0.02	0.02	0.01	0.01	0.02	0.04**	0.02	0.00	0.02
Curiosity letter	-0.01	0.02	-0.02	0.02	-0.01	0.02	-0.02	0.02	-0.02	0.02
Observations	4,220		4,219		4,216		4,214		4,212	

Robust standard errors are presented, * denotes significant at 10% level, ** at 5% level, and *** at 1% level.

Appendix D Excluding Facebook in effects of letters

Table D1. Effect of letters on pension awareness, for the 41-65 age group and for the sample of non-Facebook users.

	Pension literacy (0-5)				Pension check (0,1)			
	Model 1		Model 2		Model 3		Model 4	
	Age 41-65		No FB		Age 41-65		No FB	
	Coeff.	S.E.	Coeff.	S.E.	AME	S.E.	AME	S.E.
Letter	0.14**	0.06	0.27***	0.10	0.02	0.03	0.06	0.04
Curiosity letter	-0.12*	0.07	-0.08	0.11	-0.04	0.03	-0.08	0.05
Constant	2.22***	0.03	2.18***	0.06	0.35***	0.01	0.31***	0.02
Observations	2,084		721		2,057		711	

Robust standard errors are presented, * denotes significant at 10% level, ** at 5% level and *** at 1% level. AMEs are the average marginal effects.

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Network for Studies on Pensions, Aging and Retirement

This is a publication of:
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E-mail info@netspar.nl
www.netspar.nl

April 2020