

Improving Pension Information: Experimental Evidence on Willingness to Learn Using Online Resources

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September 20, 2021

Abstract

Going through the retirement process, deciding what to do with one's pension funds and where or not to apply to State pension benefits is a trinity of pain: one-shot, high stakes, and in a technical language few people understand. It is therefore not surprising that a majority of workers in the private pension scheme pay for advice, while many entitled to public benefits leave money on the table by not applying. This decision making impasse, the unwillingness to autonomously engage with pension information, can have negative impact on retiree welfare. We argue that one way to address this issue is by reducing the cognitive effort needed to learn about pensions, and we do this by experimentally measuring the impact of changing the structure and format of pension information websites on willingness to engage in pension decisions measured using real effort tasks. The baseline websites have a Frequently Asked Questions design (a.k.a. Product oriented) structure with information in text, while the experimental innovations change to a Profile oriented structure with videos. The robustness of the innovation is compared across two different populations (with and without access to public benefits). The online field

^{*}Denise Laroze would like to thank Fondecyt de Iniciación Project Numb. 11180281, CONICYT, Chile, for funding this study. All replication material is available on <https://github.com/deniselaroze/Pensions-Website-Design>, repository that will be kept updated as the project evolves.

experiments include micro replications, process tracing protocols and face-readers to capture the emotional states of the participants when visiting the websites. The study is conducted in association with the Chilean *Superintendencia de Pensiones* and *Instituto de Previsión Social*.

Going through the retirement process, deciding what to do with one's pension funds and or going through State benefit applications is a trinity of pain: one-shot, high stakes, and in a technical language few people understand. It is therefore not surprising that many retirees forgo decision making and pay for advice – in the Private Pension scheme – or leave money on the table by not applying to public benefits – Public Pension benefits. This decision making impasse, the unwillingness to autonomously engage with pension information, can have negative impacts on retiree welfare. Delegating pension decisions to someone else that 'knows best' does not ensure one will get the best offer available, in fact during 2018-19 only 50% of retirees choose one of top three alternatives available to them, despite the generalized use of advisors [Duch et al. \(in print\)](#). Whereas, NOT applying to public benefits, when eligible, is a clear welfare loss. However, present bias and risk aversion can make it very disagreeable to deal with bureaucracy if there is a risk of getting left out because one has earned just a bit too much in life – benefits are available to the lowest 60% of income.

We argue that one way of dealing with the decision making impasse is to reduce cognitive demand of acquiring information. We do this by innovating in the structure and format in which pension information is provided online.¹ Acquiring some basic knowledge on the pension process is in the retiree's best interest, even if they end up paying for advice, for it improves autonomy when conversing with the advisor. One knows from [Chan & Stevens \(2008\)](#), [Martinez et al. \(2009\)](#), [Comisión Asesora \(2015\)](#) that information levels on pension related topics are low, and that financial literacy is low many countries ([Lusardi & Mitchell 2014](#), [McGrath 2015](#)). What one doesn't know is, what is the best way of educating a population on a topic that is difficult, risky and has substantive consequences for their life. Currently many official government or pension company websites have a Frequently Asked Questions, or "Product Based" structure, where the retiree looks up the name of a product (e.g. Annuities, Programmed Withdrawals, Beneficiaries, Online applications, etc.) and gets information in a relatively unstructured manner – Table A.1 in Appendix has examples.² In this structure the cognitive effort for the individual is high, as s/he is expected to read everything and process the information in order to understand what is in his or her best interest. We argue this demand leads people to feel overwhelmed, surprised, fearful and angry, which leads them to give up prematurely and not engage with the information that is available. We argue that an alternative "Profile Based" structure can help reduce the cognitive load of gathering information by ordering the topics hierarchically and streamlining the relevant information for each type of individual, without limiting the person's ability to search more broadly. This Profile organization of topics is expected to reduce fear, surprise and anger and improve willingness to engage with the information that is available.

A second dimension of a person's willingness to engage with pension information has to do with the format in which it is provided – text v. video. We know from the literature

¹Another complementary alternative issue is for the regulator to simplify the metrics and formats used to present pension offer information, topic that has been addressed by [Duch et al. \(in print\)](#).

²Official Chilean websites are hosted by the Pensions Superintendency - *Superintendencia de Pensiones* (SP) <https://www.spensiones.cl/portal/institucional/594/w3-propertyvalue-9994.html> and the Commission for Financial Markets - *Comisión para el Mercado Financiero* (CMF) <http://www.svs.cl/mascerca/601/w3-article-1723.html>

on education that innovative ways of presenting information, including videos, are a powerful tool for improving financial literacy [Luisardi et al. \(2017\)](#) and teaching school aged students, especially in combination with other educational resources ([Karppinen 2005](#), [Berk 2009](#), among others). Many governments, NGOs and other institutions have already started to use short informative videos as educational elements, such as the UK’s National Health Service (NHS), the [World Bank](#) and [Unicef](#). However, very little is known about how much or if videos lead to better comprehension of complex topics in a population that is 50 year or older.

To address these issues, this study uses an online experimental design where participants are asked to participate in a survey that provides the instructions, collects block randomization data and redirects the participants to a treatment website where they can browse for as long or little as they like. Participants exit the website by opting into/out of an incentivized real effort pensions task. The experimental treatments are based on a classic 2×2 design, with two information structure treatments (Product and Profile) and two information format treatments (Text and Video). The baseline is a Product + Text treatment and the full innovation is a Profile + Video treatment. Subjects are income, age group and gender block random assigned to each treatment and participants are recruited from a Chilean convenience sample of males and females, aged 55-70, that have not yet retired.

The main goal of this experiment is to identify what website structures and formats increase people’s willingness to engage with pension information and reduce the amount of people that opt-out of making an effort in acquiring information relevant for their retirement. Specifically, we aim to 1) identify which of the innovations (Profile and/or Video), if any, increase the amount time people browse through the pensions website relative to a baseline website. 2) identify which of the innovations (Profile and/or Video), if any, increase the willingness to complete a Real Effort Task that represents the costs of getting a Private or Public pension, relative to a baseline website. 3) identify how emotions mediate or moderate the relationships between the innovations and people’s willingness to engage with pension decision making tasks. 4) evaluate if there are any differences in the impact of these innovations across income, gender and age sub-samples of the population.³

To ensure the robustness of the innovations’ impact on the different retirement experiences of high and low income populations, we incorporate a population specific micro-replication strategy into the experimental design. We do this by adding two content variations, one for each of the two income subgroups, and provide information that is income specific. In total there are 8 treatments ($2Content * 2Structure * 2Format$ variations). The Public and Private Pension websites mirror each other in terms of the website structure, the format in which the information is on the websites and the types of incentivized questions in the real effort task. **The differences across the micro-replications are in the content the person receives in the website and, consequently, the content of the questions in the real effort task.** In practice this implies that participants who access the Private pensions website have roughly double the amount of information to process.

With these innovations and experimental design this study contributes to the litera-

³It is good practice to evaluate potential impact heterogeneity of public policies, Age and Income are potential sources given their associations with a person’s level of internet access and familiarity, education levels and potential difficulties to process new information. Gender is a another standard test, however it was not found to be significant source of heterogeneity in a similar experiment in Chile (see [Duch et al. in print](#))

ture on Financial Literacy in the population (Lusardi & Mitchell 2011b, Lusardi et al. 2017, Xue et al. 2020), as well as it's effects on pension readiness Lusardi & Mitchell (2017), Mitchell (2017), Clark et al. (2019), Song (2020), Ghafoori et al. (2021), by conducting experiments to measure the impact of a new 'just-in-time' online financial education mechanism aimed at simplifying the information needed to retire. To ensure internal and external validity, we conduct both a controlled lab version with a convenience sample and an online field experiment on the target population of people aged 50 or above, that have not yet retired. This is a hard to reach population and there are limited number of studies that attempt it, among them Duch et al. (in print), Nam & Loibl (2021), Xue et al. (2020).

The innovations and their evaluation build on the literature on A/B testing approach (Kohavi & Longbotham 2017, Fabijan et al. 2017, Hassenzahl & Tractinsky 2006, among many others), to address the complex problem of getting people to engage with difficult pension information. We do this by taking into account the importance of making an attractive and enjoyable user experience (Hassenzahl et al. 2001, Stone & University 2005, De Koning et al. 2009, among many others), and doing so by simplifying the user interface into profiles and adding relatable visual cues that evoke a relatable norm Bicchieri (2002).

The following sections present a summary of the Chilean pensions system, followed by a brief literature review of each of the different aspects of the experimental innovation. The paper then goes on to describe the theory, hypothesis and experimental design.

Context: The Chilean Pensions System

As of January 2021 the Chilean pension system consists broadly of two saving schemes, one compulsory and another voluntary, and two main transition to retirement schemes, a **fully private scheme** for people who are in the top 40% of income; and a **mixed private and public scheme** available to people in the lower 60% of income. In this study we focus on the transition to retirement schemes, specifically on the process of learning about and deciding how to retire. The answers to these questions depends on if one is eligible for public benefits or not, which is determined by a State calculated pensions targeting score (*Puntaje de Focalización Previsional*) and some residency requirements.

When a person reaches retirement age (60 women 65 men) they must decide how to use the money they have accumulated **Private Pensions** personal savings accounts (a.k.a. individual capitalization accounts or *Cuenta de Capitalización Individual*). There are three main retirement strands, Annuities, Programmed Withdrawals and a mix of these two, access of each of these schemes is conditions simply by the amount of money accumulated and the possibility of paying for the administrative costs of the schemes. The default are Programmed Withdrawals for retirees that have not accumulated enough money to finance an Annuity (second in the order of costs).

There are currently three broad variations of the **Private Pension schemes**: 1) **Annuity**. Individuals buy the right to receive a fix and constant (inflation adjusted) amount from an insurance company. 2) **Programmed withdrawals PW**. A scheme that allows individuals to maintain ownership of the money that remains at the AFP and withdraws a proportion of it every month – with the financial and longevity risks associated. The maximum amount that is withdrawn is regulated by law and depends on the total funds available, the returns of the remaining savings and the yearly adjusted life expectancy, which in practice means the monthly amount decreases over time eventually getting to zero if the person lives long enough; and 3) **Mixed Schemes**. A combination of Annuities and Programmed Withdrawals that can be wither 3.a) Sequential. In which the customer starts off with a Programmed withdrawal, for a short and fixed time period, and then goes on to an Annuity. The Programmed Withdrawal periods provide a higher pension for the first years, but instead of going down gradually to zero, the pension levels off into an Annuity. 3.b) Simultaneous. There is a scheme that combines a simultaneous Programmed withdrawal and Annuity scheme. In Mixed Schemes consumers split their funds into two pots, one for the Annuity and another for the Programmed Withdrawal (see [Superintendencia de Pensiones 2019](#)).

Each of the different modes has pros and cons, Programmed Withdrawals are more risky, as people can run out of money, but are more flexible in terms of inheritance; Annuities are less risky, but are more constrained in terms of who and how much money is left for the beneficiaries, the other two modes are combinations of both and tend to hedge the risk and benefits. Within each mode there are a multitude of special conditions/nuanced decisions that marginally modify the pension's value and characteristics, but can provide security for beneficiaries – for example Guaranteed Periods that can be added to annuities in which one can identify other (non-legally defined) beneficiaries in case of an early death.

One of the challenges workers face when they initiate the retirement process has to with the large amount of alternatives available. For any of the pensions schemes there is a market of providers and one must make that selection using a formal quote process implemented via the SCOMP <http://www.scomp.cl/> – an online cross comparison process intended to summarize all pensions offers available to each individual and introduce competition. SCOMP produces a report with tables informing the offers for each of the pension schemes and special conditions (nuanced variations) selected for a quote. There are series of nuanced variations one can request, these give the retiree the opportunity to tailor his or her pension to their individual needs, at the cost of having to make decisions and learning, or paying for advice. The amount of information presented in the SCOMP reports depends on the number alternatives one selects for a quote. This implies that the more undecided an individual is – the more alternatives one asks information for – the larger the final report, generating a report that has too much information to process, leading to ‘cognitive overload’ (cf. [Sweller 1988](#), [Kahneman 2011](#)). The decisions the worker makes are risky, especially because of the little understanding of pension related matters in the population and the real possibility of not selecting the ‘Best Alternative’ for one’s persona circumstances. We expect these decisions to be especially complex for people with lower levels of financial literacy that have a hard time understanding the information they are asked to evaluate (cf. [Lusardi & Mitchell 2007](#), [Gathergood & Weber](#)

2017, McGrath 2015).⁴

For people that are classified in the lower 60% of income according to the pensions targeting score, there are four **Public Pension Benefits** they can apply for, which complement the private pensions produced by the savings accumulated in their individual capitalization accounts ([Superintendencia de Pensiones 2019](#)). There is also a Basic pension (a.k.a. the ‘Stay-at-Home-Mother’ public pension) for people that never contributed to pensions savings. In order to access these benefits the workers must first retire through the private pension scheme (if it applies) and then apply for the public benefits at the age of 65. Applications, as usual, involve going through red tape, but are relatively simple if one has a Pensions Targeting Score.⁵

There are currently four **Public Pension benefits** for legal residents in the target population of lowest 60% of income: 1) Old Age Basic Solidarity Pension (**Pensión Básica Solidaria vejez - PBSv**). A baseline State Pension for anyone 65 years or older meeting the targeting requirements, that does not have pension savings in their individual capitalization account. 2) Old Age Supplementary Solidarity Pensions (*Aportes Presivionales Solidarios vejez - APSv*). A government top up of the private pension generated by the funds in the individual capitalization account, if the private pension is below a certain age dependent threshold. Retirees must be 65 years or older. 3) Disability Basic Solidarity Pension (**Pensión Básica Solidaria Invalidez - PBSi**). A baseline disability benefit for residents aged 18-64 years that do not have savings in their individual capitalization account. 4) Disability Supplementary Solidarity Pensions (*Aportes Presivionales Solidarios Invalidez - APSi*). A government top up of the disability pension generated from the private funds accumulated in the individual’s capitalization account. Beneficiaries must be between 18-64 years old and comply with targeting requirements.

The challenges for potential beneficiaries of **Public Pensions** are similar to the Private Pensions, in that there is too much information that is difficult to understand and one needs to make the bureaucracy facing effort of applying. In the Public Pensions the attention needed to go through all the red tape can be demanding. Retirees need to learn about the offers available to them and apply to the correct benefit, but they need to fill out forms, instead of making decisions as in the Private Pensions. The risk the retirees face is putting in all the effort of going through the red tape and then getting rejected because of having earned just a bit too much money and begin above the Pensions Targeting Score. We expect the evaluation of this risk to be especially difficult for people with low financial literacy literacy.⁶

⁴There are two government oversight organisms that regulate the market and provide unbiased pension information for retirees: the Pensions Superintendency (*Superintendencia de Pensiones - SP*), with authority over the AFPs, and the , Financial Market oversight Committee (*Comisión para el Mercado Financiero - CMF*), that regulates the securities market of which annuities are one of the relevant products.

⁵Getting the Pensions Targeting score can be a long and tedious process, but it is also a basic requirement for most public benefits. The population that has access to public pensions is also a population that can access other social benefits with the same score.

⁶While it is true that for the Public benefits of APSv and APSi one needs to first go through the Private pension process and then apply for the Public benefits, many people in the target population do not have a choice of how to use the savings in the individual capitalization account, they only alternative available to them are Programmed Withdrawals as they hardly ever have enough saving to pay for an Annuity.

Financial Literacy

Lusardi, Mitchell, co-authors, and others, have conducted over a decade of research registering the welfare loss associated with financial illiteracy and its relationship with personal financial decisions including retirement savings (Lusardi & Mitchell 2007, 2011b, 2014, 2011a, Hastings & Mitchell 2011, Chen & Volpe 1998, J 200). Their results show that financial illiteracy is widespread among the population (Lusardi & Mitchell 2014)⁷ People understand little about pensions and women do worse Hasler & Lusardi (2017), getting them to save for retirement is hard work Fernandes et al. (2014), Clark et al. (2019), Gerrans & Heaney (2019), Song (2020), Ghafoori et al. (2021), Brugiavini et al. (2020). Chile is no exception, Landerretche & Martínez (2013) find that Chileans have limited knowledge regarding the pension system, its rules, and the consequences their (in)decisions. Their results also suggest that the subgroups with higher levels of financial literacy behave more financially responsible with regards to pension savings – they are, more likely to have additional financial savings, present active financial behavior, and or voluntarily contribute to their pension funds when self-employed.

The subgroups of the population where financial literacy is significantly worse than the rest of the population are women, the elderly and the less educated (Lusardi & Mitchell 2011a, Hasler & Lusardi 2017), concentrating the problem on a sub-population that is vulnerable in other major aspects of pension decisions. Women tend to accumulate smaller pension savings, in part due to lower proportions of women in the workforce, taking time-off for childcare and gender pay gap, etc. The less educated also tend to be the poorer sections of the population (Contreras 1999) and, consequently, accumulate lower pension savings as ‘tax’ is defined as **10% of gross income**. Most importantly, the financially illiterate are less likely to plan for retirement (Lusardi & Mitchell 2011b).

Given low levels of financial literacy regarding pension savings, where a worker has several decades to learn about the topic, one can assume workers will have a difficult time answering the question: Now that I have saved up this amount for retirement, what do I do? The answer to that is complicated and requires some understanding a complex retirement market that has many alternatives, providers, pension modes (Annuities, Programmed Withdrawals and Mixed schemes) and nuanced options available to tailor each pension to individual needs. Inevitable the decision to engage with the retirement process has a learning cost.

High income earners can address this information hurdle by paying a third party specialist for advice and reducing the effort to a monetary cost. However, delegating pension decisions to someone that ‘knows best’ does not ensure one will get the welfare maximizing offer available, in fact during 2018-19 only 50% of retirees choose one of the three best alternatives available to them, despite the generalized use of advisors Duch et al. (in print). Low income earners, on the other hand, do not have the option to pay for advice, they can only choose whether or not to make an effort to apply for the benefits. A low cost effort is to start by googling information. Accessing information outside a person’s preferred web-browser adds a level of physical effort to the task, such as going to a public office for advice. However, NOT applying to public benefits, when one is eligible, is a clear welfare loss. The difficulty is in getting past the first hurdle of understanding what benefits are available and if one is a potential beneficiary.

⁷In a measure of financial literacy composed of three questions, one on interest rate compounding, another on inflation and a last one on stock risk— only 30.2% of USA respondents answered all three correctly, with similar proportions in France, while Germany (53.2%), Switzerland (50.1%) and the Netherlands (44.8%).

In the *status quo* retirees can learn about the pensions market online in websites that are generally organized as lists of pension topics (a.k.a. Products). See for example Fig. 1, the current Pensions Superintendency website, where there are names of pension related concepts and their definitions – Appendix table A.1 presents a list of international examples of websites.



Figure 1: Screen-shot of the official Chilean Superintendency Pensions Retirement Advice website

This study contributes to the literature on Financial Literacy by testing if two innovations to online information resources (a change to a Profile website structure and to a video format) attract peoples attention, get them to engage with pension related topics, and improve their levels of retirement literacy; and while doing so, taking care of collecting data in a manner that allows for income, gender and age sub-group evaluations of impact. The results of the study provide substantive insights that are applicable to autonomous learning tools for tie in-work stages of pension savings and other high stakes + low information decision making events [Examples would be nice].

Tools for Autonomous Learning There are a few studies that address the issue the communication of pension information, people's retirement knowledge or the decisions they make, and most focus on in-work saving and investment strategies [CITE]. (Larsson et al. 2009, p.141–159) have one such study in which they summarize attempts by different OECD countries to evaluate the impact of Personal Pension Statements on savings and investment decisions. They find, however, that data is scarce, that current designs do not allow for causal interpretations and conclude that more research is needed. To our knowledge, this is the first study to measure the impact of online website resources as a potential tools for autonomous learning of pension related topics.

Research suggests that providing people with information does improve knowledge. Finseraas & Jakobsson (2014) find that participants experimentally assigned to receive a pension information treatment are more likely to respond correctly to questions about the pension system than those who were assigned to a control group. While, McGowan & Lunn (2019) test the impact of explanatory diagrams on saving decisions using a laboratory experiment. In the experiment they randomly allocate participants to treatments with or without one or two diagrams, and have them answer incentivized questions on information recall, comprehension and choice of contribution rate. They find that the diagrams had a marginal influence on recall or comprehension, but did prompted more participants to advocate higher contributions and influence the rationale participants gave for decisions. They conclude that while pension products are still difficult to understand,

despite the diagrams, these may alter pension decisions by reinforcing relevant causal thinking.

Web-based Pension Information is a cheap and accessible source of pension information. One can access it in the comfort of the home, work computer or smartphone of choice.⁸ However, this comfort comes at the cost of not being able to ask questions verbally, and implies making an effort to understand the content of the website and to select valid sources of information. Among those sources are official government websites. In a review of nine Pensions websites conducted in April 2020 (references in Appendix table A.1), the majority are structured in terms of Products, that is, focused on defining concepts used in the pension jargon. They are good sources of legal references that can be used by pensions advisors or sales agents, but not citizen-user friendly. There are a few examples of websites that have invested in a friendlier user interface, most notably the German *Deutsche Rentenversicherung* https://www.deutsche-rentenversicherung.de/DRV/EN/Home/home_node.html?https=1 and the Australian Services Australia <https://www.servicesaustralia.gov.au/individuals/older-australians>, but a Profile structured User Interface, that is organized by types of pension clients and the information that is most relevant to them is rare.⁹ Wesbroom (2004) conducted a survey on the use of websites to promote company pension schemes in the UK and finds that, while sixty-two per cent of companies had a dedicated website, the majority had a ‘reference library’ format (a.k.a product based information) with a series of pdf files to download, and only a few cases presented a web-friendly structure.

User Interface

There is a recent trend in the Computer Sciences to foster the use of multivariate A/B testing of user-interfaces in order to settle on alternatives that increase in click-throughs and capture people’s attention to send personalized advertising, improving the Returns on investment (ROI), among others (Kohavi & Longbotham 2017, Kohavi et al. 2013). As (Fabijan et al. 2017) argue, the benefits of A/B include: A) identifying what constitutes consumer and business value, and how working with product teams contributes to this. Due to the possibility provided by controlled experiments, it is possible to analyze which are the main elements that customers value most in the products offered. B) Restructuring of teams based on the evidence delivered in experiments by "(1) knowing what changes improved the key metrics in the past and by how much, product development teams can (2) generalize and organize their schedule to focus their work on the type of changes that were shown to have the most beneficial effect on the product". C) Improvements to the products themselves from working in teams capable of planning, executing and measuring them. Over all, A/B testing allows practitioners to scientifically select among competing design alternatives. Included in the A/B testing line of research one can find the development of automated tools such as AB4Web (Vanderdonckt et al. 2019), that enable practitioners to compare end-users’ preferences for user interface amongst a set of pre-defined alternative menu layouts, widgets, controls, forms, or visual input commands. This is one example, but there are many others developed by large companies as Facebook

⁸According to Ipsos Chile (2015) survey data, in 2015 Chile had an internet penetration of 71.3% of households, 74.2% in urban areas, 55% in rural, and a 62,1% in the lowest quantile of households. Therefore, a large proportion of the population could access these resources.

⁹See the Chilean Previred.cl for an example of website designed for active workers.

(Bakshy et al. 2014), Microsoft (Kohavi & Longbotham 2017, Kohavi et al. 2013), Google (Tang et al. 2010) and others (Fabijan et al. 2018).

A second line of research that we present is what we could call "non-automated experimental designs", from the disciplines of user-user interface (UI) and user-experience (UX), which are dedicated to the evaluation of the best features to improve the relationship between the user and the interface to perform various tasks.

One of the central issues analyzed by these disciplines is the balance between traditional usability - "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (Stone & University 2005) versus other usability approaches based on "joy" and aesthetically positive sensations (Hassenzahl & Tractinsky 2006, Hassenzahl et al. 2001) as color schemes, shapes, symmetry, etc.

It has been observed in these investigations that, for example, the manipulation of usability for experiments considerably increases the delay time to accomplish tasks as well as their results, in addition to the fact that in conditions of low usability, good aesthetics can improve such results (Moshagen et al. 2009); It has also been observed better perceptions of beauty in symmetrical distributions of web pages in men, while women consider relatively the same way both symmetrical and asymmetrical models (Tuch et al. 2010). And that, contrary to the thinking about modern flat designs presented as "improvements" to traditional designs of icons and typography for web design, it has been observed that there are no such statistical differences, even increasing the cognitive load due to flat designs do not consider the three-dimensional nature of the objects with which we relate (Burmistrov et al. 2015)

A third focuses on "emotional designs" has been developed on the premise that web designs in all their characteristics (design shapes, colors, letters, web structure) evoke positive or negative emotions, which can either facilitate or hinder learning in each of these platforms (Um et al. 2012, Heidig et al. 2015). For example, with regard to designs with externally induced emotions vs. emotional designs embedded within the intervention, statistically significant differences have been found. In the first case, positive emotions decrease during learning, while it implies greater mental effort. On the other hand, in the embedded designs, positive emotions do not decline during learning and reduce the perceived difficulty (Um et al. 2012) as well as colorful designs and rounded shapes improve both the understanding of the subjects studied and their results when evaluated (Plass et al. 2014). However, as Knörzer points out (2016), there is still no conclusive evidence, especially if we look at the limited type of people with whom we have experimented (young university students). Some researchers have shown that, despite the existence of this hypothesis of positive emotions as facilitators of learning, they have still been inconsistent about the direction it takes.

The present study contributes directly to the field by conducting a non-automated block randomized A/B type test of Product versus Profile interface designs in a large-scale experiment designed to measure the impact of the formats on attention (time), click-through, comprehension of information provided and the emotions associated to the different alternatives. The aforementioned experiments on emotions and learning usually use small samples of students, while this research is conducted on target sample of 500 people drawn from the general population of 50+ year old adults, that constitute the target population of the policy implementation. Secondly we contribute by using face reading software to measure emotions unobtrusively, an evolution over the PANAVA scale widely used in experimental surveys. A third contribution of this research project

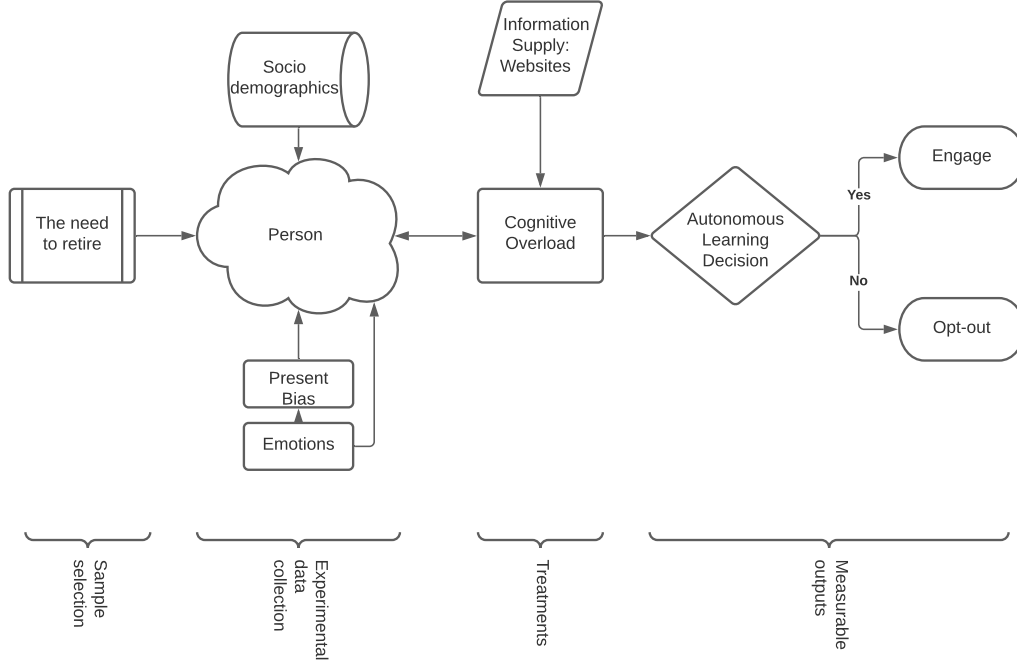


Figure 2: Conceptual diagram of the theory

to provide a bridge between the business oriented UI and UX perspectives of focusing on the users needs to the policy sector, by implementing a robust experimental design to justify substantive changes to the way pension information is provided by the State – in a What Works ethos.

Innovations

In this study we argue there are at least two potential innovations to websites that can improve on **status quo** levels of retirement literacy, the first is changing the structure of the website from a Product structure to a Profile structure where the new focus is on the different types of workers that are going to retire. The second is by reducing the attention effort needed to acquire information by transforming text into video. Websites are a key element of the information supply of the retirement decision making process and we believe changes at that level can induce more people to engage with the learning aspect of the retirement process and, ultimately improve people’s welfare. To justify this argument, let us reflect on the retirement decision making process.

The retirement decision making process is reflected in Fig. 2. The process initiates with a person’s need to retire, an inevitable event for a worker that lives long enough. We argue that how one engages with the process, if one clicks through a pension related website, learns about the alternatives available, etc. will depend on the quality of the external information that is available (the information supply), the cognitive effort needed to understand, and the individual’s characteristics. Our innovation proposes a simplification of the information supply so as to reduce the cognitive effort needed to get informed, which will lead to more people engaging with the information.

The Pension decision making process has all the characteristics of a “Paradox of Choice” type situation (see [Iyengar & Lepper 2001](#), [Schwartz 2004](#), [Scheibehenne et al. 2010](#), [Kinjo & Ebina 2015](#)). For both high and low income earners there are a lot of different pension alternatives, some of which one can access and not others, implying that one needs to filter through information. Theoretically there is a welfare maximising offer one can aspire to, if one knows enough and uses the nuanced variations to tailor the pension to my ‘Best’ option. However, doing so implies a very steep learning curve for a once in a lifetime decision written in jargon. We argue that this scenario leads to a decision making impasse where workers leaving money on the table because of not being able to deal with the Cognitive Overload (see [Kirsh 2000](#), [Kahneman 2011](#), among others)

Cognitive Overload. The Retirement Process has a high cognitive demand. There is **too much information supply**, with multiple sources of online, phone and in-person information and offers of advice from Insurance Company sales agents; not all the information from these sources is consistent, unbiased, or up to date, and the worker is required to filter through the noise on his/her own. There are **multitasking and interruption components**, as many people initiate their retirement process while they are still at work and have other responsibilities to tend to. **Information demand is high** as there are life long monetary consequences to the decisions, and, we argue, there is **deficiency in the information infrastructure**, as the *status quo* retirement information websites are unfriendly and difficult to understand. In this study we aim to reduce the cognitive demand by improving the information infrastructure available to the individual. In doing so we do not reduce the alternatives that are available to the person, but simply order the information so it is easier to process.

Easing the effort One way to ease the cognitive effort is structuring online retirement information in terms of the users’ perspective and how they enter the retirement process. Assume one initiates the process by browsing online with a vague understanding of the topic. Upon viewing the first homepage I make an evaluation of how difficult my next step into the learning process is going to be. A Profile structured website that greets me with a small amount of words and asks a “who are you?” question is simpler than a Product based structure that has a list of unfamiliar concepts and makes the person ask a “What do you want to know?” question. Selecting who I am out of a short list of alternatives is simpler than knowing what I want. We expect that this simplification will lead more people to click though onto a second tab and pay attention to the content. Attention is a scarce resource in the “Information economy” we currently live in ([Lanham 2006](#), [Davenport & Beck 2001](#)). Attracting and keeping a persons attention is a key element in getting them to learn about a new topic, and a more knowledgeable worker can reduce problems in the retirement market. This outcome is in the State’s and the individual’s interest and has the potential of improving upon current pension market conditions without limiting a person’s alternatives. However, a change to a Profile structure is costly and requires the efforts of a multidisciplinary group of experts. This experimental study provides an opportunity to measure the potential impact of the effort on a variety of behaviours – Clicking though the website or not, time spent reading, emotions, real effort questionnaires – and evaluate the potential impact of the change.

A second innovation is changing from an all text format to one that includes videos for the most relevant topics – what alternatives are available and how to access them.

We expect videos to make the content more relatable and easier to comprehend, reducing the effort one needs to make to learn. Educational literature suggests that innovative ways of presenting information, including videos, can be a powerful tool for teaching school age students (Karppinen 2005, Berk 2009, among others). Governments, NGOs and other institutions have already started to use short informative videos as part of their educational material – for example the UK’s National Health Service (NHS), the World Bank and Unicef are strongly image/videos based. E-learning facilities can be especially simple and effective solutions when other alternatives are not available, such as teaching children in the Amazon rain-forest (Michael Trucano 2014) or in situations such as retirement, where classroom style educational resources are limited and not easily found. However, not all videos or e-learning facilities are useful (Lim Fat et al. 2011). An evaluation of a multi-method e-learning innovation designed to teach clinical skills to student nurses, finds that students appreciate the videos, but that it did not improve performance outcomes on their own (Kelly et al. 2009). Luisardi et al. (2017) study the impact of different online financial literacy training tools and find that an informational brochure, a visual interactive tool, a written narrative, and a video narrative are all effective tools in increasing self-efficacy. However, videos, in particular, improved financial literacy more effectively than written narratives or any of the other tools. This study is a substantive contribution on how to improve web-based information for in work.

Despite some positive findings, it is not evident that a visual format is always an efficient way of transmitting information to an older population, especially when there are relevant consequences at stake. This age group is not as used to technology as younger age groups, and reading text may be a more natural way of self-studying for them. Furthermore, retirees are more likely to have hearing problems or difficulties retaining information at the speed of a short 1-3 min video. It may be, that despite the availability of visual aids, the increased ease of acquiring information is not sufficient to substantively reduce the use of pension advisors or sales agents. If that is the case, it would not be cost-effective to produce images and video content. It is, therefore, relevant to study the impact of this innovation on that age group.

Individual characteristics and potential heterogeneous treatment effects

In the pension decision making process one cannot rule out the impact of personal characteristics on the decision making process, such as income, gender, age or emotional reactions to the information. All of these factors and more can alter a person’s willingness to engage with information on a specific day. That is why experimental research with random assignment to treatment is fundamental for an unbiased estimation of potential impact of the innovations (Gerber & Green 2012). However, while estimations may generate unbiased coefficients with random assignment alone, policy wise it is informative to evaluate if certain sub-populations have the same reaction to the innovations or not. It may be possible that a simplification of information is more effective in getting a 70 year old low income women’s attention than it is a 55 year old high income man’s, so this experiment includes randomization protocols to account for these potential differences.

A first characteristic that could have a potentially substantive difference is income – and it’s confounded relationship with the complexity of pension decisions. Workers at the top of the income scale have the benefit of choices at the cost (effort or monetary) of making informed decisions. If one chooses to get informed, the task is hard and retirees

face a choice Paradox. Workers at the bottom of the income scale don't have many choices, if they have savings there is only one way of accessing the money (a Programmed Withdrawal) and when that runs low enough and they meet the targeting requirements – namely being in the lower 60% of income, over 65, and have legally resided in the country for a certain amount of years – they can access the State pension benefits. The amount of information to process is much simpler, there are no choices, just understanding if one is eligible for the benefits and learning how to apply. The lower volume of information and cognitive effort needed in the low income group's Public Pensions website could interact with a participants' general willingness to browse the website, increasing the likelihood they will look through more than one tab. The structure of the experimental design, with one branch for private pensions and another for public benefits allows us to test the effect of higher versus lower cognitive demand on the willingness to engage with the websites themselves. However, we do not have expectations as to how or if the the difficulty of the content in the tab interacts with the main treatment variations (Structure and Format of the homepage) as these treatments are presented to the participant before s/he accesses the pension relevant information in the tab. If one finds an interaction it would likely reflect participants pre-experimental expectations about the difficulty of the information.

A second dimension of interest to test for treatment heterogeneity is gender. Evidence suggests that men have higher levels of financial literacy and that there are gender differences in retirement investment decisions (Sundén & Surette 1998, Lusardi & Mitchell 2008, Lusardi & Mitchell 2014). Hasler & Lusardi (2017) measure the financial literacy of Chilean adult women: 39 percent are categorized as financially literate compared to 41 percent of the adult population. It is also the case that in Chile men are more likely to be in the formal workforce than women (INE 2021) and, therefore, have private pension savings to deal with. These gender differences could make the treatment information more salient for high income men, increasing their willingness to engage with the website, relative to high income women who may not have private pension savings. However, one would not expect gender differences in salience in the public pensions website as public benefits are gender neutral. If there is a salience effect, the two branches of the treatment design would allow us to tease out the effect, however, one would not necessarily assume that salience of the pension information interacts the structure and Format of the homepage, as the information is included in the second tab.

A third and final dimension that could generate heterogeneous treatment effects is age. Associative memory and cognitive ability decline with age, as one get older it is more difficult to perform new tasks or learn complex new topics (Peretti et al. 2002, Cerella et al. 2006,?). Given the amount of information included in the websites – 5000 words for the Private Pensions plus 10 min of video content, 2800 words for the Public Pensions plus 6 minutes of video content **[Update at the end]** – the cognitive difficulties of ageing could interact with a persons willingness to engage with a the incentivized real effort task of answering questions based on the content of the website, as this requires a higher effort for them that it does of a fifty year old or a university student. It is, therefore, possible that people of different age groups react differently to changes that reduce the amount of information on the homepage (Profile vs Product designs). Hearing and vision loss as the population gets older could also interact with the treatments on the likelihood of answering questions correctly in the Real Effort Task. Videos may be too fast for an older population, reducing the likelihood of answering questions correctly in the RET, whereas videos may be more attractive to younger populations used to the format and increase the likelihood of engaging with the information in the first place. We

do not have hypotheses as to how exactly age interacts with the treatments, however, we do believe it is an aspect worth looking into and therefore, have an age group block into the randomization protocol.¹⁰

Emotions

A different output of the innovations are the emotional reactions it causes on the person. We expect the Profile structure homepage and Videos to reduce the emergence (or intensity) of emotions such as fear, surprise and anger, relative to the Baseline. This would be a positive externality, as the affective generalization hypothesis (Johnson & Tversky 1983), suggests that affects play a role in judgements of probabilities, where negative emotions trigger more pessimistic risk assessments, and positive emotions evoke more positive risk assessments, even if the source of the emotion is not related to the risky object. We also know from Bechara (2004), and others, that there is neurological evidence that emotions play a role in delayed reward decision making game, which would imply that emotions can have a substantive role in risky long term pension decisions. Along these lines, the correlations between fear, happiness, anger and surprise with risk-averse decisions, identified by Nguyen et al. (2014), also suggest that the emotions a person experiences as part of a risky decision making process can substantively influence the outcomes, leading people to make more risk averse decisions. For these reasons we expect emotions to have a relevant impact on the retirement process where we expect strong negative emotions to be associated with less willingness to engage with autonomous learning of retirement information.

Other individual characteristics such as Present Bias [CITE] and Financial Literacy [Cite] can and alter the willingness to pay attention to the website. One can expect more Present Bias individuals to skip a time-consuming sections of the experimental survey, such as viewing a video or clicking through a website, when it is voluntary. While these characteristics should balance across treatment groups we have incorporated survey instruments to control for them explicitly.

To summarize our hypothesis are:

1. that a **profile** oriented website structure will lead to **less people to opt out** than a product oriented one, and that
2. information in a **visual format**, images/videos, will lead to **more people** choosing to **engage with the information** and with the real efforts tasks, relative to text based information format.
3. We further expect that the **combination** of both profile and video/image treatments will lead to the **highest** amount of people choosing to **engage with the information** and engage with the real effort tasks. We further expect,
4. the differences in emotional states induced by each of the treatments to be a significant causal mechanism to explain the changes in the likelihood of engaging with pension processes. Particularly, we **expect that profile and image/video content will reduce the presence of fear, anger and surprise among participants**.

¹⁰Other potential sources of treatment heterogeneity could be Present Bias or risk aversion, and we include these variables as controls, however, because of power constraints we did not incorporate these measures into the randomization protocols.

5. We do not expect treatments effects to vary across populations, however, we incorporate block randomization protocols for income, age and gender to test for treatment heterogeneity.

Experimental Design

The experiment is carried out online using the survey software Qualtrics in combination with the treatment websites (a.k.a prototypes). Participants are recruited from the CESS Universidad de Santiago de Chile online subject pool and consist of male and female participants between the ages of 50-70. To ensure participation, a minimum payment of CLP 5.000 (approx USD 7) is paid for completing the experiment and participants can earn an extra CLP 5.000 in the incentivized tasks.

The survey starts with socio-demographic questions needed for the block random assignment and descriptive data analysis. Among those questions is an income classification instrument designed specifically to seamlessly transport participants onto the website we estimate is most relevant for their income level.¹¹ Participants classified into the ‘low’ income group are derived to the Public Pension website, as only the low income population can access those benefits. Participants classified into the ‘High’ income group are derived to the Private pension website which presents the alternatives uses of the savings accumulated in the individual capitalization accounts. If a participant’s classification is too noisy to estimate reliably, they were derived to the Public pensions website as the current 60% of income threshold to access benefits is under revision and will likely be modified to include somewhere between 70-90% in the upcoming reforms.

Information format			
Information Structure		Product	Profile
	Text	Baseline	Treatment 1
	Video	Treatment 2	Treatment 3

Table 1: Experimental treatment groups

Both the Private and Public pension websites have variations for the four alternative experimental prototypes presented in Table 1. That is, two **Information structures** interacting with two **information formats**. The Baseline treatment (Table 1) uses a text format with the product structure, as is currently in place on the CMF website. Treatment 1 varies the information to a profile based structure. Treatment 2 uses the product structure with information in video form and, treatment 3 is the combination of both a profile structure and video information and is the furthest from the current *status quo*. Treatment 3 allows us to estimate the interactive effect of radically changing both the structure and format in which the pension information is provided, and identify if there are substantial gains with regards to the other two treatments.

In the Product structure (a reflection of the the *status quo*) the homepage has a list of links with the names of a select number of pension topics. The Profile structure has a homepage where there are large buttons with a few words that convey a type of worker going through the retirement process – see Fig 3. Product and Profile Prototypes also differ in the organization of the More Information (Fig. 4), when Product is simply a list and Profile organises the information by categories.

¹¹See Appendix for information on the validation of the instrument.



Figure 3: Homepages of the four treatment prototypes of the Private pension website. Top left is Baseline, top right is Treatment 1, bottom left is treatment 2 and bottom right is treatment 3.

In terms of the structure itself, the Product prototypes are organized in two hierarchical levels (see fig. 5). There is a homepage and one depth of tabs. One can navigate back and forth between the two levels. The complete organizational structures of the prototypes are presented in figures 5 and 6. On the other hand, the Profile Based (Fig.

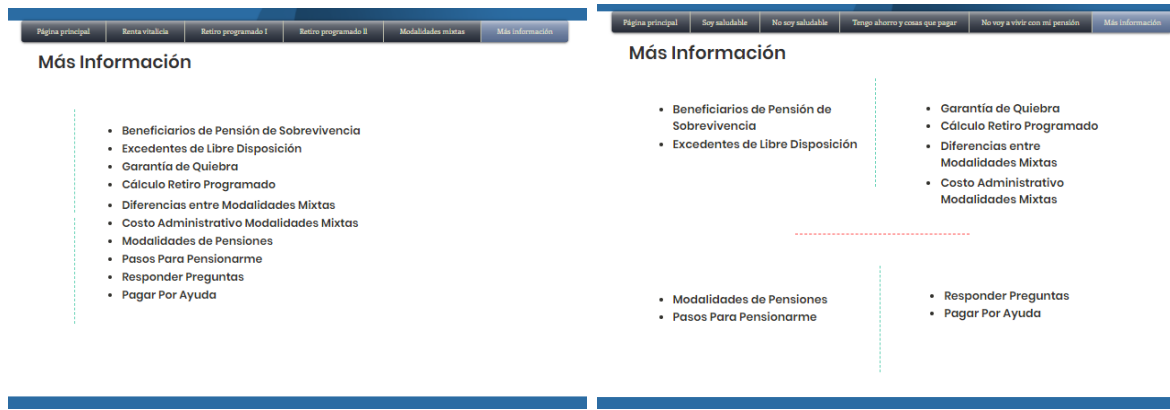


Figure 4: More Information screen difference between Product (B, T2) and Profile (T1, T3) structures

6) uses a hierarchical structure where one enters through a type of individual – Healthy, Not Healthy, Saved but has high short term costs, Will not live off the pension – and that Profile leads to a tab with information on one retirement scheme which then **provides a limited number of useful links at the bottom**. This strategy reduces the number of new topics (tabs) that are presented to the participant, without reducing the total information they can access. The full content list is always available in the top right *Más información* “more information” tab.

The main differentiating elements of the structure prototypes are the Homepage and the More Information tabs. The two homepages on the left of Fig. 3 (Baseline and T2) are the Product prototypes and the two on the right are the Profile prototypes. Fig. 4 presents the variations in the More Information tab across treatments, where in Product prototypes it is a full list of navigation alternatives, and in Profile the links are separated into four categories aggregated by similarity of content. The differences across income groups (Private v Public benefits websites) are only in terms of content, everything else is a mirror of each other. The number of screens, the structure, the colors, the font, are all the same, the wording of the instructions, the length of the text and/or video content is equivalent.

The information format modes are fairly straight forward, in the text variate participants receive all the information in text. The Video variation includes two videos, one that summarises the pension schemes that are available to the income group, and a second that presents information on how to access the benefit. The bottom two homepages in Fig. 3 make evident the existence of a video by including a standard video object reference next to the links that contain information in video form.

Exiting the prototype. When participants decide they have seen enough, they can exit the prototypes through three alternatives. The first is to complete an incentivized real effort task (RET), the second is to opt-out of the RET forfeiting some earnings, but continue with the survey, and a third is to simply close the browser and exit the experiment forfeiting all earnings. The RET is the bottom left yellow button in Fig. 3 *Responder Preguntas* Answer Questions, and opt-ing out is the bottom right yellow button *Pagar por Ayuda* Pay for help (Private pensions website), and *No Contestar* Do

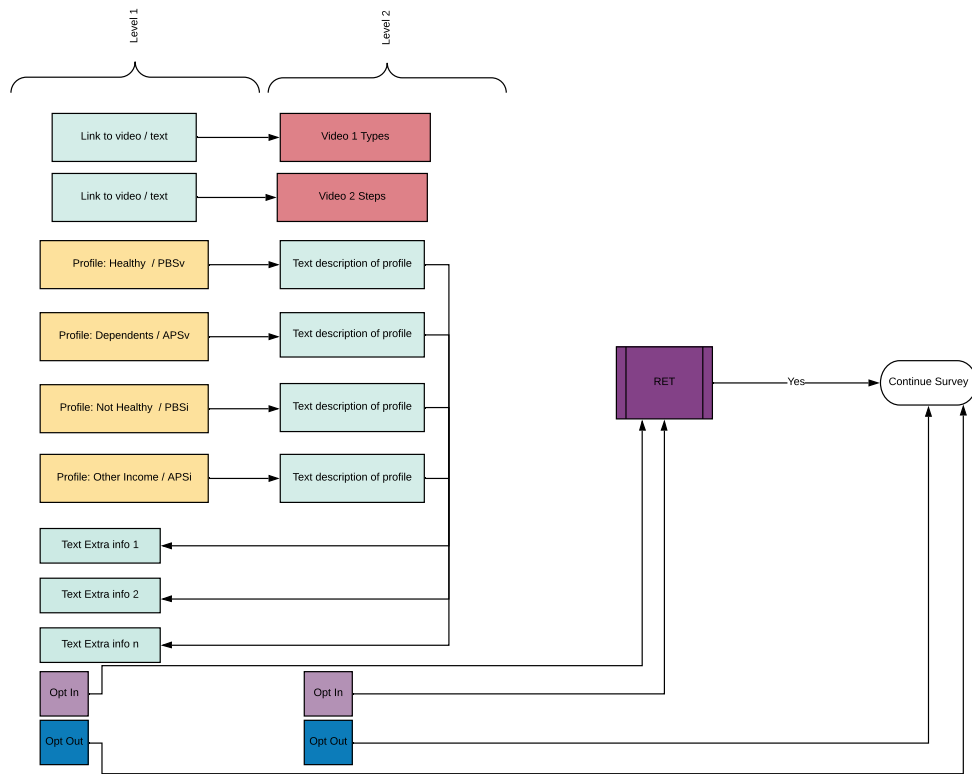


Figure 5: Product Structured Website Treatment Design

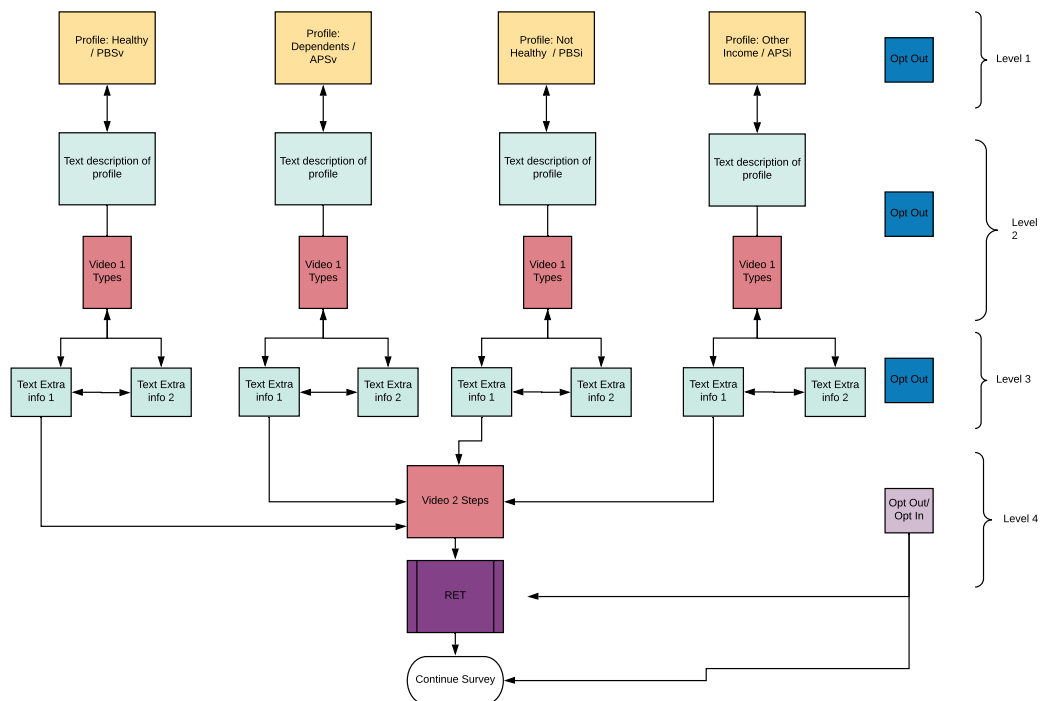


Figure 6: Profile Structured Website Treatment Design.

not Answer (Public pension website). The study collects process tracing information on

how long the participant browses their treatment prototype.

The Real Effort Tasks If participants chose to go through the RET they have to answer a series of questions related to the content of the website they just observed. Both real effort tasks include a set of 7 multiple choice questions, that have one correct answer. The questions are different content wise across treatments, **but qualitatively validations of the questionnaire suggest they are equivalent in terms of effort and difficulty (see online appendix).**¹² Correct responses are monetarily incentivized at 500 CLP (approx 0.5 USD) per correct response and participants can go back and forth, looking for answer in the treatment prototype, if they are willing to spend the time.

Opting-out of the RET The participant can skip the RET if they are not interested in making the extra effort but still want to get paid for completing the survey. To make it incentive compatible with the retirement process, in the experiment this decision has a cost. In the Public pensions the cost forfeiting the additional payment, as people would if they don't apply to the Public benefits. In the Private pensions, opting-out of knowing something about the retirement alternatives does not imply forfeiting benefits, rather it means one has to pay for someone else to make the decisions for us. This has a risk, as the other person does not for advice (or not getting retired) and that has a risk. During 2018-2019 only **[XXXX confirm number]** of the pensioners that paid for advice selected one of their top-three pension providers [Duch et al. \(in print\)](#). For this reason, participants that opt-out do so at a risk of: **[“a 0.8 probability of getting all the questions correct (i.e. maximum payoff) and a 0.2 probability of getting half of the questions correct (1/2 payoff)”]**. For all treatments, there is the alternative of opting out completely, as in closing the browser, to reduce this potential source of attrition we have included a high monetary compensation for completing the survey.

Microreplications

Following the discussion on replicability ([Camerer et al. 2016](#), **[Add Others]**), generalizability **[add references]** and the importance of incorporating a multi-modes approach to account for experiment-measurement error ([Duch et al. 2020](#)), this study incorporates two micro replication strategies:

Experimental modes

- We conduct a fully **[Block?]** randomized version of the experiment on a convenience sample of Spanish speaking university students at the Economic Science Laboratory, Eller College of Management, University of Arizona. In this version of the experiment participants will be provided with a hypothetical profile and asked to go through the website on the basis of that profile.
- An online field version of the experiment on the target population of Chilean residents aged 50 or above that have not yet retired. In the field version participants will self select on to the website of choice to provide content that is relevant for their retirement process. Before participants reach the treatment interventions they are told there are a series of questions one should ask oneself when going through the retirement process. These 10 questions provide a context and useful insight

¹²For exact wording of the questionnaire please see the Github repository.

for the participant before entering a given treatment website. At the end of that section of the questionnaire, participants are informed that there are two roads to retirement, one is through the private pension system and the second is through the public (with the restriction that public benefits are only available to people in the lower 60% of income). They are then asked to select which pension website they'd like to visit and self-select into the one they prefer. The self-selection aspect limits the comparability of the Public and Private pension samples, however, it adds an important 'just in time' financial literacy intervention element to the target population of future retirees. For them it is important to receive information that is appropriate to their retirement alternatives.

Summary of variables of interest

To summaries, in this study we collect data on a series of behaviours. 1) **Attention**, by measuring the time spent on the prototype. 2) **Emotions** through the use of a **Noldus Facereader?**, www.noldus.com, a face reading software that analyzes facial expressions, and measures the degree of conformity with the six basic universal emotions (Ekman & Friesen 1986, Ekman 2007, Nguyen et al. 2014): fear, happiness, anger, disgust, surprise, and sadness. 3) **Knowledge** through the private pensions RET, and 4) **effort** through the public pensions RET. We also collect a series of self-reported or non incentivized tasks including: 5) Measures of what participants thought of the prototype and how complicated the information was. 6) What pension scheme they think is best for them, among the income relevant alternatives; 7) risk aversion, 8) financial literacy, 9) time discounting, 10) health conditions, and 11) potential beneficiaries.

Data analysis

We will conduct.....

1 Long term agenda

This project is part of a wider research agenda that includes following respondents real (anonymized) pension decisions for ten years.

Papers The project is a research agenda intended to publish papers on:

1. Willingness to engage with pension decisions
2. Emotions in the decision making process
3. Process tracing of complex decisions with hesitation and changes in opinions
4. Long term consequences of accessing the website prototypes on if the used a pensions advisor, what pension scheme they actually opted for, etc.

To do

- Get feedback on prototypes
- Edit videos.
- Code experiment payment (Mauricio López will program)
- Pilot experiment before may 2021
- Run full experiment before may 2022.

Potential Journals

- INTERNATIONAL JOURNAL OF FINANCE & ECONOMICS (Q2)
- JOURNAL OF BANKING & FINANCE
- REVIEW OF FINANCIAL STUDIES (Q1)

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Appendix

Acronyms

RP: *Retiros Programados* - a draw-down plan.

RVI: *Renta Vitalicia Inmediata* - an annuity.

RT-RVD: *Renta Temporal con Renta Vitalicia Diferida* - a sequential combination of a temporary draw-down plan with an annuity that starts at some pre-determined time in the future.

RVI-RP: *Renta Vitalicia Inmediata con Retiro Programado* - a simultaneous combination of an annuity and a draw-down plan.

Examples of website types

Country	Website	Reference	Link
UK	Product	Structure	Link
Ireland	Product		Link
Canada	Product		Link
Spain	Product		Link
New Zealand	Product		Link
Italy	Mixed		Link
USA	Mixed	Audiovisual	Link
Germany	Profile	Structure	Link
Australia	Profile		link

Table A.1: Table of website references reviewed April 2020. UK, USA and Germany serve as references for material for this study.

Separation of the Sample - original wording

En el Sistema de Pensiones de Chile existen dos mecanismos a través de los cuales uno puede acceder a una pensión, el sistema privado de los ahorros en la AFP y el sistema público del Pilar Solidario.

El sistema de AFP produce pensiones para todas aquellas personas que tienen ahorros en alguna AFP.

El Estado, en cambio, a través del Pilar solidario entrega pensiones básicas o aportes previsionales solidarios a aquellas personas que están en el 60% de menores ingresos del país, independiente de si tienen ahorros en la AFP o no.

A continuación le pedimos que elija **¿Cuál sitio web prefiere navegar?**

- ☐ Sitio web de pensiones del sistema de AFP
- ☐ Sitio web de Beneficios Públicos (Pilar Solidario)

Figure A.1: Question used to divide the sample in the online field experiment