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Breaking Barriers in Retirement Planning: Evidence from Colombia's Dual-Advisory Program

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Abstract

This paper investigates the impact of behavioral frictions and information provision on retirement planning through the Dual Advisory program in Colombia. The program gradually became mandatory to prevent costly mistakes and offered personalized information on switching pension plans. Using a regression discontinuity design and administrative data, we estimate the causal effects of the program on switching behavior and contribution patterns. The findings indicate that the program reduced unfavorable switches by approximately 29.5%, due to a combination of deterring would-be switchers for whom the switch would have resulted in lower expected pension (22.7%) and the information received by those who attended the sessions (6.7%). However, the program also deterred favorable switches by 10.7%. There is no evidence of the program affecting contribution frequency post-intervention.

Keywords: Information provision, retirement planning, pensions, switching cost, inertia.
JEL codes: D14, I22, G53, H55

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1 Introduction

As global population aging advances, the question of how to ensure the financial well-being of the elderly becomes a growing concern. In developed economies, defined benefit (DB) programs are under financial stress and already represent a major public expenditure in several countries. Defined contribution (DC) programs face their own challenges as workers require more active participation in decisions as relevant as enrollment, savings amounts, and choosing the right investment plans and types of payouts, among others (Choi, 2015). In developing countries, these problems are aggravated because informal employment is prevalent and long-term savings are scarce. These factors put additional pressure on non-contributory schemes and families as a backstop for inadequate pensions (Bosch et al., 2013; Banerjee et al., 2024).

Given the increasing responsibility placed on individuals, empowering consumers to make informed choices for retirement planning is crucial to improving their financial well-being. However, in developing countries, several frictions prevent consumers from maximizing their limited retirement savings. On the consumer side, individuals often exhibit a limited understanding of fundamental concepts necessary for savings and investment decisions (Hastings et al., 2013; Lusardi and Mitchell, 2011), and they frequently lack trust in both private and public insurance plans (Banerjee et al., 2024). Compounded by the complexity and lack of comprehension surrounding pension systems, consumers tend to rely on informal information sources and heuristics when making critical choices. On the industry side, reduced competition and the intricate nature of information presented in privately managed pension plans contribute to higher fees and decreased consumer mobility across plans (inertia). This inertia prevents consumers from switching to more advantageous pension plans, leading to reduced competition and welfare losses (Hastings et al., 2013; Luco, 2019).

This paper investigates the role of information provision in mitigating the negative consequences of information frictions on retirement planning. We examine this by estimating the causal effect of a publicly mandated information provision program in Colombia. The intervention, known as Dual Advisory, is an informational nudge that offers workers considering switching between available pension plans two mandatory counseling sessions. These sessions provide a free, personalized assessment of their pension prospects before switching. Between October 2016 and March 2019, the program provided information to approximately 230,000 individuals contemplating a switch between the private and public pension plans, whose combined retirement savings represented roughly 0.5-0.8% of GDP. The program's primary objective at its inception was to assist workers in avoiding costly mistakes arising from switching plans without adequate information or based on misinformation, which could

result in financial losses as high as 75% of the person's pension savings. An added benefit of the program was that, regardless of the individual's final decision following the mandatory counseling sessions, the information provided consistently demonstrated that higher contribution frequency led to improved pension outcomes.

The gradual implementation of the program provides exogenous variation to obtain causal estimates of the effects of providing financial information on retirement planning indicators. The program was implemented in three phases, starting with women aged 42 and older and men aged 47 and older, and two years later was extended to all potential switchers. Using administrative data from multiple sources, we examine the effects of the introduction of the program by comparing the switching and contribution behavior of potential and actual switchers at ages just before and just after the Dual Advisory's eligibility ages.

While the program's design is context-specific, Dual Advisory illustrates three mechanisms through which information programs can influence worker decision-making. First, although the program was free, it imposed the non-pecuniary cost of attending two mandatory counseling sessions on prospective switchers. Regardless of the potential advantages of switching, this cost may have increased individual inertia, effectively locking them into their current pension plan. Second, for those attending the sessions, the information provided increased the salience of the consequences of their actions. It consolidated complex information regarding different plans into a simplified, easily comprehensible metric: potential pension benefits under alternative plans. Third, by demonstrating not only the differences between plans but also the positive correlation between contribution frequency and pension prospects, the sessions enabled workers to learn and subsequently adjust their contribution behavior.

We find that the program reduced the total number of switches between pension plans. This result is the combination of increased inertia among people interested in switching - potential switchers- and the positive influence of information on workers' choices. On the one hand, during the first two years of the program (when participation was mandatory for selected workers), the increase in switching costs reduced the number of potential switchers by approximately 32% at the eligibility age compared to those just before. The magnitude of the effect was similar across genders (despite different eligibility ages) and across the first and second years of the program (when the eligibility age shifted). These findings are in line with a significant disincentive effect associated with mandatory counseling, leading to inertia (Luco, 2019).

Regarding the value of information, conditional on attending the sessions, the information provided had a positive impact on the likelihood of making a favorable retirement plan decision. From an econometric perspective, the observed inertia implies that standard as-

sumptions within the regression discontinuity framework fail to identify the treatment effect, as self-selection into treatment may affect the comparability of samples just before and after the eligibility threshold. We address this challenge by proposing a novel identification strategy that uses institutional knowledge and administrative data to estimate self-selection bias and identify the average treatment effect on the treated. Our estimates suggest that self-selection bias was small and, in most cases, statistically not significant. This is consistent with previous qualitative analyses showing that many switchers based their decisions on non-financial factors, such as lack of trust in private pension funds and advice from informal sources (Ministerio de Hacienda, 2014; Forero et al., 2019). We find that providing personalized information increased the probability that workers choose a plan with higher expected returns by about one-third.

Consistent with the evidence discussed by Fernandes et al. (2014), a well-timed intervention can positively affect desirable financial outcomes, particularly retirement preparedness. Back-of-the-envelope calculations suggest that the introduction of the Dual Advisory program reduced the total number of switches by 40.2%, mostly explained by a reduction in unfavorable switches (29.5%), primarily due to inertia. The reduction in unfavorable switching benefited workers who would have lost by switching, typically those with lower earnings. Unfortunately, the increase in inertia also implied a reduction in favorable switching of about 10.7%. Thus, while the overall effect of the intervention was positive for workers, the design of the program exacerbated behavioral frictions.

Interestingly, while the program effectively deterred workers from switching when it was unfavorable, it did not alter their subsequent contribution frequency. A component of the counseling sessions emphasized that higher and more consistent contributions yielded greater pension savings and retirement benefits. Utilizing an identification strategy based on the difference-in-discontinuities framework (Grembi et al., 2016), we examined whether the information provided during the sessions influenced the contribution frequency of switchers up to two years post-intervention. We found no statistically significant changes in contribution frequency. While this result may appear disappointing regarding the information provision's impact on savings behavior, we cannot exclude the possibility that the intervention enhanced workers' financial capability. This is due to the fact that potential switchers receiving information are inherently more likely to contribute than the average worker. Moreover, we are unable to account for other downstream behaviors, such as increased voluntary savings or spillover effects on the saving habits of friends and family.

Our study contributes to a growing literature that finds that the level of financial literacy is generally low, and has proven to be an obstacle to economic, social, and financial development (Xu and Zia, 2012; Lusardi and Mitchell, 2014). The Dual Advisory program

provides a unique opportunity to analyze the causal effects of a large-scale, national financial information program on retirement planning. In addition, the implementation of the program and the availability of data allow reducing potential identification problems and assess if the results are driven by factors like switching costs, information gains, and downstream behaviors.

Moreover, we can identify the effects of information on actual outcomes using administrative records of potential and actual switchers. Because retirement planning is a long-term goal, many of the papers analyzing educational interventions base their results on surveys that measure workers' intentions rather than their actual choices regarding their pension plans (Hastings and Tejeda-Ashton, 2008; Hoffmann and Plotkina, 2020; Boyer et al., 2022). We complement this literature in a context where financial information empowers workers to make more informed choices regarding their retirement plan. While financial education for retirement does not seem to have a strong effect in earlier stages of the life cycle (Harvey and Urban, 2023), our study illustrates how providing information is effective – at least in avoiding costly mistakes if not in changing saving behaviors – in the middle of the working life and at the same time keep the final decision in the hands of (more informed) workers. Furthermore, our paper also contributes to the literature highlighting the importance of providing simple information, procedures, and incentives to empower workers to engage in financial planning (Carroll et al., 2009; Cole et al., 2011; Beshears et al., 2013). In particular, the results provide evidence of how simplified information and procedures facilitate better financial decision making in developing countries, as in the cases of Chile (Fajnzylber et al., 2009), Mexico (Duarte and Hastings, 2012), and Dominican Republic (Drexler et al., 2014).

The rest of the paper is organized as follows. In section 2 we describe details of the Colombian pension system and the details of the program. Section 3 describes our empirical approach, including our identification strategy. Section 4 presents the estimation results. Finally, in section 5 we conclude.

2 Institutional background

The Colombian pension system has unique features that make it complex. Since 1994, the mandatory component of the system has been based on the competition between a defined benefit (DB) pay-as-you-go plan administered by a public pension fund (Colpensiones) and a defined contribution (DC) individual retirement account plan administered by private pension funds (AFP, Administradoras de Fondos de Pensiones). This dual system is mandatory for all public and private sector workers (including the self-employed), who must choose between the two pension plans upon initial enrollment. Workers can switch plans every five

years, up until ten years prior to reaching the minimum retirement age, which is 57 for women and 62 for men.[1]

From the workers' perspective, while contribution rates, tax exemptions on contributions and pensions, and payout options are the same in both plans, the choice of pension plan determines their pension eligibility and benefits. Workers in the DC plan receive a pension based on their savings, as long as their savings are sufficient to purchase a lifetime annuity of at least the legal minimum monthly wage. High informality rates, a rapid real growth of the minimum wage, and a low minimum retirement age relative to the life expectancy mean that many workers are unable to afford the lifetime annuity with the accumulated savings. In such cases, workers are entitled to a minimum pension equal to the monthly minimum wage once they reach the age of 62 (men) and 57 (women) if they have contributed for at least 1150 weeks (about 22 years). If workers do not qualify for a pension under the DC plan, they are entitled to receive a lump sum equal to their accumulated contributions plus accrued interest.

Workers in the DB plan receive a pension based on their contribution record and a reference wage (the average taxable earnings over the last 10 contribution years). For those with at least 1,300 weeks of contributions (about 25 years) and who are older than the minimum retirement age (57 for women; 62 for men), the pension benefit varies between 55 and 80% of the reference wage (typically 65%), depending on the time of contribution. The plan also has a minimum pension equal to the legal minimum wage.[2] As in the DC plan, workers who reach the minimum retirement age and have not accumulated enough time to qualify for a pension are entitled to receive a lump sum equal to their inflation-adjusted contributions; however, unlike in the DC plan, they are not entitled to any accrued interest.

2.1 The Dual Advisory program

The differences in pension eligibility criteria and benefit formulas between DB and DC plans created differences in expected pension benefits as a function of workers' prospects of receiving a pension. This is a key element of the system because only 25% of older adults are eligible to receive a pension (Becerra et al., 2023). Roughly speaking, those with more stable careers and higher earnings will find it advantageous to contribute to the DB plan rather than the DC plan because they will be eligible for a pension, and the DB formula typically embeds a large public subsidy that increases with income level (Bosch et al., 2015). In contrast, those with more erratic employment histories and lower earnings tend to find

[1] The details and formulas for determining pension eligibility and benefits are presented in the appendix.

[2] Due to the high incidence of the minimum wage, the minimum pension implies that the pension can reach up to 100% of the reference wage (Becerra, 2024).

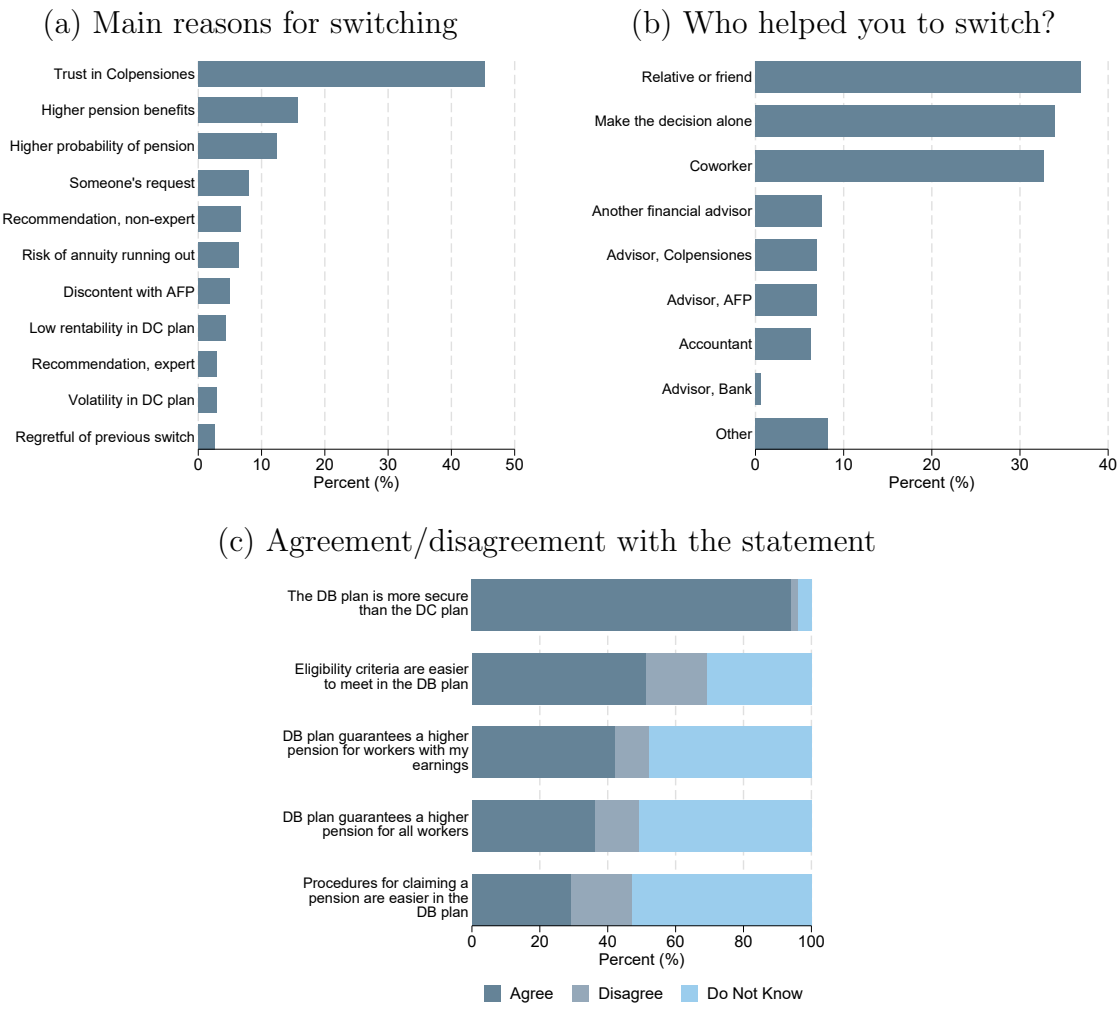
the DC plan more convenient because they can claim back their pension savings, including accrued interest, during their working lives.

Unfortunately, giving workers the choice to switch between plans without sufficient information and advice can lead many to make decisions against their best interests (Llano et al., 2013; Forero et al., 2019). Between 2010 and 2015, the most frequent plan switches observed were from the Defined Contribution (DC) to the Defined Benefit (DB) plan,[3] with approximately 116,000 workers switching annually. This resulted in a transfer of pension savings equivalent to about 1% of GDP from the DC to the DB plan. However, the characteristics of those switching from the DC to the DB plan suggested that many have a low probability of qualifying for a pension, meaning their switch would likely result in the loss of a significant portion of their accumulated pension savings (Llano et al., 2013).

Qualitative studies examining the motivations, knowledge, and sources of advice during the pension plan switching process reveal that most workers transitioning from the DC to the DB plan were driven by factors beyond expected financial gains or losses, often making decisions with limited information. This is corroborated by survey results from the Ministry of Finance (Ministerio de Hacienda, 2014), conducted among a representative sample of switchers in 2014, and presented in Figure 1. Notably, a strong preference for the public pension fund (Colpensiones) over the private pension funds (AFP) is apparent. Specifically, 45% of respondents cited trust in Colpensiones as a primary reason for switching (panel (a)), and 94% agreed with the statement "the DB plan is more secure than the DC plan" (panel (c)). Subsequent qualitative studies, such as Forero et al. (2019), highlight the significant concern regarding the risk of losing savings in the AFP, reinforcing these findings. These patterns are in line with broader literature on developing countries, where a lack of trust in private insurance, potentially derived from limited experience or knowledge of consumer rights, leads individuals to avoid private insurance or, as observed here, to favor perceived safer, government-backed plans (Banerjee et al., 2024).

Qualitative research further revealed that switchers often lacked a comprehensive understanding of the pension system. As a result, many decisions were based on misinformation or reliance on social networks. Regarding pension non-qualification scenarios, 41% of the sample were unaware that the DC plan would return contributions plus accrued interest, while 59% were unaware that the DB plan would return contributions without interest (Ministerio de Hacienda, 2014). Moreover, Figure 1 (panel (b)) illustrates that some cited motivations for switching were incorrect, such as the belief in a higher likelihood of securing a pension in the DB plan or the misconception that lifetime annuities from the DC plan could be exhausted. Panel (c) also show that many switchers' were unaware of fundamental plan

[3]Figure A1 in the appendix shows the total number of switches between plans.



Note: This figures show the results of a qualitative study to analyze the motives, knowledge, and sources of advice of switchers from the DC to the DB plan (Ministerio de Hacienda, 2014).

Figure 1: Motives, knowledge, and sources of advice during the switching process

differences, including benefits and eligibility criteria. The reliance on social interactions for decision-making was also substantial, with a majority reporting either deciding alone (34%) or relying on relatives, friends, or co-workers (37% and 33%, panel (b)).

However, while many switchers exhibited limited information and understanding in their switching process, some made more informed choices. Among the cited motivations, some responses reflected an awareness of potential benefits, such as higher pension benefits in the DB plan (16%) or concerns about low returns and volatility in the DC plan (4% and 3%). Additionally, approximately 7% of workers reported receiving assistance from advisors during their switching process.

To address the negative impact of workers making uninformed decisions about their retirement planning, the Colombian government introduced the Dual Advisory program in 2016. This is an information provision program in which advisors from both Colpensiones and the AFP provide free, personalized information to people interested in switching before they make their decision. The program was intended to be mandatory for all prospective switchers, but it was implemented gradually, depending on the age of the person. In a first stage, from October 2016 to December 2017, only men and women within 15 years of reaching the minimum retirement age (women 42 and older; men 47 and older) were required to attend the counseling sessions. In the second phase, from January 2018 to December 2018, the program was extended to women and men up to 20 years before reaching the minimum retirement age (37 and 42, respectively). Finally, in January 2019, the program became mandatory for all workers (Superintendencia Financiera de Colombia, 2016a).

Prior to the Dual Advisory, an individual interested in switching for example, from the DC plan to the DB plan, simply had to submit an application form to his or her AFP indicating the intention to switch, and the switch was made as long as the individual met the legal requirements. After the Dual Advisory, an individual must request the advisory session at either their AFP or Colpensiones, and the pension fund must provide the session in less than 20 working days. The sessions can be conducted in person, by phone or online, and the results of the session are valid for 12 months. The session must include general information about the system and their plan, and a projection of the person's likelihood of receiving a pension and either the amount of the pension benefit or the refund of their pension savings/contributions under scenarios with varying frequency of contributions: a scenario in which the person stops contributing and contributes for 6, 9, and 12 months in the following years. Typically, pension funds add an additional scenario in which the individual contributes based on their historical contribution pattern.

The measures reported in the sessions are four. In order to provide a measure of the likelihood that the person will be able to obtain a pension in simple terms, the counselor must

report in each scenario the age at which the person will be able to meet the requirements for obtaining a pension. If the person will not be able to meet the requirements by the minimum retirement age, the report will indicate that. Also, the report includes the expected time of contribution accumulated up to the age at which the person will meet the requirements. In addition, the report includes the pension benefits or refunds, if they apply. The individual must answer a questionnaire to confirm that he or she has received the information. Finally, the counselors must send the results of the session to the individual, and once the individual acknowledges that he or she has received the information from the counselors at both plans, the individual can proceed with the switch (Superintendencia Financiera de Colombia, 2016b).

3 Empirical Strategy

The design of the program influences several aspects of the consumer decision-making process. The program changed the information available to workers about their pension prospects before the decision to switch. It made salient the consequences of their actions on a simple metric, the likelihood of receiving a pension and its benefits. In addition, it also provides information about prospective contribution scenarios (no contribution, contributing 6, 9, or 12 months per year), which generally show that the benefits of contributing are higher when the person contributes more often. This new information may influence the switchers' future contribution patterns.

On the other hand, the program also increased switching costs (because people had to attend the sessions), which could increase workers' inertia and therefore, lock them into their current pension plan. In this section, we discuss how we estimate the impact of information provision through these three channels.

3.1 The data

In order to examine the impact of the Dual Advisory program on the retirement planning of the workers, we make use of two sources of administrative data:

- Data on the universe of workers interested in switching from DC to DB plans (potential switchers) between October 2015 and March 2019, collected by the AFP Association (Asofondos). The dataset is a cross-section of administrative records of 588,333 individuals who were interested in switching between pension plans, as they requested the switch and some of them actually switched. Of the total, 230,390 were required to participate in the Dual Advisory program.

In addition to information on date of birth and gender, the dataset contains information on the switching process. In particular, if the individual was eligible, the dates on which the individual attended the first and second counseling sessions, whether the worker decided to switch, and the actual date of the switch to the DB plan. The dataset also includes the variables needed to calculate expected pension benefits in both the DB and DC plans, namely the value of their individual pension savings, the time of contributions, recent earnings, and the date of entry into the DC plan.

To perform the identification checks in section 4.1, we use data on the universe of workers in the DC plan before the program was implemented (2015), collected by Asofondos. This dataset contains basic information on 13.4 million workers enrolled in the DC plan, including demographic characteristics, earnings, time of contribution, and pension savings up to 2015.

- Data on the universe of workers contributing to the mandatory social security system, as collected by the Colombian Ministry of Health (PILA by its Spanish acronym) from 2011 to 2019.[4] The dataset is a monthly longitudinal linked employer-employee dataset and includes, in addition to date of birth and gender, information on the pension plan to which workers contribute and the range of their taxable earnings. PILA does not include information on workers' employment history, such as pension savings or time of contribution.

  Based on PILA, we construct a longitudinal dataset of switchers from the DC to the DB plan. To do so, we exploit the fact that PILA reports a worker's pension plan, and we identify switchers based on whether they start reporting the DB plan code instead of the DC plan codes. To eliminate spurious transitions, we exclude cases where the worker switched more than once in less than 5 years, as this is not allowed by law.

  Compared to the data on potential switchers reported by Asofondos, we are able to follow workers over time, but we have less information about their contribution history. In addition, we can only follow actual switchers, which excludes those who attended counseling sessions and did not switch. In Figure A4 in the appendix, we show how the time trends of the population of switchers in PILA closely follow the trends in the administrative data.

[4]Since contributions to the social security system (health, pension, and occupational safety and health) are mandatory for all workers in Colombia, PILA represents the universe of formal sector workers.

3.1.1 Expected pension benefits

A necessary step in assessing the impact of the information for these workers is to know the pension prospects of a potential switcher. To do this, we build on the information in the Asofondos dataset and use the procedures of the *Superintendencia Financiera de Colombia*, the institution that regulates the AFP, to construct estimates of the expected time of contributions and pension savings at retirement age. Using these estimates and pension eligibility rules, we construct the probability that workers will receive a pension in both plans and the potential gains from switching (both at the minimum retirement age). Since we follow the official guidelines, the information we obtain is very close to that reported by the AFP and Colpensiones.

The Superintendencia mandated that the pension funds provide scenarios of pension prospects, assuming that the person stops contributing at the moment of switching, and that contributed by 6, 9 or 12 months per year (Superintendencia Financiera de Colombia, 2016a). Pension funds have included an additional scenario with an estimate that takes into account the worker's individual contribution frequency. According to these rules, for a potential switcher i at age a, the expected time of contribution and pension savings at the minimum retirement age (R) are given by

$$time^{e}_{i,R} = time_{i,a} + \cdot\phi_{i,a}\,(R-a) \tag{1}$$

$$savings^{e}_{i,R} = savings_{i,a}\cdot(1+r)^{R-a} + \phi_{i,a}\cdot 0.115\cdot 12\cdot w_{i,a}\frac{1-(1+r)^{R-a}}{r} \tag{2}$$

where $time_{i,a}$, $savings_{i,a}$, $w_{i,a}$ are the accumulated time of contributions, pension savings, and monthly earnings as reported in the administrative data, 0.115 is the statutory contribution rate for individual accounts, and r is the real interest rate on savings contributions (which we set to $r = 0.04$ as it is commonly used by the simulators). The parameter $\phi_{i,a}$ refers to the future attachment of workers to the pension system, and it is the one that determines the simulation scenarios ($\phi_{i,a} \in \{0, 6/12, 9/12, 1\}$ for each potential switcher). In what follows, we report results based on each potential switcher's historical contribution frequency, defined as the ratio of the current contribution date to the time the person has been enrolled in the DC plan.

Using these variables, we compute the expected pension benefits or contribution refunds for each worker using the formulas discussed in the appendix. Let $B^{db}_{i,R}$ and $B^{dc}_{i,R}$ represent the present value of the pension benefits or refunds expected at age R in the DB and DC plans, respectively.[5] Based on this information, we define that an individual finds it advantageous

[5]Note that, as we discuss in the appendix, $B^{db}_{i,R}$ and $B^{dc}_{i,R}$ may differ from an individual's pension savings - even in the DC plan - because some of them will be entitled to a minimum pension, and workers who do

to switch from the DC plan to the DB plan if $B^{db}_{i,R} > B^{dc}_{i,R}$. If $B^{db}_{i,R} = B^{dc}_{i,R}$, then the DC plan is more advantageous to the potential switcher because the DC plan requires less time to contribute to secure a pension.

3.2 Estimating the effects of the program

Because we are interested in the different effects of providing information on retirement planning, we implement three identification strategies. Specifically, we analyze the effects of the Dual Advisory program on workers' intentions to switch pension plans, the probability of individuals making an optimal switching decision, and the downstream effects on switchers' contribution patterns.

First, to estimate the effect of the program on workers' intentions to switch, we compare the changes in the distribution of potential switchers below and above the eligibility age (at the time of requesting the switch or switching). If there is no other institutional or economic mechanism to explain a jump in the distribution around the eligibility age, the difference is an estimate of the effect of the switching costs from the information provision program on the intention to switch.

We estimate the effects on intention to switch by testing for changes in the distribution of potential switchers by age using the estimator developed by Cattaneo et al. (2020). The underlying assumption in our strategy is that the distribution of observable and unobservable determinants of intention to switch (e.g., preferences, prior financial literacy, perceived gains from switching) evolves smoothly around the eligibility threshold (Imbens and Lemieux, 2008). While this assumption is not directly testable, we provide suggestive evidence that this may be the case in the identification checks and estimation results.

Second, in order to estimate the effect of the information on current and future financial outcomes, our research design must account for potential self-selection into the treatment due to switching costs and information exposure. Intuitively, if the program's switching costs or information systematically discourage certain groups of workers, for example, by preventing workers with low gains from attending the counseling sessions, then comparing the outcomes of interest of individuals just below and just above the eligibility age will not identify the program's effects. In both of our datasets (Asofondos and PILA), while workers who were not eligible for the Dual Advisory program were not exposed to either switching costs or information, we observe those eligible for the program who either intended to switch despite the switching costs (potential switchers, Asofondos) and switched after receiving information (actual switchers, PILA).

not receive a pension in the DB plan are not entitled to accrued interest.

We discuss the identification problem in a general setting because the problem is similar in both cases. Our goal is to understand whether providing information has an effect on retirement planning outcomes. Let y_i be an indicator of i's outcome of interest, and let d_i be an indicator of whether the individual receives information, defined as $d_i = 1_{\{z_i \geq z_0\}}$ (z_i is the age at which the individual intended to switch).

Using the potential outcomes notation, we have that $y_i = y_{0i} + d_i (y_{1i} - y_{0i})$, where y_{1i} and y_{0i} represent the value of y_i if i receives information and if i does not (Hahn et al., 2001). Since our assignment variable may affect the take-up behavior of i, the continuity assumption on the conditional expected value function is not sufficient to identify the effect of the program (Imbens and Lemieux, 2008). To see this, let x_i denote an indicator variable for whether i is willing to take the program in order to switch. Since we have a sample of potential switchers, $x_i = 1$ for those with $z_i \geq z_0$, and x_i can be 0 or 1 for $z_i < 0$. In this scenario, the mean difference in outcomes around $z_i = z_0$ is

$$\begin{aligned}
\Delta &= \mathbb{E}(y_i \mid z_i = z_0 + e) - \mathbb{E}(y_i \mid z_i = z_0 - e) \\
&= \mathbb{E}(y_{1i} - y_{0i} \mid z_i = z_0 + e) + [\mathbb{E}(y_{0i} \mid z_i = z_0 + e) - \mathbb{E}(y_{0i} \mid z_i = z_0 - e)] \\
&= \mathbb{E}(y_{1i} - y_{0i} \mid z_i = z_0 + e, x_i = 1) + \mathbb{E}(y_{0i} \mid z_i = z_0 + e, x_i = 1) \\
&- \mathbb{E}(y_{0i} \mid z_i = z_0 - e, x_i = 1) P(x_i = 1 \mid z_i = z_0 - e) \\
&- \mathbb{E}(y_{0i} \mid z_i = z_0 - e, x_i = 0) (1 - P(x_i = 1 \mid z_i = z_0 - e)),
\end{aligned} \tag{3}$$

and our comparison of outcomes just before and after the eligibility threshold identifies the effect of providing information on retirement planning for those who participate in the program (an average effect of the treatment on the treated, ATT) plus a term affected by the self-selection into the treatment.

In the appendix we show that, when the conditional expected value functions are continuous around $z = z_0$, the self-selection term does not vanish as $e \to 0^+$. We use our knowledge of the program and additional information to identify the ATT of the program. Our strategy depends on the effect we want to estimate and the dataset we are analyzing:

- We first focus on our sample of potential switchers. To identify the average effect of providing information on the probability that the worker choose the plan with the higher gains (either to switch because their gains from switching are positive or not to switch because their gains are negative), we directly estimate the bias implied by self-selection into the treatment (i.e., we estimate $\lim_{e \to 0^+} \mathbb{E}(y_{0i} \mid z_i = z_0 + e) - \mathbb{E}(y_{0i} \mid z_i = z_0 - e)$). In equation (3), the bias term represents the difference in the probability of choosing the plan with the higher gains in the absence of information between the groups just above and just below the eligibility threshold.

To estimate the bias term, we note that in the absence of the program, the probability that a potential switcher would choose the plan with the higher gains is reduced to the probability that his or her expected gains in the DB plan were greater than the gains in the DC plan. Since we have information about their expected gains, we can calculate this probability and test if there is a change around the age of eligibility ($z = z_0$). The change would give us an estimate of the magnitude and direction of the selection bias.

- Next, we focus on our longitudinal sample of actual switchers. In this case, we want to identify the effect of providing information on the contribution frequency of workers after they switch. The bias term represents the difference in the contribution frequency of switchers around the discontinuity in the absence of information.

  In contrast to the identification strategy for potential switchers, we cannot directly estimate the bias term in this case. Therefore, we take advantage of the longitudinal nature of our data and estimate the bias term by using the differences in contribution frequency at the discontinuity before the switchers received the information (a difference in discontinuities design, Grembi et al. (2016)). As long as these differences are stable over time, we can estimate the bias effect and the ATT.

  We describe additional details of our difference in discontinuity strategy in the appendix.

To estimate the effects described in this section, we implement local polynomial estimators using as dependent variables the indicator variables of whether the potential switcher chose the plan with the higher gains, whether the potential switcher had a gain from switching, and the time contributed to the system after switching, and as continuous variables the age of the person at the time of application or switching computed from the date of birth.

4 Results

4.1 Summary statistics

We present summary statistics of the variables in the Asofondos dataset in Table 1. The table shows the number of potential switchers over time, their demographic characteristics, the variables used to compute expected pension benefits at the time of switching, and the projected gains from switching (section 3.1.1). Although the dataset has information on 588,333 potential switchers, we exclude observations for which we found either inconsistencies

or missing information.[6]

Our sample includes 487,079 potential switchers, mostly concentrated in the years when the program was phased in (2016-18). The savings that these workers would transfer to the DB plan represent between 0.54% and 0.86% of GDP per year (between 2.4% and 3.6% of the AFP's assets under management). About half of the potential switchers are women, and most of the potential switchers are workers aged 40 and over.

The pension system variables suggest that many of the workers in the sample may face a loss of pension savings by switching from the DC to the DB plan. Despite being relatively old, the typical potential switcher tends to have a few years of contributions, 10.9 years, and has contributed 71% of the time enrolled in the system. The median monthly earnings reported in the system is about US$900 (PPP), and their median pension savings is just about US$19,000 (PPP). Workers at the top of the distribution of these variables tend to show a positive correlation between earnings, attachment to the system, and consequently higher pension savings and years of contribution. Unfortunately, there are some workers who perform poorly on the same indicators, and they are the ones who are more likely to lose a significant portion of their pension savings by switching.

About one-third of the sample (177,495) participated in at least one session of the Dual Advisory program. Consistent with a substantial proportion of potential switchers being at risk of losing some of their pension savings, our projection of gains at the minimum retirement age indicates that 48% of workers would face losses in pension savings by switching, while 17.5% would receive no improvement in pension amount because they would receive the minimum pension in both plans. The losses can be substantial. Workers in the first decile of the distribution of switching gains face a loss of 74% of their pension savings. Although the average gains from switching are 8% of pension savings, the result is driven by workers who would receive a significant subsidy from the DB plan. For example, workers in the top decile of the distribution of switching gains face an expected gain of at least 127% of their pension savings.

While there is a positive correlation between pension savings and contribution history, the expected gain or loss from switching varies widely depending on earnings, attachment to the pension system, the timing of the contribution decision, and the nonlinearity of pension benefit formulas. This is the case we show in Figure 2, where we plot the probability of reporting positive gains from switching (left panel) and the distribution of potential switchers

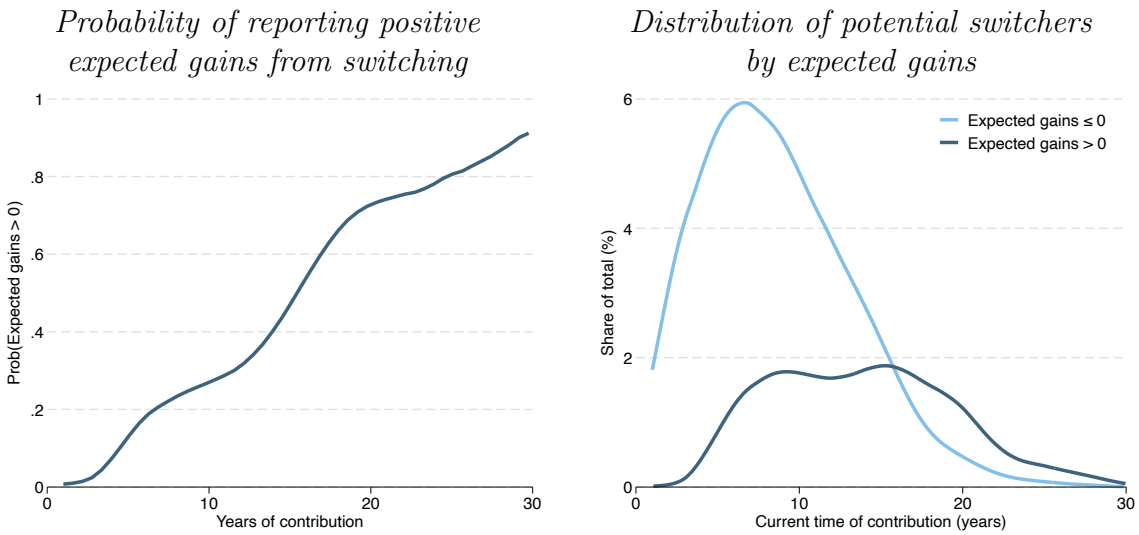
[6]In particular, we exclude cases of workers who were younger than 20 or older than 47 or 52, workers with years of contribution greater than their years of enrollment in the system, workers with pension savings below one month of the minimum contribution and workers with extremely high savings, and workers with no reported earnings. In addition, we trim outliers of pension savings based on the residuals from a regression of log pension savings against years of contribution, cohort, and time fixed effects by gender.

A. Demographic characteristics						
Female (%)	46.93					
Age groups (%)						
20-30	9.42					
30-40	37.93					
40+	52.65					
B. Potential switchers per year		*C. Pension savings (% of GDP)*				
2015 (Q4)	35,825	2015 (Q4)	0.16			
2016	115,510	2016	0.54			
2017	118,638	2017	0.61			
2018	159,531	2018	0.86			
2019 (Q1)	57,575	2019 (Q1)	0.31			
Total	487,079					
D. Pension plan variables						
	Mean	p10	p25	Median	p75	p90
Years of contribution	10.9	4.0	6.4	10.1	14.6	19.0
Years of cont/Years enrolled (%)	71.1	33.8	54.6	76.8	92.2	98.0
Monthly earnings (USD PPP)	1,553	531	602	927	1,781	3,320
Pension Savings (USD PPP)	32,873	5,245	9,677	18,962	37,542	72,668
E. Dual advisory variables						
Participants	177,495					
	Mean	p10	p25	Median	p75	p90
Gains from switching (%)	8.0	-74.0	-50.1	0.0	40.2	127.3
	< 0	$= 0$	> 0			
Distribution of gains (%)	48.03	17.48	34.49			

Note: The table presents summary statistics for prospective switchers from the DC to the DB pension plan. We restrict our sample to workers with complete information and without data inconsistencies. The table provides the distribution of potential switchers by demographic characteristics, as well as observed variables related to the DC pension plan and projected gains from switching.

Table 1: Summary statistics, potential switchers (Asofondos) data, 2015-19

(right panel) as a function of years of contributions between October 2015 and September 2016. The probability of reporting positive gains from switching is concentrated among workers with longer contribution histories, as they are likely to secure a pension in the DB plan and receive the subsidy. However, as shown in the right panel, there is significant overlap between the distributions of years of contributions of switchers who gain and those who lose from switching. Unless the individual belongs to the small share that have a strong attachment to the formal sector and high earnings, relying on heuristics such as the experience of other workers with similar current employment histories (e.g., years of contributions or earnings) may not be sufficient to predict the future worker's gains from switching.



Note: The figures show the probability that a potential switcher reports positive expected gains (left) and the distribution of switchers by expected gains (right) as a function of the years of contributions in the DC plan (horizontal axis). The distributions are calculated based on Asofondos data from prospective switchers between October 2015 and September 2016, before the Dual Advisory program began.

Figure 2: Gains from switching from the DC to DB plan by years of contribution, 2016

4.1.1 Identification checks

The key assumption in our identification strategy is that the underlying determinants of the decision to switch evolve smoothly around the Dual Advisory's eligibility threshold. Thus, in the absence of the information provision program, the conditional expectation and density of our outcomes of interest would have been continuous around the eligibility age.

While the identification assumptions cannot be tested directly, the standard approach in the literature on regression discontinuity design is to provide indirect evidence of the plausibility of the design by conducting falsification tests based on the characteristics of the program, such as testing for changes around the age of eligibility into the program for variables determined before the treatment took place. A second standard practice is to test for manipulation of the assignment variable by potential participants to get into/out of the program (Cattaneo and Titiunik, 2022).

To gather evidence on the plausibility of our identification assumptions, we use data from the universe of workers enrolled in the DC plan through December 2015, almost a year before the Dual Advisory program began. In this dataset, we have information on variables that determine workers' expected benefits and gains from switching, such as earnings, years of contribution, and pension savings. We look for changes around the eligibility threshold in

both the distribution of workers by age and the determinants of pension prospects before the reform, as they would suggest that there may be other institutional factors driving our results.[7]

A feature of our design is that assignment to the program was based on age, and was phased in over two years (October 2016 to December 2018). It is not possible to set a unique eligibility threshold because it changes over time as more workers become eligible each month.[8] Nevertheless, we illustrate our approach by comparing changes in the distribution by age as of October 1, 2016, the first group eligible for the program. Our results are presented in Table 2 and the graphical evidence is presented in the appendix. The estimates show that there are no significant jumps around the eligibility threshold, consistent with the idea that the distribution of determinants of workers' retirement planning evolved smoothly around the eligibility threshold prior to the start of the program.[9] The only exception is a significant estimate for years of contribution for men. While this poses a challenge to our identification strategy, the result is driven more by the variability of years of contribution around the age of 40 than by any actual systematic difference between those to the left and right of the eligibility threshold. In particular, the results are highly sensitive to the choice of the eligibility threshold and fail the placebo tests at ages where we should not expect jumps in the distribution.

We also run tests for manipulation in the running variable. As Figure A3 in the appendix shows, the data follow a regular seasonal pattern that makes testing for manipulation in the assignment variable difficult. When we use the Cattaneo et al. (2020) estimator to assess potential manipulation in age, we find that the test tends to reject the null of no manipulation over almost the entire support of the distribution, suggesting that the results are driven by the seasonal patterns from the data and not by any particular characteristic around a particular eligibility age.

[7]The full dataset includes information on 13.4 million enrollees. Using age as of December 31, 2015, we exclude cases with ages below 20 and above 47 (women) or 52 (men) (approximately 6.4 million observations). In addition, we exclude cases with few years of contributions (less than one year, about 1.8 million enrollees), as they usually refer to workers who either enrolled and never contributed or contributed but there are inconsistencies in their records. Finally, we also trim pension savings with very low or very high values conditional on a person's cohort and years of contribution by gender.

[8]The age eligibility thresholds were announced at the end of April 2016, were effective in October 2016, and changed in January 2017.

[9]For the RD estimation, we use the robust estimators developed by Calonico et al. (2014). In all cases, we fit a linear polynomial regression ($p = 1$) to find the estimates and a quadratic regression ($q = 2$) to estimate the bias term, and use a triangular kernel.

Dependent variable	Men		
	Earnings (logs)	Years of cont.	Pension savings (logs)
RD estimate	0.0072	0.1198	0.0189
	[0.0057]	[0.0599]**	[0.0127]
Observations	2,311,114	2,311,114	2,311,114
Robust 95 CI	[-.004; .018]	[.003; .237]	[-.006; .044]
Bandwidth (years)	2.2	1.7	1.7

Dependent variable	Women		
	Earnings (logs)	Years of cont.	Pension savings (logs)
RD estimate	-0.0013	-0.0203	-0.0096
	[0.0057]	[0.0506]	[0.0112]
Observations	1,627,068	1,627,068	1,627,068
Robust 95 CI	[-.012; .01]	[-.12; .079]	[-.032; .012]
Bandwidth (years)	2.1	1.8	1.9

Notes: This table presents the estimation results of testing factors that challenge the validity of the assumptions required for the implementation of the identification strategy discussed in section 3.2. The table presents regression discontinuity (RD) estimates, which are used to assess other potential changes that may confound the estimated effect of the policy. The variables analyzed include the log of earnings, years of contributions, and the log of pension savings. In all cases, we use the robust estimators proposed by Calonico et al. (2014), employing a local linear regression ($p = 1$), a quadratic regression to account for potential bias ($q = 2$), and a triangular kernel. Standard errors in brackets. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2: Balance checks, 2015

4.2 Effects of the program

The previous sections suggest that choosing the right pension plan is a complex, case-by-case decision. This complexity is exacerbated by the fact that workers may not have sufficient financial literacy and information to make the right decision on their own.

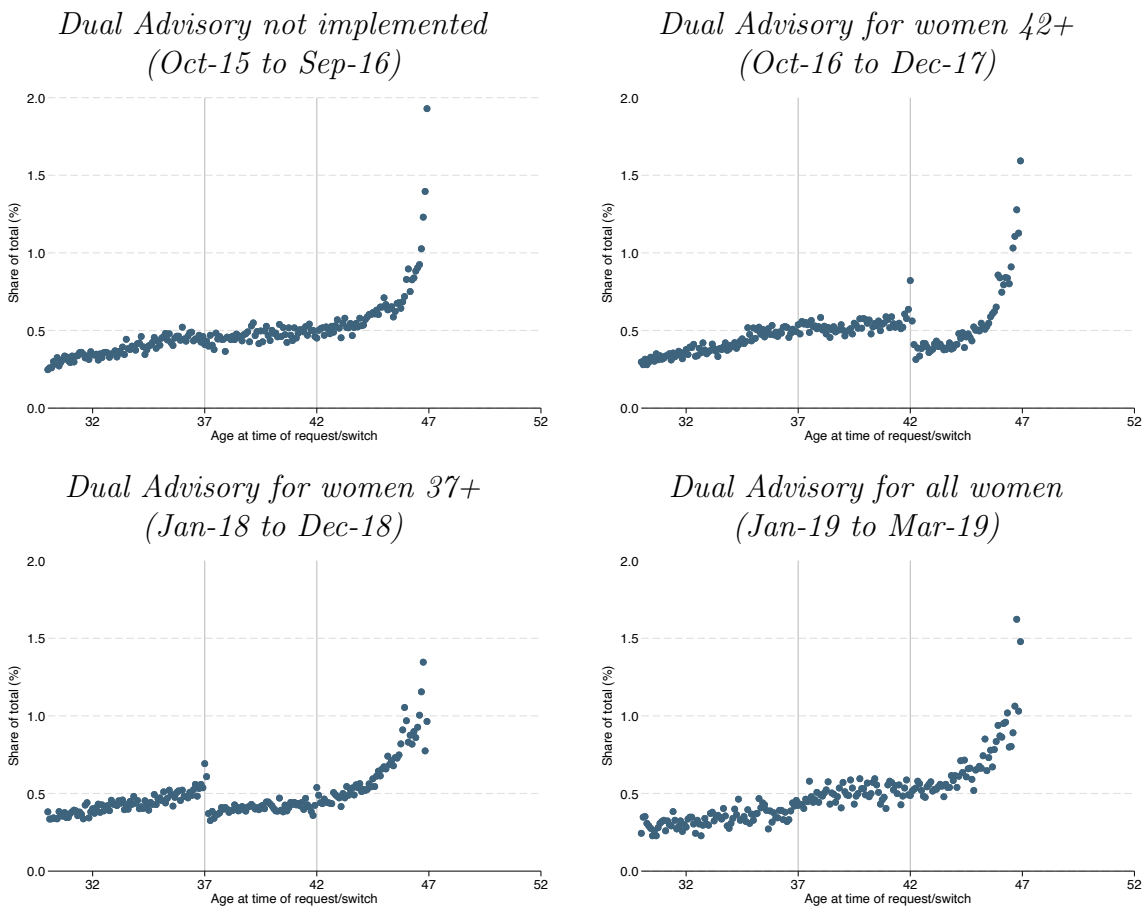
We divide our discussion of the results into three parts. First, we examine the impact of the program on workers' inertia in seeking to change their pension plan. Next, conditional on workers' participation in the program, we measure whether the information provided in the counseling sessions led potential switchers to make better decisions. Finally, we examine whether providing information affected downstream behavior.

4.2.1 Effects of switching costs on the interest to switch

Our first goal is to understand whether the increased switching costs resulting from introducing the program discourage workers from trying to switch between the DC and DB programs. While the counseling sessions are free, workers have to go through bureaucratic formalities that may increase their opportunity costs. For example, they must schedule an appointment with advisors from both plans and take the time to attend the sessions, which last between 20 and 40 minutes each. Workers have suggested that counseling could be provided by only one neutral counselor (Forero et al., 2019), but the design of the counseling sessions has the advantage of reducing potential misalignment of financial advisor incentives.

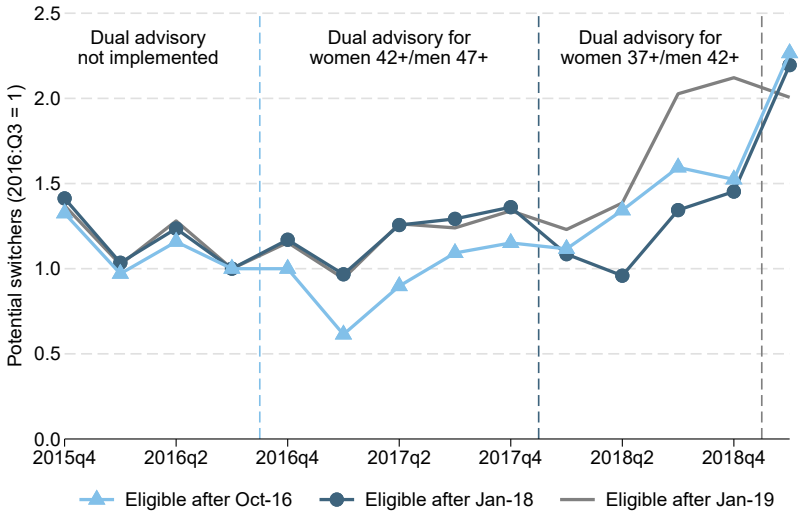
To estimate the effect of switching costs on individual inertia, we examine the distribution of potential switchers after Dual Advisory took place. Figure 3 shows the distribution of potential switchers by age at the time of the switching request or the effective switching (in months) obtained from the Asofondos data. We present the distributions for women, while the graphical evidence for men is presented in the appendix. We divide the sample into four periods based on the stages of implementation of the Dual Advisory program. As the second and third panels in the figure show, the introduction of the program led to a visible reduction in the number of potential switchers just around the eligibility threshold. This behavior holds when the eligibility age changes from 42 to 37, and is not present either in the pre-program periods (when no one had to take the counseling sessions) or after the program became mandatory for all applicants. As we show in the appendix, the results are similar for men, even though they face different eligibility ages.

While Figure 3 shows evidence of a change in the distribution of potential switchers around the Dual Advisory eligibility threshold, it is still possible that this result is explained by an anticipation effect of younger switchers avoiding the switching costs. To address this, Figure 4 presents the time trends in the number of potential switchers for eligible cohorts



Notes: This figure uses Asofondos data to present graphical evidence testing whether the increase in switching costs from the Dual Advisory program discourages individuals considering switching their pension plans. Each panel shows a phase of implementation of the program. Within each panel, the dark dots represent the share of potential switchers by age at the time of requesting the switch (in months, horizontal axis). Vertical lines indicate the eligibility thresholds defined by regulation in the phases of the program.

Figure 3: Distribution of potential switchers by age. Women, 2015-2019



Notes: This figure uses Asofondos data to gather evidence of whether the change at the discontinuity age reported in Figure 3 is explained by an anticipatory behavior from younger switchers. The Figure displays the time trends of potential switchers by cohort for eligible cohorts across different program phases. We normalize the number of potential switchers by their observed value in the third quarter of 2016, just before the start of the program.

Figure 4: Time trends of potential switchers

across different program phases. We normalize the number of potential switchers by their observed value in the third quarter of 2016, just before the start of the program. The figure shows a decline in the number of potential switchers within eligible cohorts at the onset of each program phase, suggesting that the observed results in Figure 3 are explained by a reduction in the number of individuals seeking to switch, driven by the increased switching costs.

The graphical evidence suggests that the additional opportunity cost imposed by the program increased the inertia of workers interested in switching and kept more workers in the DC plan. In addition, the isolated jump around the eligibility threshold for those just below the eligibility threshold suggests that some workers may have anticipated the intervention and attempted to switch before the program was mandatory for them, consistent with the idea that switching costs were a factor that workers sought to avoid.

In addition to the graphical evidence, we also use the test proposed by Cattaneo et al. (2020) for testing the continuity of the density of the running variable (age) around the eligibility cutoffs.[10] We exclude potential switchers with an age within one month of the eligibility cutoff, as the graphical evidence shows potential anticipatory behavior. The results

[10]We also implemented the density test proposed by McCrary (2008) and obtained similar results.

Cattaneo et al. (2020) density test

Phase	Oct-16/Dec-17		Jan-18/Dec-18	
	Women	Men	Women	Men
Test statistic (Robust)	-3.1137	-2.0326	-5.5337	-4.0583
p-value	.0018475	.0420937	3.14e-08	.0000494
Eligibility age	42	47	37	42
Effective observations	6,531	5,859	13,975	12,466
Est. Bandwidth (left)	1.009	.8823	2.434	2.369
Est. Bandwidth (right)	.9991	.8713	1.764	1.723

Note: This table uses Asofondos data to test whether the increase in switching costs from the Dual Advisory program discourages individuals considering switching pension plans. The table presents the results of testing for discontinuities in the distribution of potential switchers by age at the moment of requesting to switch around the Dual Advisory eligibility age. Each cell corresponds to the robust test statistic proposed by Cattaneo et al. (2020), using a local quadratic regression ($p = 2$), a cubic regression to account for potential bias ($q = 3$), and a triangular kernel.

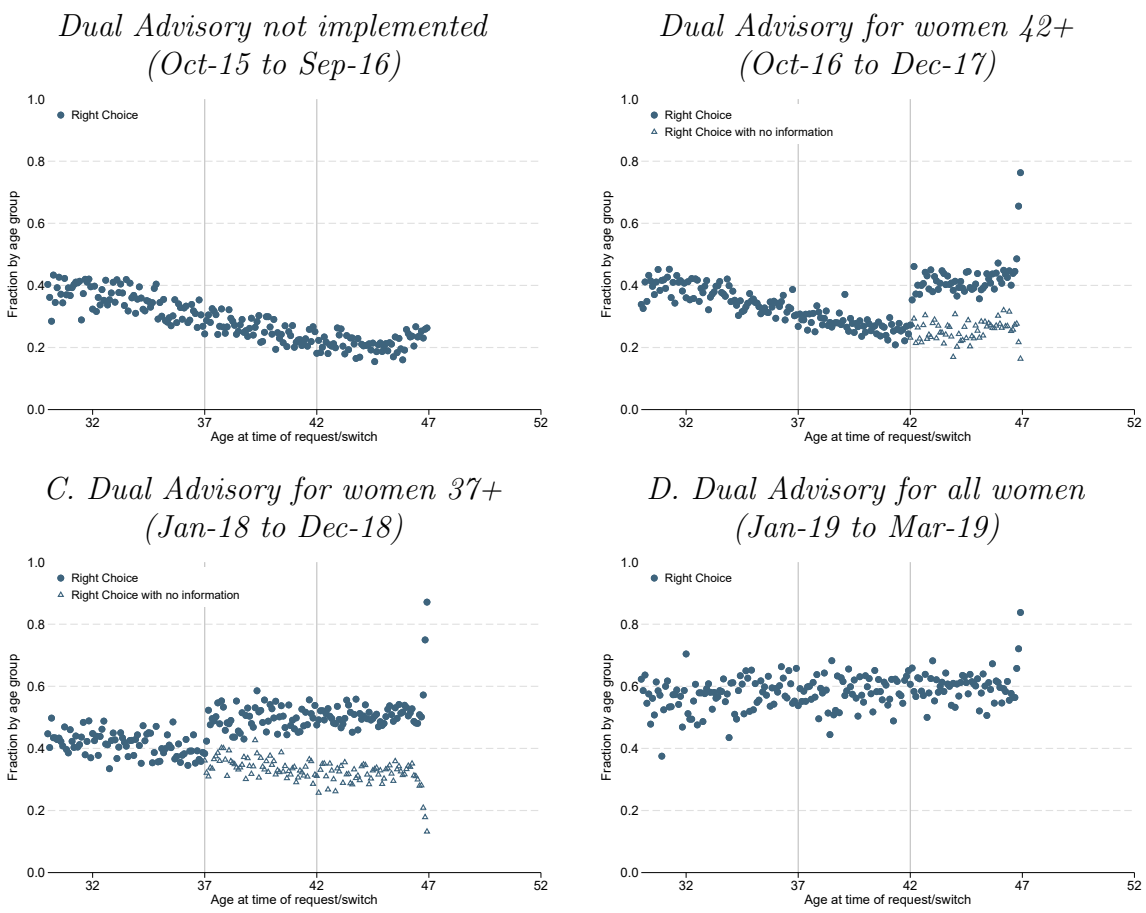
Table 3: Effects of increasing the switching cost on potential switchers

are presented in Table 3, where we evaluate the null hypothesis that the density of age is continuous around the program eligibility age. In all cases, we find a significant decrease in the density around the eligibility threshold.

Taken together, our results suggest that the program increased workers' switching costs and inertia. Based on a local regression using the data from Figure 3, we estimate a reduction in the number of potential entrants around the eligibility threshold between 32.3% and 35.2% (on average, 33.4%). In the context of retirement planning, this evidence is consistent with the results presented by Luco (2019), who finds that both decision costs (e.g., the time and effort required to gather information and make a choice) and bureaucratic costs (e.g., administrative hurdles in switching plans) significantly influence workers' inertia in switching between pension funds in Chile. This, in turn, hampers competition among pension fund providers and raises equilibrium fees. While our context is different, our results highlight how switching costs and behavioral factors can play a central role in workers' financial outcomes by preventing them from acquiring valuable information.

4.2.2 Effects of providing information on switching decisions

Next, we analyze the direct effect of providing information on the main goal of the program: preventing workers from choosing a plan that could reduce their future pension savings. In the following, we focus on the sample of potential switchers from the DC to the DB plan and analyze whether the information provided with the Dual Advisory changed the likelihood of choosing the pension plan with the higher expected returns.



Notes: This figure uses Asofondos data to test whether the information provided in the Dual Advisory program increases the probability that workers choose the plan with the higher expected gains. Each panel shows a phase of implementation of the program. For each age (in months) the graph shows the share of individuals who choose the plan with the higher gains for them, i.e., either to switch because their gains were positive or not to switch because the gains were negative. For potential switchers beyond the age of eligibility, the hollow triangles represent the share of individuals by age for whom the gains from switching are positive, making it convenient for them to switch even with no information.

Figure 5: Effects of information provision on switching decisions. Women, 2015-2019

Figure 5 shows the graphical representation of the identification strategy discussed in section 3.2. Again, we focus on women; the figures for men are in the appendix. In the figure, we plot, for each age (in months), the share of individuals who choose the right plan for them. For the population groups that were not eligible to receive information, all individuals in our sample switched (i.e., chose the DB plan), and therefore choosing the right plan for them only occurs if their expected gains from switching were positive. In contrast, for those who received information, choosing the right plan means either switching because their expected gains were positive or not switching because the expected gains were negative. This is our main outcome of interest. For potential switchers beyond the age of eligibility, the figure also shows the proportion of individuals by age for whom the expected gains from switching were positive (hollow triangles), making it convenient for them to switch even without information. Thus, the comparisons between the dark circles just below and above the eligibility age give us the overall effect of the program, and the comparisons between the dark circles just below and the triangles just above identify the selection bias.

The first notable pattern reported in Figure 5 is that the likelihood of potential switchers reporting positive expected gains is stable by age, and is very similar for those receiving information (hollow triangles). This result is in line with the idea that the workers' motives, knowledge, and sources of advice during the switching process have a low correlation with the expected gains from switching. In such a case, switching costs may affect the behavior of individuals across the distribution of expected gains, which would imply a moderate selection bias.[11] In addition, providing information played a positive role in guiding workers to make better decisions, as individuals who received information were more likely to make the right choice by selecting the most advantageous pension plan, as some individuals stayed in the DC plan and did not risk their pension savings.

We formalize this idea in Table 4, where we present the estimation results for the four groups affected by the phased implementation of the information provision program (men and women during 2016 and 2018). Each coefficient represents a separate regression discontinuity estimation, where the dependent variable is either an indicator of whether the potential switcher made the right choice in terms of switching (columns labeled estimate) and an indicator of whether the potential switcher has positive expected gains (selection bias). We use the robust estimators proposed by Calonico et al. (2014). The difference between them is the ATT of the information provision program on the probability of making the right choice regarding switching between pension plans. We also implement a local polynomial estimator

[11] In fact, qualitative findings from focus groups with switchers indicated that workers were not aware of the Dual Advisory program. Many of the participants did not know about the requirement until the moment they requested to switch.(Forero et al., 2019).

to directly estimate the ATT.[12]

Consistent with the graphical evidence, the estimation results suggest that the information program increased the probability that individuals made the right choice regarding their pension plan. On average, conditional on being willing to participate in the program, individuals who received the information provision program increased their probability of making the right choice by about 10 percentage points. Our estimated selection bias is small and not significant in all but one of our samples (men in the first phase of the program). The effect of information is also remarkably stable across women and men, implementation stages, and eligibility ages.

Overall effects on switching behavior Next, we combine the inertia and information results to understand the overall effect of the program on switching behavior. Table 5 shows the results of our calculations to determine the joint effect of inertia and information on switching. All of our results are local around the eligibility threshold. The top part of the table shows estimates of the probability of making a favorable switch without information at the discontinuity, as obtained in the estimation results presented in Table 4, and the estimated reduction in the number of potential switchers due to inertia, obtained by running a local linear regression on the number of potential switchers by month of age used in Figure 3. Additionally, we include our estimated effect of providing information on switching, which is the negative of the estimates of ATT presented in Table 4.

Assuming negligible selection bias, our results show an average reduction in the total number of switches from the DC to the DB plan of about 40.2%, where the largest reduction is due to unfavorable switching (29.5%). This reduction is explained by the combination of fewer people interested in switching due to rising switching costs (22.7%) and the value of the information provided to workers (6.7%). Unfortunately, the rising switching costs also imply an increase in inertia for workers who would face favorable switches, where we estimate that the reduction in favorable switching is about 10.7%. Although this is a local effect, it shows the importance of information frictions driven the overall effect of the program, as the introduction of the program was positive for most potential switchers, but those frictions reduced some favorable switches.

The estimated results reinforce the idea that frictions play an important role in determining retirement preparedness. Although the information program had a positive effect in

[12]We run a local polynomial estimator in which we pooled the dependent variable as either reporting positive gains (the counterfactual scenario) or making the right choice against the standard regression discontinuity controls, and differentiate whether the observation belongs to the counterfactual scenario. For the estimation, we use a triangular kernel and the optimal bandwidths derived by Calonico et al. (2019). Having the results of the pooled model, we test the difference and compute the standard errors, which are clustered at the individual level.

Dependent variable: Making right choice regarding switching

Oct-16/Dec-17	Women		Men	
	Estimate	Selection Bias	Estimate	Selection Bias
Information provision (Robust)	0.1254 [0.0264]***	0.0243 [0.0275]	0.1292 [0.0255]***	0.0410 [0.0233]*
Difference (ATT)	0.1011		0.0882	
Information provision (Local linear ATT)	0.1107 [0.0305]***		0.0898 [0.0287]***	
Eligibility age	42	42	47	47
Observations	61,628	61,628	71,357	71,357
Robust 95 CI	[.074;.177]	[-.03;.078]	[.079;.179]	[-.005;.087]
Bandwidth	1.5	1.4	1.7	1.8

Jan-18/Dec-18	Women		Men	
	Estimate	Selection Bias	Estimate	Selection Bias
Information provision (Robust)	0.1088 [0.0207]***	-0.0087 [0.0220]	0.1081 [0.0213]***	0.0107 [0.0194]
Difference (ATT)	0.1175		0.0974	
Information provision (Local linear ATT)	0.1135 [0.0240]***		0.0911 [0.0252]***	
Eligibility age	37	37	42	42
Observations	63,620	63,620	76,764	76,764
Robust 95 CI	[.068;.149]	[-.052;.034]	[.066;.15]	[-.027;.049]
Bandwidth	2.6	2.2	2.7	3.2

Note: This table uses Asofondos data to test whether the information provided in the Dual Advisory program increases the probability that workers choose the plan with the higher expected gains. The dependent variable is either an indicator of whether the potential switcher made the right choice in terms of switching (columns labeled estimate) or an indicator of whether the potential switcher has positive expected gains (selection bias). The difference between them represents the Average Treatment Effect (ATT) of the information provision program on the probability of making the right choice regarding switching between pension plans. In all cases, we use the robust estimators proposed by Calonico et al. (2014), employing a local linear regression (p=1), a quadratic regression to account for potential bias (q=2), and a triangular kernel. We also implement a local polynomial estimator to directly estimate the ATT. Standard errors in brackets. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 4: Effects of information provision on switching decisions

	Oct-16/Dec-17		Jan-18/Dec-18		Simple
	Women	Men	Women	Men	Average
(1) Prob. of favorable switch - no info	0.2408	0.2824	0.3519	0.4126	0.3219
(2) Prob. of unfavorable switch - no info	0.7592	0.7176	0.6481	0.5874	0.6781
(3) Inertia effect	-0.3521	-0.3288	-0.3337	-0.3231	-0.3344
(4) Share attending info sessions	0.6479	0.6712	0.6663	0.6769	0.6656
(5) Information effect on switching	-0.1107	-0.0898	-0.1135	-0.0911	-0.1013
Total effect on switches	-0.4238	-0.3891	-0.4093	-0.3847	-0.4017
Unfavorable	-0.3390	-0.2962	-0.2919	-0.2514	-0.2946
- Inertia (2×3)	-0.2673	-0.2360	-0.2163	-0.1898	-0.2273
- Information (4×5)	-0.0717	-0.0603	-0.0756	-0.0617	-0.0673
Favorable - inertia (1×3)	-0.0848	-0.0929	-0.1174	-0.1333	-0.1071

Note: This table uses our estimates of the effects of inertia and information on switching behavior to calculate the local effect of the program on switching behavior (around the eligibility threshold). The top part of the table shows estimates of the probability of making a favorable switch without information at the discontinuity and the estimated reduction in the number of potential switchers due to inertia. We also include our estimated effect of providing information on switching, which is the negative of the estimates of ATT presented in Table 4.

Table 5: Local effects of the reform on switching behavior

preventing decisions that were against the best interests of potential switchers, other factors beyond information meant that more than half of the potential switchers still switched when they could lose a significant portion of their pension savings. This is supported by qualitative evidence collected by Forero et al. (2019), which showed that a significant proportion of individuals were determined to switch regardless of the information provided in the information sessions, and attended the sessions only to satisfy the requirement. In the words of one switcher describing her conversation with the AFP counselor: "*...I tried to cut the meeting short because I was not interested in continuing in the AFP. Look, I've already made up my mind. No matter what you tell me, I've already made my decision.*" As anecdotal evidence based on interviews with DC plan advisors, Forero et al. (2019) report that advisors estimate that between 30% and 50% of participants were not interested in the information provided. Thus, while information played a role in this environment, potential switchers with strong preferences against the DC plan or inattention may explain these results.

4.2.3 Effects of information provision on post-session outcomes

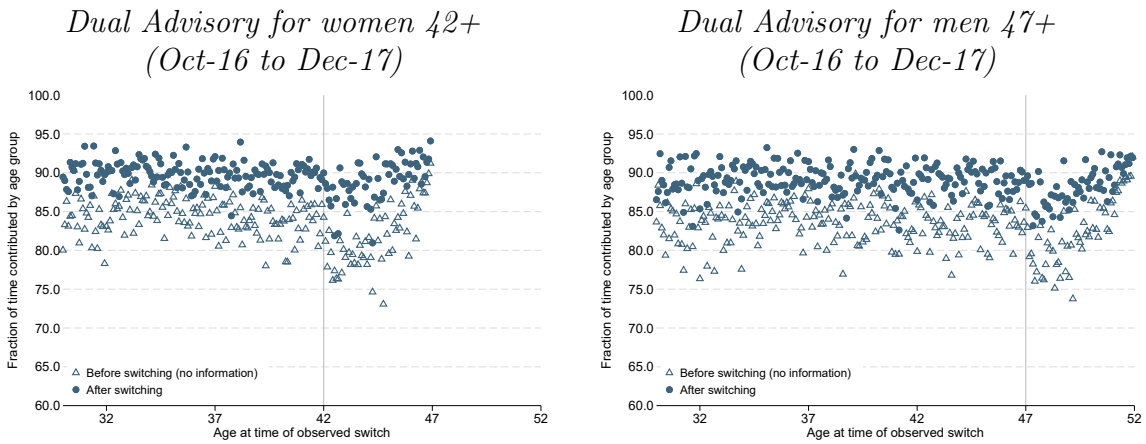
Our main goal in this part is to understand whether the information provided by the Dual Advisory program influences the behavior of switchers with respect to their post-switch con-

tribution patterns. The program provided information on expected pension savings and pension prospects for each pension plan under 5 different contribution scenarios (see section 2). Regardless of their final decision, the program showed that higher contribution patterns lead to higher pension savings/benefits, which may influence workers' attachment to the contributory pension system.

We use data from PILA, the longitudinal dataset with the universe of workers contributing to the pension system, to assess the effects of information provision on workers' attachment to the contributory pension system. We can identify actual switchers in these data because PILA reports a worker's pension plan. Thus, we identify switchers as those who reported a change in their pension plan from the DC to the DB plan. This approach implies that our estimates will be affected by measurement error, as we can see the date that the individual began contributing to the DB pension plan, which is after the date of the switch and participation in the counseling sessions. In appendix figures A7 and A8 we perform an analysis similar to the one presented in section 4.2.1 with the PILA dataset. We found that the behavior of switchers closely follows the patterns observed in the Asofondos data, suggesting that while the measurement error is rather moderate, selection into switching may play a significant role in our results.

To create a measure of the contribution frequency observed for workers after they switch, we take advantage of the longitudinal structure of PILA and calculate the number of months the person contributes in the two years before and after the switch, normalized to the maximum attainable time (24 months). For example, for a person who switched in March 2016, we analyze their contributions between March 2014 and February 2016 and April 2016 and March 2018. We focus our analysis on workers who switched from the DC to the DB plan in the first phase of the program (October 16 to December 17), because in this phase we have a longer period of time after they switched (our data end in December 2019).

Figure 6 shows the data we use for our identification strategy discussed in section 3.2. The figure plots on the vertical axis the average fraction of time a switcher contributed two years before (hollow triangles) and after (dark circles) the switch, and on the horizontal axis the age at the time of the switch. Each point represents the average fraction of time contributed per age (in months). The sample of switchers tends to be attached to the pension system, as they contributed about 80% and 90% of the time. Looking at the post-switching contribution patterns (dark circles), switchers located just after the eligibility ages show a different pattern on the contribution time (especially for men). However, the behavior of the contribution patterns of these workers before receiving information and switching (hollow triangles) shares this differential pattern, suggesting that the change is driven by self-selection rather than the effect of information.



Notes: This figure uses PILA data to present graphical evidence to test whether the information provided in the Dual Advisory program changes the frequency of contributions of switchers. We focus on women and men who switched between October 2016 and December 2017. For each age (in months) the graph shows the average contribution frequency for switchers two years before (hollow triangles) and after (dark circles) the switch by age at the time of switching (in months, horizontal axis).

Figure 6: Effects of information provision on contribution frequency

Table 6 presents the estimation results of our identification strategy based on the PILA dataset. The top panel of the table presents the results of separate RD estimates comparing the fraction of time contributed just before and just above the eligibility age, before and after the switcher received the information. Consistent with the graphical evidence, the post-switching RD estimates show a reduction in the fraction of time contributed of 3.5 (women) and 0.72 (men) percentage points, but a similar pattern is also observed for the period before eligible individuals received the information (-2.5 and -2.6). When we run a joint estimation, we find that the observed differences are small, around 1 percentage point in both cases, and they are not significant.[13]

In sum, the estimation results presented in this section provide suggestive evidence that, after accounting for selection among switchers, the information provided in the program does not change the contribution frequency of switchers after the counseling sessions and the switch. Although information provision may not produce change in this particular outcome, we cannot rule out additional outcomes that may be affected by workers' choices and that we cannot test due to lack of information, i.e., voluntary saving, or other additional outcomes, i.e., spillover to other potential switchers due to social interactions.

[13]The differences between the joint and individual estimates are explained by differences in the bandwidth used to compute the individual estimates.

Dependent variable: Fraction of time contributing after switching (%)

	Women		Men	
Oct-16/Dec-17	Before	After	Before	After
Information provision	-2.5298	-3.4621	-2.6241	-0.7162
(Robust)	[2.3782]	[1.4476]**	[2.2879]	[1.9179]
Difference (ATT)	-0.9323		1.9079	
Information provision	1.2037		1.3114	
(Local linear ATT)	[1.4363]		[1.9034]	
Eligibility age	42	42	47	47
Observations	43,897	43,897	47,228	47,228
Robust 95 CI	[-7.191;2.131]	[-6.299;-0.625]	[-7.108;1.86]	[-4.475;3.043]
Bandwidth	1.5	2.3	1.6	1.3

Note: This figure uses PILA data to test whether the information provided in the Dual Advisory program changes the frequency of contributions of switchers. We focus on women and men who switched between October 2016 and December 2017. The dependent variable is the fraction of the time the switcher contributed two years before and after the switch. The difference between them represents the Average Treatment Effect (ATT) of the information provision program on the contribution frequency after switching pension plans. In all cases, we use the robust estimators proposed by Calonico et al. (2014), employing a local linear regression (p=1), a quadratic regression to account for potential bias (q=2), and a triangular kernel. We also implement a local polynomial estimator to directly estimate the ATT. Standard errors in brackets. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 6: Effects of information on contribution frequency

5 Final remarks

We document the causal effects of a large-scale, mandatory information provision program on retirement preparedness. We use multiple sources of administrative data and identification strategies that take advantage of the phased implementation of the program to show how the program affected individuals' decisions regarding their choice of pension plan. We find that the program reduced the number of workers interested in switching between plans, and that this was the result of both a disincentive effect due to switching costs and the positive effect of better decision making by workers. We also assess whether the information provided by the program affected the contribution frequency of switchers up to two years after the switch, and we find no systematic changes in their contribution patterns.

Our results shed light on the importance of several aspects of the consumer decision-making process. First, by increasing the cost of switching, the program effectively increased workers' inertia and reduced the number of individuals interested in switching. Interestingly, the increase in inertia appears to be spread across the entire distribution of gains from switching, suggesting that individuals are motivated by factors other than their expected gains when making retirement savings decisions. In particular, lack of trust in the private managers and social interactions appear to be a relevant factor, as qualitative evidence showed that switchers have higher confidence in the public pension fund, and that switchers based their decisions on past experiences of friends and family members rather than on knowledge of their potential gains. While the increase in inertia may benefit most workers who would have switched against their best interests, it prevents workers who would be better off with the switch from taking advantage of it.

Second, the role of providing simple but timely information allows workers to make better choices. The program made clear the consequences of their actions on a simple metric, the likelihood of receiving a pension and its benefits. This information was sufficient to prevent a significant proportion of workers from making a decision that would have reduced their expected pension savings, even after controlling for selection. Providing the simple and necessary information in this context has proven useful in improving retirement planning decisions. Nevertheless, strong preferences and behavioral factors such as inattention may explain why a significant proportion of workers still make decisions that can affect their future retirement savings.

Finally, we found that the program did not change the frequency of contributions. There are several reasons that could explain this result, and they do not imply that this intervention has no effect on downstream behavior. The intervention is a short-term informational nudge that was successful in providing workers with better information to make decisions. Longer-

term behaviors, however, may require a more active role for public policy to change them.

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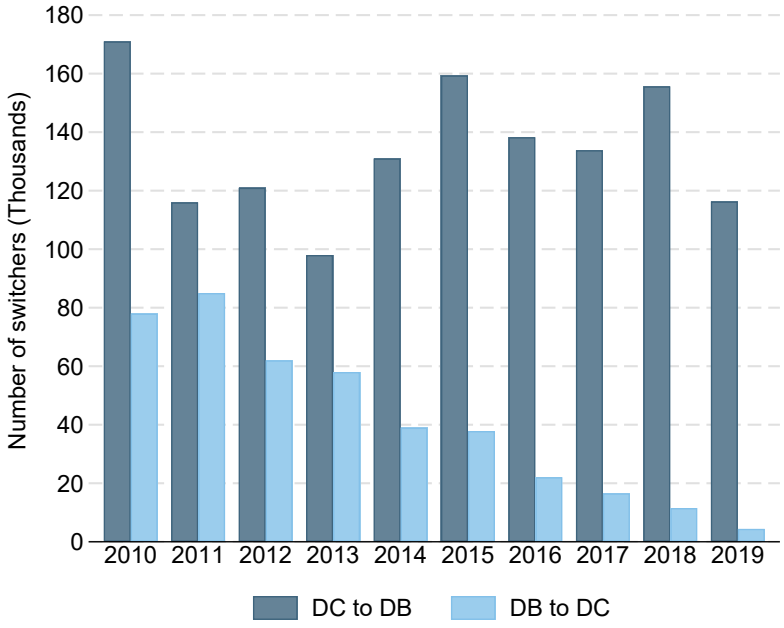
Online Appendix

A Additional tables and figures

Cattaneo et al. (2020) density test				
Phase	Oct-16/Dec-17		Jan-18/Dec-18	
	Women	Men	Women	Men
Test statistic	-2.3312	-2.0976	-5.0053	-3.3721
p-value	.0197433	.0359397	5.58e-07	.000746
Eligibility age	42	47	37	42
Effective observations	5,442	4,635	10,468	8,215
Bandwidth years (left)	1.227	1.075	2.334	2.224
Bandwidth years (right)	1.185	1.015	1.725	1.586

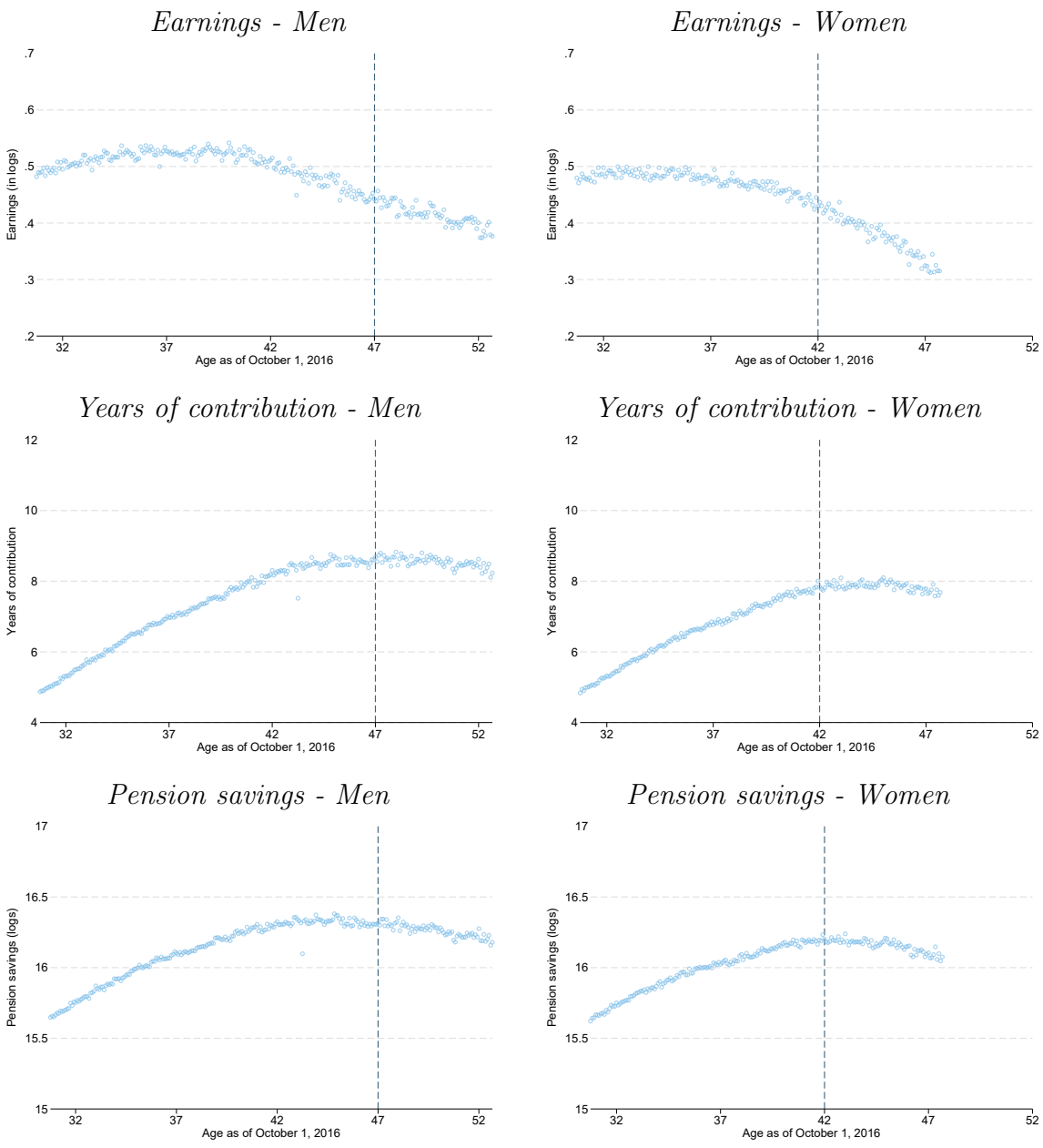
Note: This table uses PILA data to test whether the increase in switching costs from the Dual Advisory program discourages individuals considering switching their pension plans. The table presents the results of testing for discontinuities in the distribution of switchers by age at the moment of switch around the Dual Advisory eligibility age. Each cell corresponds to the robust test statistic proposed by Cattaneo et al. (2020), using a local quadratic regression (p=2), a cubic regression to account for potential bias (q=3), and a triangular kernel.

Table A1: Effects of increasing the switching cost on switchers - PILA dataset



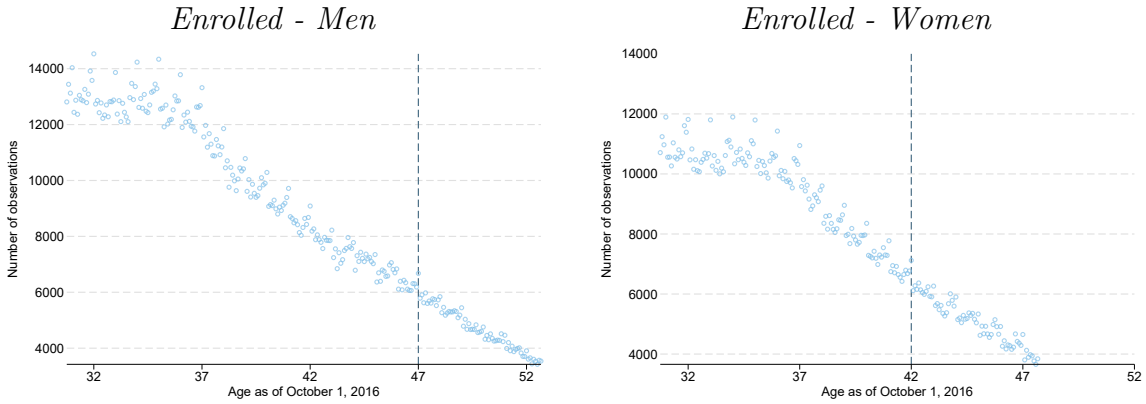
Notes: This figure presents the total number of switchers between the DC and DB plans between 2015 and 2019, as reported by Colpensiones data.

Figure A1: Total number of switches between pension plans, 2015-2019



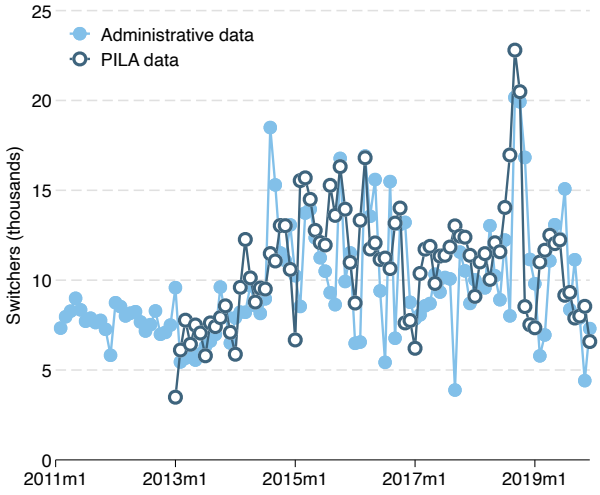
Notes: This figure presents graphical evidence to test factors that challenge the validity of the assumptions required for the implementation of the identification strategy discussed in section 3.2. Each dot represents the average of variables (log of earnings, years of contributions, and log of pension savings) by age in months as of October 1, 2016. All these variables are determinants of the expected gains from switching yet are predetermined by the time the Dual Advisory began (2015).

Figure A2: Balance checks, 2015



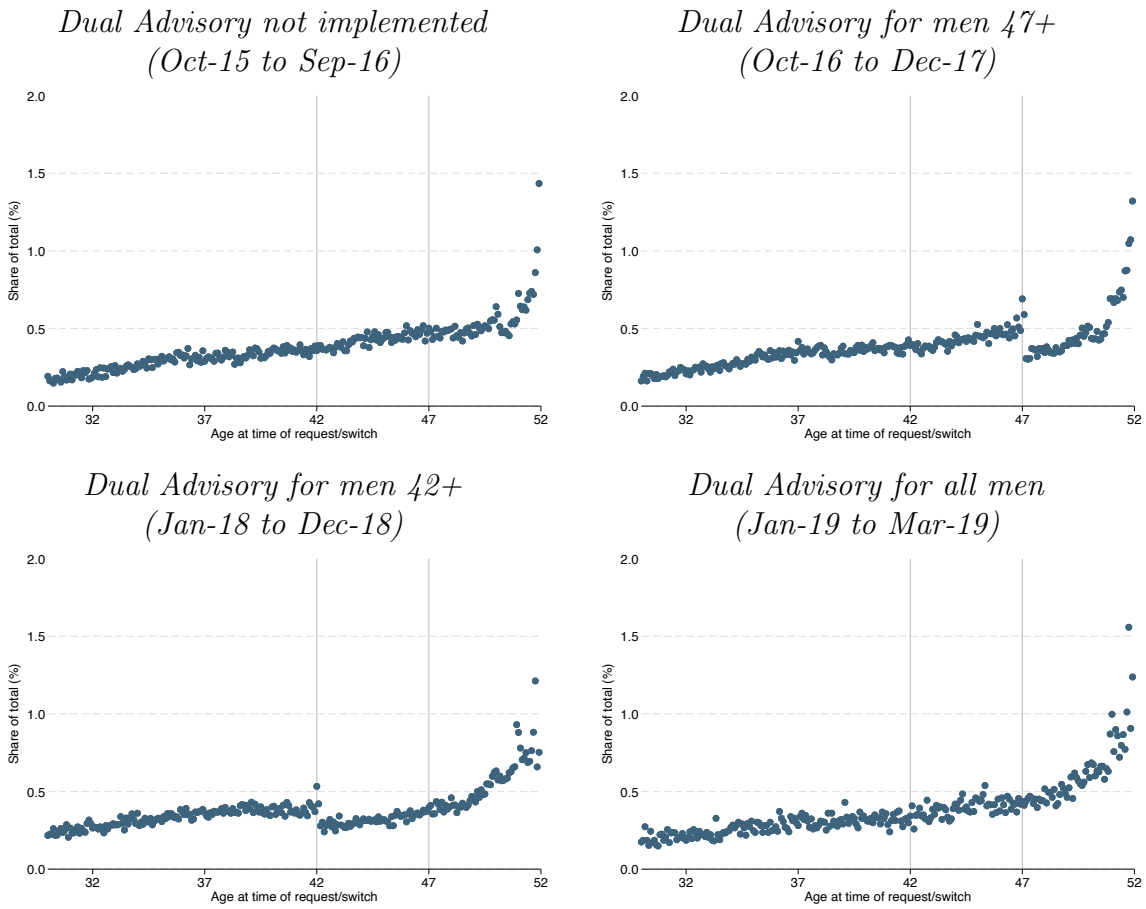
Notes: This figure presents graphical evidence to test factors that challenge the validity of the assumptions required for the implementation of the identification strategy discussed in section 3.2. Each dot represents the number of enrolled in 2015 in the DC plan by age in months as of October 1, 2016.

Figure A3: Workers enrolled in the DC plan by age, 2015



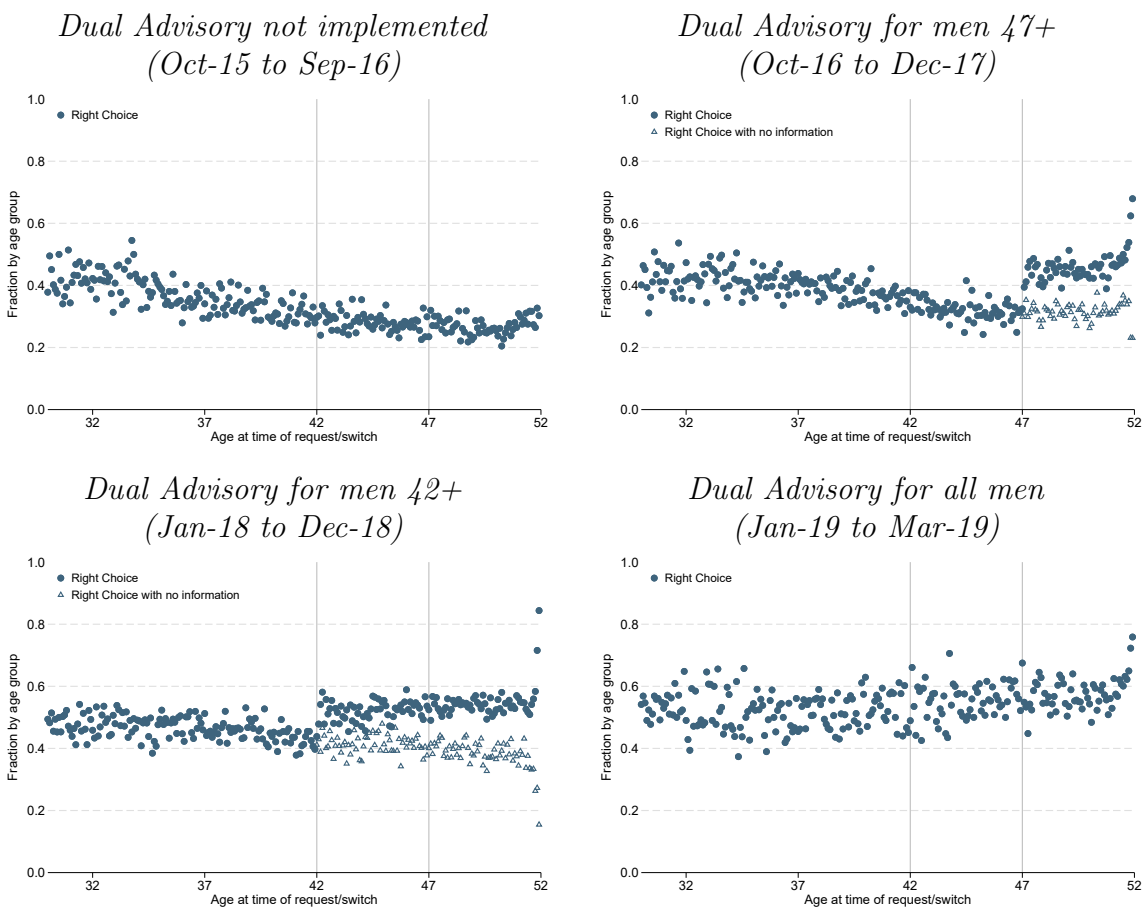
Notes: This figure compares the time series of the total number of switchers from the Defined Contribution (DC) to the Defined Benefit (DB) pension plan, as recorded in administrative records from Colpensiones (light circles) and estimates from PILA (hollow circles) between 2011 and 2019.

Figure A4: Number of switchers in PILA and Administrative data, 2011-19



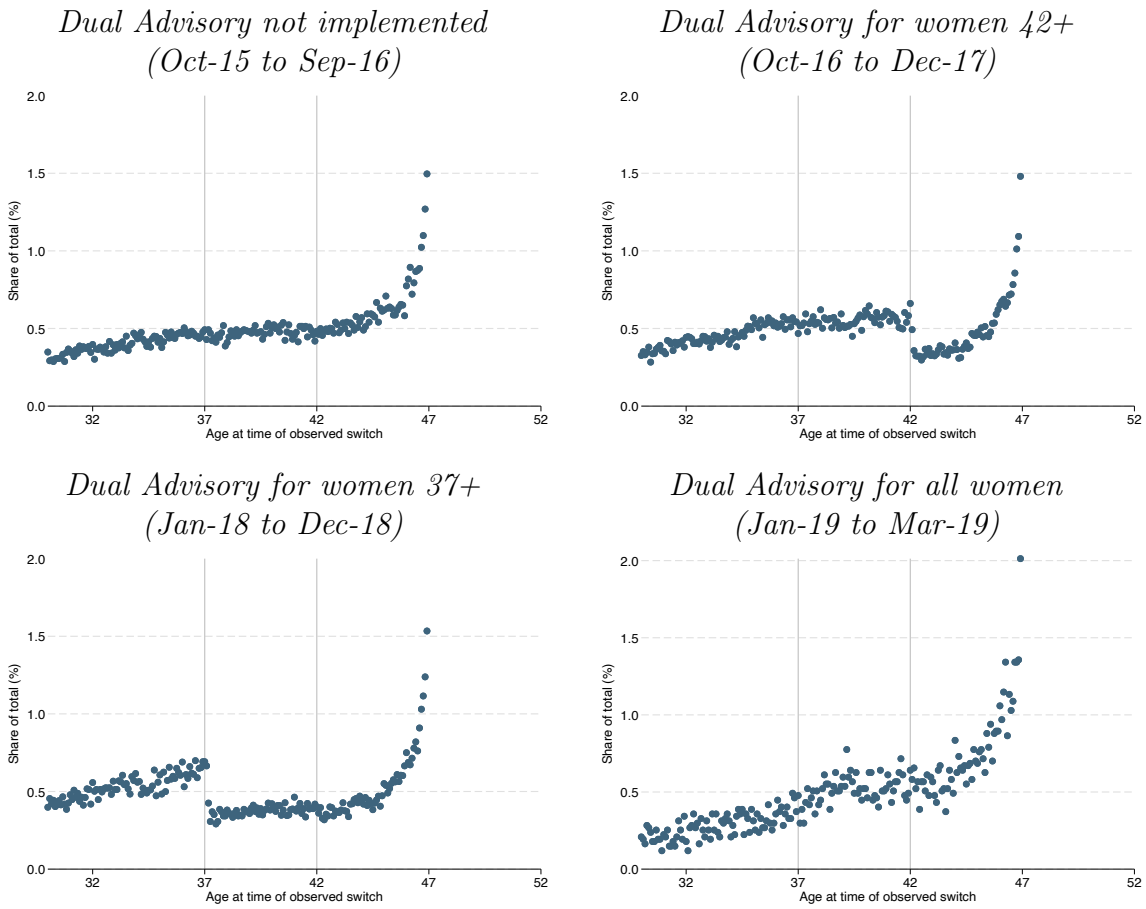
Notes: This figure uses Asofondos data to present graphical evidence testing whether the increase in switching costs from the Dual Advisory program discourages individuals considering switching their pension plans. Each panel shows a phase of implementation of the program. Within each panel, the dark dots represent the percentage of potential switchers by age at the time of requesting the switch (in months, horizontal axis). Vertical lines indicate the eligibility thresholds defined by regulation in the phases of the program.

Figure A5: Distribution of potential switchers by age. Men, 2015-2019



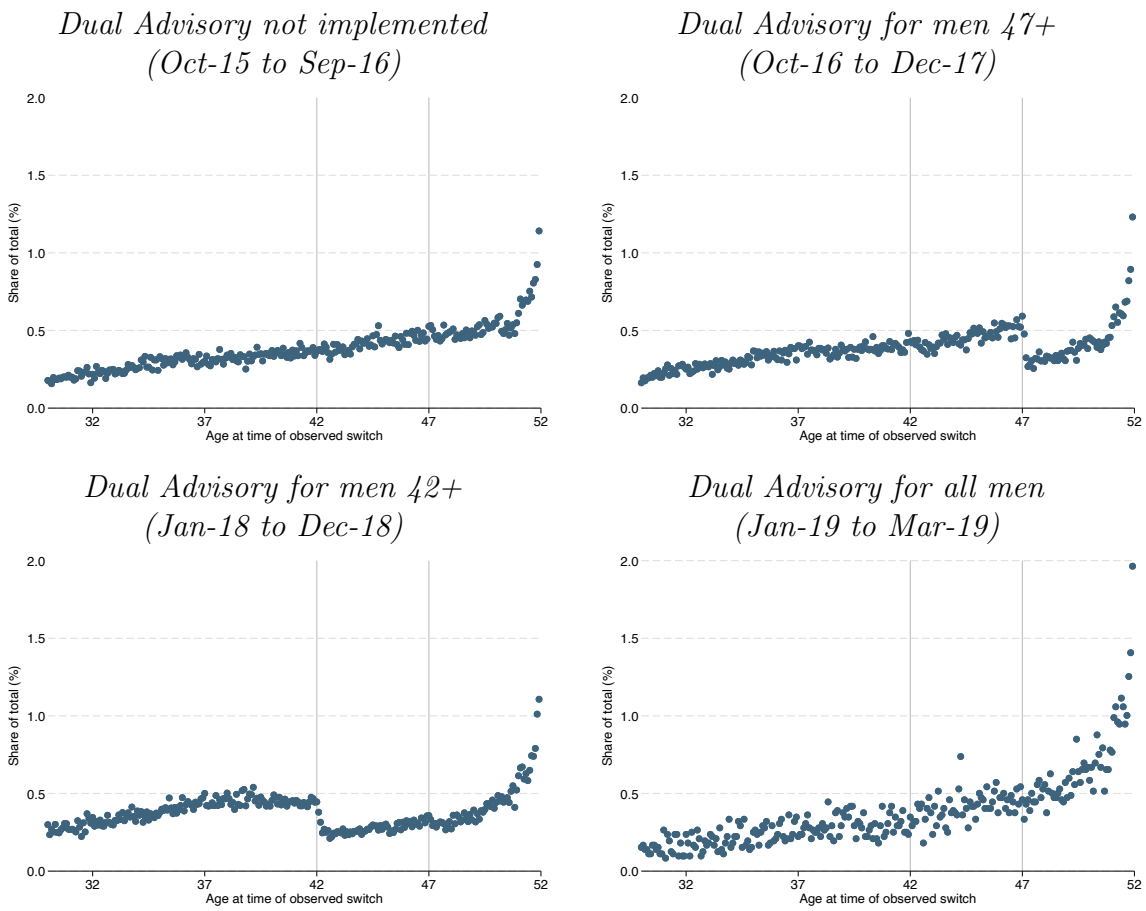
Notes: This figure uses Asofondos data to test whether the information provided in the Dual Advisory program increases the probability that workers choose the plan with the higher expected gains. Each panel shows a phase of implementation of the program. For each age (in months) the proportion of individuals who choose the plan with the higher gains for them, i.e., either to switch because their gains were positive or not to switch because the gains were negative. For potential switchers beyond the age of eligibility, the hollow triangles represent the proportion of individuals by age for whom the gains from switching are positive, making it convenient for them to switch even without information.

Figure A6: Effects of information provision on switching decisions. Men, 2015-2019



Notes: This figure uses PILA data to present graphical evidence testing whether the increase in switching costs from the Dual Advisory program discourages individuals considering switching their pension plans. Each panel shows a phase of implementation of the program. Within each panel, the dark dots represent the percentage of switchers by age at the time of requesting the switch (in months, horizontal axis). Vertical lines indicate the eligibility thresholds defined by regulation in the phases of the program.

Figure A7: Distribution of switchers by age - PILA dataset. Women, 2015-2019



Notes: This figure uses PILA data to present graphical evidence testing whether the increase in switching costs from the Dual Advisory program discourages individuals considering switching their pension plans. Each panel shows a phase of implementation of the program. Within each panel, the dark dots represent the percentage of switchers by age at the time of requesting the switch (in months, horizontal axis). Vertical lines indicate the eligibility thresholds defined by regulation in the phases of the program.

Figure A8: Distribution of switchers by age - PILA dataset. Men, 2015-2019

B Pension system formulas

In this appendix, we discuss the formulas we use to compute $B^{db}_{i,R}$ and $B^{dc}_{i,R}$, the present value of expected pension benefits or refunds at the minimum retirement age (R) for individual i. In the following, we require the expected time of contributions and pension savings, $time^{e}_{i,R}$ and $savings^{e}_{i,R}$, as defined in the equations (1) and (2) in the section (3.1.1). Along with these variables, we need additional assumptions about expected earnings and the growth of the statutory monthly minimum wage. For future earnings, denoted by $w_{i,R}$, we follow the procedures of the Dual Advisory and take current earnings as the reference wage and assume that they are constant in real terms, and we assume that the minimum wage grows in real terms at a rate of 1% per year, which is an optimistic assumption (the real growth rate of the minimum wage between 2000 and 2020 was 1.6% per year). We also assume a real interest rate of 4% and use the life tables required by the current regulation to calculate the lifetime annuity factors.

Pension benefits and reimbursements depend on the pension plan. Under the DC plan, individuals are eligible for a pension if they either have sufficient savings for a lifetime pension that is greater than the legal minimum monthly wage, or if they have contributed for at least 1,150 weeks and have reached the minimum retirement age (57 for women, 62 for men) for a lifetime pension equal to the minimum pension (which is the legal minimum wage). Based on expected savings and the time of contribution, the estimated pension benefit at retirement age follows the formula

$$P^{dc}_{i,R} = \begin{cases} \frac{savings^{e}_{i,R}}{a(R,r)} & \text{if } \frac{savings^{e}_{i,R}}{a(R,r)} \geq MW_R \\ MW_R & \text{if } \frac{savings^{e}_{i,R}}{a(R,r)} < MW_R \text{ and } time^{e}_{i,R} \geq 1,150 \end{cases}, \tag{B1}$$

where MW_R is the minimum wage and $a\,(R,r)$ is the annuity factor, i.e., the factor used to discount the actuarial present value of a life annuity beginning at age R at a discount rate of r.

If workers do not achieve a pension in the DC plan, they are entitled to receive their pension savings as a lump sum. Therefore, the refunds received by those who do not achieve a pension are

$$Ref^{dc}_{i,R} = savings^{e}_{i,R}. \tag{B2}$$

As a result, the present value of the DB plan benefits or refunds is

$$B_{i,R}^{db} = \begin{cases} savings_{i,R}^{e} & \text{if } \frac{savings_{i,R}^{e}}{a(R,r)} < MW_R \text{ and } time_{i,R}^{e} < 1,150 \\ MW_R \times a\left(R,r\right) & \text{if } \frac{savings_{i,R}^{e}}{a(R,r)} < MW_R \text{ and } time_{i,R}^{e} \geq 1,150 \\ savings_{i,R}^{e} & \text{if } \frac{savings_{i,R}^{e}}{a(R,r)} \geq MW_R \end{cases}. \tag{B3}$$

Under the DB plan, individuals become eligible after contributing at least 1,300 weeks and reaching the minimum retirement age (57 for women, 62 for men), and pension benefits are calculated as follows

$$P_{i,R}^{db} = \max\left\{b \times w_{i,R}, MW_R\right\}, \tag{B4}$$

where $P_{i,R}^{db}$ represents the monthly pension amount, b is the replacement rate, $w_{i,R}$ is the monthly reference wage based on the average of the last 10 years of contributions, and MW_R is the minimum wage at retirement age (which is the statutory minimum pension). Using the estimated time of contribution, we follow the regulation and compute the replacement rate as

$$b = 65.5\% - 0.5\% \times \frac{w_{i,R}}{MW_R} + 1.5\% \times \min\left\{\left\lfloor \frac{time_{i,R}^{e} - 1,300}{50} \right\rfloor, 10\right\} \tag{B5}$$

(capped at 80%), where $\lfloor \cdot \rfloor$ represents the floor function. The replacement rate decreases by 0.5 percentage points as the reference wage increases, and has a bonus of 1.5 percentage points for every 50 weeks above the minimum contribution requirement.

If workers do not reach the minimum contribution time by age R, we calculate the refund of their contribution as

$$Ref_{i,R}^{db} = 0.13 \times w_{i,R} \times 12 \times \left(\frac{time_{i,R}^{e}}{360/7}\right), \tag{B6}$$

where 0.13 is the part of the contribution rate that is used to finance the pension fund and 360/7 is the number of weeks in a year as defined in the regulation.

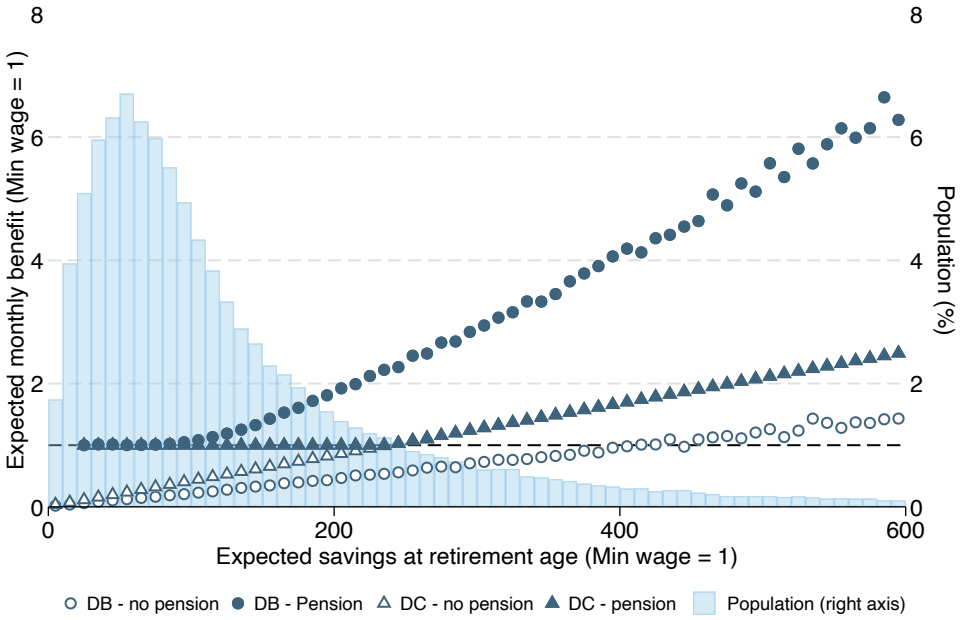
Using these formulas, the present value of the pension benefits or refunds in the DB plan is given by

$$B_{i,R}^{db} = \begin{cases} Ref_{i,R}^{db} & \text{if } time_{i,R}^{e} < 1,300 \\ P_{i,R}^{db} \times a\left(R,r\right) & \text{if } time_{i,R}^{e} \geq 1,300 \end{cases}, \tag{B7}$$

where $a\left(R,r\right)$ is the annuity factor.

In Figure B9, we use data from potential DC-to-DB plan switchers between October 2015 and September 2016 to calculate expected pension benefits for each plan. The figure plots the average expected pension benefits (vertical axis) for each pension plan as a function of the expected pension savings at retirement age (horizontal axis), where we distinguish between

Figure B9: Gains from switching from the DC to DB plan by years of contribution, 2016



Note: This figure uses Asofondos data from potential switchers to plot the average expected pension benefits (vertical axis) for each pension plan as a function of the expected pension savings at retirement age (horizontal axis). The plot distinguishes between benefits paid to individuals who are eligible to receive a pension and those who are not. The light bars shows the distribution of potential switchers by expected savings at retirement.

benefits paid to individuals who are eligible to receive a pension and those who are not. The figure shows that, conditional on being eligible for a pension above the minimum pension, individuals in the DB plan will receive a higher average pension than if they contribute to the DC plan, while the opposite is true if individuals are not eligible for a pension. Moreover, as the distribution of the population by expected pension savings shows (light blue bars), most of the population has very low expected pension savings, suggesting that for most of them, contributing to the DC plan will provide higher gains.

C Identification - Differences in discontinuities

A main concern in our study is that the increase in the switching costs caused by the Dual Advisory program prevented workers from switching in a non-random manner, implying that the comparison of outcomes of switchers just below and just above the eligibility age may not identify the causal effect of providing information on our outcomes of interest.

To overcome this limitation, one of our identification strategy relies on longitudinal information of switchers and compare the outcomes of interest just below and above the eligibility age before and after the entry of the program. In this appendix we show that, under reasonable assumptions, this strategy identifies the average effect of providing information on the switchers who participated in the program (an Average Treatment Effect on the Treated, ATT).

In what follows, z_i denotes the age at the time of the switching and z_0 is the eligibility age for the information provision program. Lets assume we have a sample of switchers that we observe for two periods, before ($t = 1$) and after ($t = 2$) the entry of the program, and let $y_i(t)$ and $d_i(t)$ denote the outcome of interest for switcher i in period t and an indicator of whether the person receives information ($d_i(t) = 1_{\{z_i \geq z_0, t=2\}}$). Using the potential outcomes notation, we have that $y_i(t) = y_{0i}(t) + d_i(t)(y_{1i}(t) - y_{0i}(t))$, where $y_{0i}(t)$ is the outcome in period t for i if she does not receive information and $y_{1i}(t)$ the outcome if she does.

The mean difference in outcomes after the entry of the program around $z_i = z_0$ is given by

$$\begin{aligned}\Delta_2 &= \mathbb{E}(y_i(2) \mid z_i = z_0 + e) - \mathbb{E}(y_i(2) \mid z_i = z_0 - e) \\ &= \mathbb{E}(y_{1i}(2) - y_{0i}(2) \mid z_i = z_0 + e) \\ &+ [\mathbb{E}(y_{0i}(2) \mid z_i = z_0 + e) - \mathbb{E}(y_{0i}(2) \mid z_i = z_0 - e)].\end{aligned} \tag{C8}$$

In equation (C8), the first term represents the average effect of the treatment, and the term in squared brackets captures systematic differences in the expected outcome in absence of the treatment for those around the discontinuity. In a sharp RD setup, assuming that $\mathbb{E}(y_{0i} \mid z_i = z)$ is continuous around $z = z_0$ is a sufficient condition to guarantee that the term in square brackets vanishes for $e \to 0^+$ and the parameter $\tau(2) = \lim_{e \to 0^+} \Delta_2$ identifies the causal effect of the program. However, because in our case the assignment variable also affects the switching behavior, this condition is not sufficient. To see this, let x_i and indicator variable of whether the person switches after receiving information. Given that we have a sample of switchers, we have that $P(x_i = 1 \mid z_i \geq z_0) = 1$ and $0 \leq P(x_i = 1 \mid z_i < z_0) \leq 1$

(because they did not receive information), and equation (C8) can be rewritten as

$$\begin{aligned}\Delta_2 = &\mathbb{E}\left(y_{1i}\left(2\right) - y_{0i}\left(2\right) \mid z_i = z_0 + e, x_i = 1\right) + \mathbb{E}\left(y_{0i}\left(2\right) \mid z_i = z_0 + e, x_i = 1\right) \\ &- \mathbb{E}\left(y_{0i}\left(2\right) \mid z_i = z_0 - e, x_i = 1\right) P\left(x_i = 1 \mid z_i = z_0 - e\right) \\ &- \mathbb{E}\left(y_{0i}\left(2\right) \mid z_i = z_0 - e, x_i = 0\right) \left(1 - P\left(x_i = 1 \mid z_i = z_0 - e\right)\right).\end{aligned} \tag{C9}$$

From equation (C9), the term $\mathbb{E}\left(y_{1i}\left(2\right) - y_{0i}\left(2\right) \mid z_i = z_0 + e, x_i = 1\right)$ is the effect of providing information on the outcome of interest for those who participate in the program and switch. To identify this effect, we assume that

- (A1) $\mathbb{E}\left(y_{1i}\left(2\right) - y_{0i}\left(2\right) \mid z_i = z, x_i = 1\right)$ is a continuous function around $z = z_0$,
- (A2) $\mathbb{E}\left(y_{0i}\left(t\right) \mid z_i = z, x_i = x\right)$ is a continuous function around $z = z_0$ for $x = \{0, 1\}$ and $t = \{1, 2\}$,
- (A3) $P\left(x_i = 1 \mid z_i = z\right)$ is a continuous function around $z = z_0$.

Under assumptions (A1) to (A3), in the limit, the comparison of switchers just below and just above the eligibility age yields

$$\begin{aligned}\tau\left(2\right) = &\lim_{e \to 0^+} \mathbb{E}\left(y_i\left(2\right) \mid z_i = z_0 + e\right) - \lim_{e \to 0^+} \mathbb{E}\left(y_i\left(2\right) \mid z_i = z_0 - e\right) \\ = &\mathbb{E}\left(y_{1i}\left(2\right) - y_{0i}\left(2\right) \mid z_i = z_0, x_i = 1\right) \\ &+ \left[\mathbb{E}\left(y_{0i}\left(2\right) \mid z_i = z_0, x_i = 1\right) - \mathbb{E}\left(y_{0i}\left(2\right) \mid z_i = z_0, x_i = 0\right)\right] \\ &\times \left(1 - P\left(x_i = 1 \mid z_i = z_0\right)\right),\end{aligned} \tag{C10}$$

which means that a standard RD design identifies the gains of providing information for those who participate in the program and switch (the ATT) plus a bias term derived from the self-selection of switchers once they receive the information.

To cancel out the bias term in $\tau\left(2\right)$, we use information of contribution history prior to the program on the same group of switchers. Following a similar argument than before, in $t = 1$ no person has received information and therefore

$$\tau\left(1\right) = \left[\mathbb{E}\left(y_{0i}\left(1\right) \mid z_i = z_0, x_i = 1\right) - \mathbb{E}\left(y_{0i}\left(1\right) \mid z_i = z_0, x_i = 0\right)\right] \times \left(1 - P\left(x_i = 1 \mid z = z_0\right)\right), \tag{C11}$$

and under the additional assumption

- (A4) $\mathbb{E}\left(y_{0i}\left(t\right) \mid z_i = z_0, x_i = 1\right) - \mathbb{E}\left(y_{0i}\left(t\right) \mid z_i = z_0, x_i = 0\right)$ is constant for $t = \{1, 2\}$ (equivalent to the "parallel trends" assumption in the Differences-in-Differences identification strategy),

the parameter

$$\tau_{ATT} = \tau(2) - \tau(1) = \mathbb{E}\left(y_{1i}(2) - y_{0i}(2) \mid z_i = z_0, x_i = 1\right) \tag{C12}$$

identifies the causal effect of providing information on switchers who took the program and switched.