NBER WORKING PAPER SERIES

DOES MATCHING CONTRIBUTION INCENTIVIZE INFORMAL WORKERS TO PARTICIPATE IN RETIREMENT SAVING PLANS? A RANDOMIZED EVALUATION INTERACTED WITH A NATURAL EXPERIMENT

Noelia Bernal
Sebastian Galiani
Oswaldo Molina

Working Paper 33925
http://www.nber.org/papers/w33925

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 2025

We are grateful to Emilia Chocobar, Raúl Sosa, Paola Villa-Paro, William Fernández, Fabrizio Solf and Gonzalo Torres for their excellent research assistance. We also thank the helpful comments provided by participants at seminars held at Universidad del Pacifico, International Finance Conference, HEC Montreal, International Conference in Development Economics, LACEA, and Netspar. We gratefully acknowledge the financial support from the Innovation for Poverty Action (IPA) and Universidad del Pacífico, and the institutional collaboration of the Peruvian Private Pension Fund Association (AAFP), the National Pension Office (ONP), and the Superintendency of Banking, Insurance and Private Pension Funds (SBS). This study is registered in the AEA RCT Registry (unique identifying number AEARCTR-0003395) and was approved by the IPA IRB (protocol #14370). The registered pre-analysis plan (PAP) outlines the analysis we had planned to conduct prior to the emergence of the COVID-19 pandemic. The empirical analysis for the full sample follows the specifications outlined in the PAP. However, the analysis comparing outcomes before and during the pandemic was not pre-specified, as the pandemic constituted an unanticipated natural experiment.The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Does Matching Contribution Incentivize Informal Workers to Participate in Retirement Saving Plans? A Randomized Evaluation Interacted with a Natural Experiment

Noelia Bernal, Sebastian Galiani, and Oswaldo Molina

NBER Working Paper No. 33925
June 2025
JEL No. J49

ABSTRACT

We conducted a large field experiment in Peru on informal workers and studied whether offering them a matching contribution raise participation and contributions in their Individual Retirement Accounts. We had three groups: a control group receiving no match, and two treatments groups receiving 50 and 100 percent match, respectively. Additionally, due to the time span, we can also analyze the difference responses between pre and during Covid-19. The results were as follows. First, the match incentive increases participation. Workers in the 50 and 100 percent match groups show participation rates of 5.2 and 6.5 p.p. higher than workers in the control group, respectively. The participation effect is also present pre Covid-19 and disappears during it. Second, the 100 percent match incentive was the only effective in increasing savings among all individuals (1.4 p.p.), pre (2.3 p.p.) and during Covid-19 (0.97 p.p.). This effect still presents in LATE specification with higher p.p. Third, 100% match was again the only effective to make contribute more than once, in the full sample (1.2 p.p.), and pre Covid-19 (2.7 p.p.), including LATE specification (full sample – 5.6 p.p.; pre Covid-19 – 8.2p.p.). Fourth the 50 percent match is not effective in raising contribution in any specification.

Noelia Bernal
Universidad del Pacifico
n.bernall@up.edu.pe

Oswaldo Molina
Universidad del Pacifico
o.molinac@up.edu.pe

Sebastian Galiani
University of Maryland, College Park
Department of Economics
and NBER
sgaliani@umd.edu

A randomized controlled trials registry entry is available at AEARCTR-0003395

1. Introduction

Almost two and a half billion workers — representing about 73 percent of the world's employed population — do not contribute to a pension system or save for their retirement (Demirguc-Kunt et al., 2021). This occurs mainly in settings with high rates of informality, such as in Latin America, where more than half of the workers are informally employed (ILO, 2018, Cavallo and Serebrisky, 2016, Holzmann et al. 2009, Bosch et al., 2013).[1] As a consequence, they are not listed in national registries and cannot be compelled to contribute. Even if contributions to pensions were meant to be voluntary, traditional incentive schemes applied in developed countries (e.g., providing subsidies in the form of tax deductions or exemptions) could hardly be extrapolated to developing countries either. The analysis of alternative incentives to promote savings for retirement and to prevent old-age poverty among these informal workers is therefore crucial, especially in the current quick-aging context.

In this paper, we study whether offering informal workers a matching contribution —an alternative incentive to promote retirement savings[2]— can raise participation and contributions for retirement. To do so, we conducted a large field experiment on workers of small-scale firms in Peru and randomly assigned firms to a control group and two treatment arms where workers were offered a matching incentive of 100 percent and 50 percent, respectively. Workers from all groups also received information about the importance and benefits of saving for retirement. For those who complied, the matching incentive had a duration of six months from the moment of enrollment.

A key aspect of this study is the natural experiment created by the Covid-19 pandemic, which divided our intervention into two distinct economic contexts: a pre-Covid-19 period, characterized by relative economic stability, and a during-Covid-19 period, marked by severe

[1] In Africa, 85.8 percent of the employment is informal. In Asia and the Pacific, 68.2 percent. In the Arab States, 68.6 percent. In the Americas, 40.0 percent and in Europe and Central Asia, 25.1 percent (ILO, 2018).

[2] Examples of programs implemented in developed countries with different types of matching incentives are: i) the Saver's Credit, a feature of the United States (U.S.) tax code, in practice, provides a government match to encourage savings of lower income households; ii) the U.S. employer-sponsored 401(k) savings plans offer match rates that range from 0% to 200% match; iii) the voluntary saving scheme for retirement called Riester Pensions in Germany, in which individuals from low or middle-income households received a flat match subject to their contribution (Madrian, 2013, Duflo et.al. 2006, Duflo et.al. 2007, Borsch-Supan et al. 2008, Mills et al., 2008, Mitchell et al., 2007). Online Appendix Table A-4 provides a more complete review of these programs.

financial distress and income uncertainty. This unique setting allows us to evaluate the effectiveness of the matching incentive under normal economic conditions and during a crisis, providing valuable insights into the role of financial constraints in retirement savings decisions.

The Peruvian case is particularly relevant given that informality accounts for 73.2% of the economically active population (INEI, 2016), and only 3.3% of informal workers have contributed to or saved for retirement at least once in the past twelve months (INEI, 2020). In addition, the main pension system resembles the American individual retirement accounts (IRAs), but it is only mandatory for workers in the formal sector and does not provide any incentive to save for low-income workers (as the Saver's Credit, for instance), for whom the economic benefits of increasing savings may be higher.[3]

The experiment led to some important results. First, the match incentive increases participation among workers. Workers in the 50-percent (partial) match and the 100-percent (full) match groups show enrollment or participation rates of 5.2 and 6.5 p.p. higher than workers in the control group, respectively. However, this general effect masks substantial differences observed when contrasting pre- and during-Covid-19 economic environments. In the period pre Covid-19 pandemic, participation rates are 15.7 percentage points for the 50-percent match and 16.7 percentage points for the 100-percent match, compared to the control group. In contrast, during the Covid-19 pandemic, which introduced significant economic instability and income uncertainty, the 50-percent match had no effect on participation at all, and the 100-percent match resulted in only a modest and statistically insignificant 1.28 percentage point increase.

Second, the results show that only the 100-percent matching incentive effectively increased savings behavior. Specifically, it raised the probability of workers contributing at least once by 2.3 percentage points in pre-Covid-19 economic conditions, but this impact diminished significantly to just 0.97 percentage points during the pandemic. We also find heterogeneous effects of the match incentive. We find that women, workers older than 45 years old, and workers living under normal economic situations, that is before the Covid-19 pandemic, contributed more often for retirement.

[3] See Duflo et.al. 2006 and Duflo et.al. 2007 for good descriptions about the IRA and the Saver's Credit.

This paper contributes to the existing literature by documenting experimental evidence that shows that the matching contribution incentive can be effective for low-income workers in the informal sector. There are papers analyzing incentives and retirement savings, but our study distinguishes them in four ways. First, we deal with informal workers while others focus on formal employees, which are the minority of the labor force in emerging and developing countries. These studies find, consistent with economic theory predictions[4], that matching incentives have positive effects on participation rates and, moderate effects on contributions (Duflo et al, 2006, Saez, 2009, Engelhardt and Kumar, 2007, Madrian, 2012, Beshears et al., 2010, Borsch-Supan et al., 2008, Mills et al., 2008, Mitchell et al., 2007, Hyberman et al., 2007, and Dworak-Fisher, 2008)[5]. However, most of this evidence has been conducted on formal employees and comes from developed countries with relatively good functioning labor markets. In contrast, in the developing countries, there have been few evaluations about effective mechanisms to promote savings for retirement. A recent study is Blumenstock et al. (2018). They evaluate an automatic enrollment mechanism with a matching incentive for savings of formal employees from the largest Telecom company in Afghanistan and find positive effects. However, their study focuses on formal employees and incentivizes short-term savings through mobile phones, leaving a gap for evaluating incentives for long-term savings among informal (low-income) workers.

Second, we provide evidence that the different matching rates, of 50 and 100 percent, do not lead to important differences on participation, but they do entail different results on saving behavior. Only the 100 percent match incentive significantly raises the probabilities to contribute and increases savings for retirement and, more interestingly, it increases the probability to contribute after the treatment period, which is the most important outcome to improve pension coverage and long-term savings.

[4] A life-cycle model predicts that matching contribution increases the rate of return of long-term savings. For a saver, the match would have a positive effect on savings if the substitution effect outweighed the income effect. On the other hand, for a borrower, it either will not affect or will convert the individual into a saver (Browning and Crossley, 2001; Madrian, 2013).

[5] For instance, Duflo et al. (2006) conducted a field experiment on 14,000 tax filers at 60 H&R Block tax preparation offices in St. Louis and found that matching incentives on IRAs contributions significantly increase plan participation and contributions. Raising the match rate from 0–20% to 50% increased IRA take-up from 3–8% to 14%.

Third, we also provide evidence of heterogeneous effects by gender, age, and economic conditions, which mainly suggest that adverse income shocks hit the informal sector particularly hard and affect the possibility to access and contribute to social insurance programs.

Fourth, and crucially, our experiment distinguishes clearly between economic conditions before and during the Covid-19 pandemic. These findings underscore how economic stability is essential for informal workers to effectively leverage financial incentives to enhance long-term retirement savings.

Finally, this paper relates to several strands of existing research. We speak to the literature on interventions that aim to modify saving behavior in developing settings, which emphasizes the effects of saving incentives and mechanisms (Ashraf, Karlan, & Yin, 2006; Fuentes, Lafortune, Riutort, & Tessada, 2022; Callen, de Mel, McIntosh, & Woodruff, 2019), and the impact of relaxing saving barriers (Dupas & Robinson, 2013b; Brune, Giné, Goldberg, & Yang, 2016). We also contribute to the literature on financial access and inclusion, including studies showing that expanding access to formal saving instruments can increase saving and investment among low-income and informal workers (Dupas & Robinson, 2013a; 2013b; Field et al., 2021).[6]

The findings that we present here might have important policy implications for emerging and developing countries. First, expanding social protection among informal workers is a challenge as the upcoming years will be characterized by quick aging of the population (He et al., 2016, Bosch et al., 2013). In this context, matching contributions could be a promising strategy for developing countries to increase financial security and prevent old-age poverty among informal workers, given that traditional incentive schemes and other strategies such as automatic enrollment -- which have been found to be very effective (e.g., Blumenstock et al., 2018) -- are hard to implement in the informal sector. Second, in the absence of a well extended social security, governments will have to incur large costs to provide non-contributory pensions to informal

[6] There is also a strand of research on behavioral interventions to promote retirement savings, including studies on the role of simplified information (Goldin, Homonoff, & Tucker-Ray, 2017; Saez, 2009; Bhargava & Manoli, 2015; Liebman & Luttmer, 2015; Chan & Stevens, 2008; Card & Ransom, 2007; Duflo & Saez, 2003), financial incentives (Duflo, Gale, Liebman, Orszag, & Saez, 2006), and default mechanisms (Madrian & Shea, 2001; Bubb & Warren, 2020; Bernheim, Fradkin, & Popov, 2015).

workers in the future. Alternatively, offering incentives such as matching contributions might persuade them to start saving, thereby reducing the fiscal burden.

2. Experimental Design and Data Collection

Participation in the Peruvian pension system is mandatory for workers who are formally registered on a payroll; that is, employees in the formal sector. Workers can enroll in either the IRAs (SPP due to its Spanish acronym and managed by private pension funds) or the National Pension System (known as SNP and managed by the government). However, as of 2020, only about 19% and 9% contribute regularly to these systems, respectively. In contrast, for workers in informal employment, participation is voluntary, and only a small minority contribute to either the SPP or the SNP pension systems (around 3 percent, according to ENAHO (2020)). Therefore, we focus on these workers to study whether offering a Matching Contribution incentive can persuade them to participate and save for retirement in the SPP.

Sampling workers in informal employment is quite challenging because they are not listed in any public registry. For this reason, we had to take various steps to obtain our final sample. First, given that the majority of these workers earns their income through working in small-scale firms, we started using the Micro and Small Firms Directory in Lima, provided by the National Institute of Statistics and Informatics (INEI for its acronym in Spanish), and the taxpayer administrative database from the National Superintendence of Tax Administration (SUNAT for its acronym in Spanish). We applied some criteria of selection before conducting the randomization. We have kept firms that follow the legal definition of micro firm, which is a firm that has less than ten workers and annual sale's level lower than 150 taxation units. Next, we selected firms with a lifetime longer than five years, that is with active Unique Taxpayer Registry status during that time, to guarantee their current functioning. And finally, we kept firms with observed and no outlier's information on annual sales.

Second, the unit of randomization was the firm to avoid the problem of contamination within the firm. We conducted a stratified randomization process by i) sales level, micro-firms were classified according to the quintiles of the distribution of annual sales, ii) geographic location, firms were classified according to location in North Lima, South Lima, East Lima, Center Lima,

or Callao, and iii) economic sector according to the Uniform International Industrial Classification (CIIU). These were the available characteristics in our databases before initiating the field work together with the addresses. Thus, with this information, we visited randomized firms to keep only those that could effectively be located, were open at the moment of the visits, and whose workers could be surveyed.

Third, our design focuses on exploring the effects of matching contributions on workers who do not (mandatory) participate in the pension system; thus, we identified as eligible workers for the experiment all those who were not enrolled to any pension system at the moment of the visits.

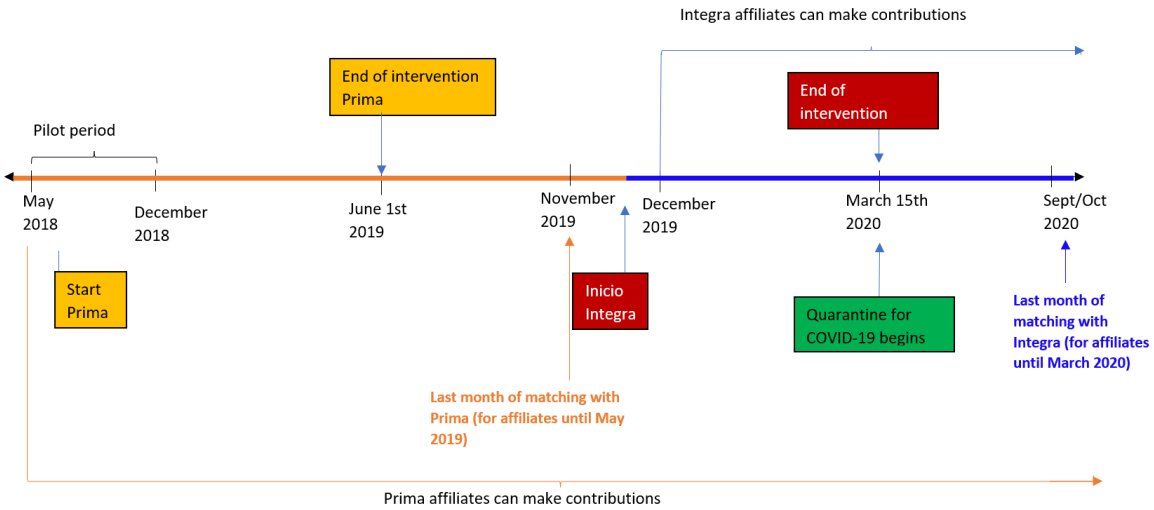
The intervention period lasted from May 1, 2018, to September 30, 2020 (see Figure 1). Every two years, all pension funds in Peru compete in an auction where the fund offering the lowest fees earns the exclusive right to enroll new workers until the next auction. For this study, we focus on data from two major pension funds: IRA Prima and IRA Integra. These funds are well-known among workers and are similar in terms of fees and other characteristics.

The IRA Integra period ran from December 2019 to September 2020, overlapping with the onset of the Covid-19 pandemic. This overlap—together with labor restrictions implemented during the pandemic and the typical holiday slowdown in December and January in Peru—provides a unique opportunity to evaluate IRA Integra as a 'during-pandemic' case. It also enables us to assess the impact of matching pre- and during-Covid-19 conditions, which, as we will show, has important implications for participation and contribution outcomes.

The intervention and data collection were carried out by Innovation for Poverty Action (IPA). During the intervention, sales professionals visited eligible workers at their job sites. First, these professionals provided workers from both treated and control groups' simple information about the importance of saving for retirement and the benefits of saving in the IRAs. Second, they offered workers assigned to the treatment groups a matching incentive conditional on contributions for a period of six months. The match offer was made available to all treated workers according to their treatment group (50% or 100% match). It had a simple structure, was clearly explained, and contributions were deposited directly into an IRA. Workers in the control group

did not receive the matching offer and obtained only information. If workers decided to participate, the sales professionals carried out the enrollment process.

Figure 1. Timeline of intervention



Our final sample comprises 2,961 workers from 2,702 micro firms located in Lima and it is representative of workers in informal employment who are not enrolled in any pension system and work at small-scale firms with active taxpayer registry status and observed sales information. Assignment is as follows: 891 workers were assigned to the control group, 1,037 to the 50% matching treatment arm, and 1,033 to the 100% matching treatment arm. Out of the 2,961 workers sampled, 1,093 belong to the pre-COVID-19 period and 1,868 to the period during the pandemic. Table A-5 in the Online Appendix shows descriptive statistics and balance tests across treatment groups and intervention stages (pre- and during Covid-19). The results indicate that observable characteristics are well balanced across groups, with no significant differences in nearly all covariates.[7]

Enrollment to the Peruvian IRAs is fast, simple and can be done through the Internet. The sales professionals were provided with tablets and an Internet connection for this purpose. After the workers become enrolled, the pension fund creates an individual account, and workers can

[7] The randomization process was conducted by IPA. In the replication package we provide the code to replicate it together with the rest of codes and data that replicate the results presented in the paper.

start contributing after the second working day of the month following the enrollment. Unenrollment is not possible.

Contributions to the IRAs must be made monthly and in person. Thus, they result from the active decisions of workers, who each month must decide how much to contribute (above the minimum) and physically go to the bank or its agencies to make the payment. The minimum monthly contribution is 10 percent of the minimum salary plus a management fee and an insurance premium. This was about 32 USD during our experimental period[8]. Making contributions and then withdrawing the funds (with or without the match) was not possible until retirement. The sales professionals gave this information to workers from both treated and control groups during the visits. Additionally, for those who enrolled, we sent remainders via WhatsApp messages over a six-month period, specifying the minimum amount and locations for contribution as well as the duration of the matching incentive (see Online Appendix Table A-4 for the messages' design).

The data for the analysis in Section 4 come from a baseline survey and the administrative data of the two pension funds. The data about enrollment and contributions come from the administrative records of the two pension funds we worked with during the intervention period. Specifically, enrollment information is observed just once for the three experimental groups (since unenrollment is not possible) and contribution information is observed in a monthly basis up to 12 months after enrollment. To complement this information, the baseline survey contains questions about workers, household and firm characteristics as well as expectations about retirement, financial literacy and preferences, among others. Table A-5 shows that, on average, most individuals report working as employees in very small firms (with fewer than 3 workers), without formal contracts (90%), and earning a labor income of around USD 397, an amount that is low compared to the average income of those already enrolled in the Peruvian IRAs (USD 628, mostly formal employees).

[8] The minimum legal salary was 930 PEN (USD 278), the management fees were between 0% and 0.23% of the salary depending on the pension fund, and the disability and surviving insurance's premium was about 1.74% of the salary. The exchange rate was 3.35 soles per dollar (December 2018).

3. Empirical Strategy

We estimate the impact of the matching incentive on participation and contribution by using the following empirical model:

$$Y_{i,j} = \alpha_0 + \alpha_1 Z_{1_{i,j}} + \alpha_2 Z_{2_{i,j}} + \alpha_3 M_j + \alpha_4 X_{i,j} + \widetilde{w}_{ij} \qquad (1)$$

where $Z_{1_{i,j}}$ and $Z_{2_{i,j}}$ are variables that indicate whether the worker was assigned to the 50 percent and 100 percent match groups,, respectively, $Y_{i,j}$ is an indicator for enrollment or contribution, M_j is a vector of the firm-level variables that were used in the randomization stratification (annual sales, location, and economic sector), $X_{i,j}$ is a vector of control variables at the individual, household, and firm level, and $\widetilde{w}_{ij}$ represents the error term. We cluster the standard errors at the firm level.

When $Y_{i,j}$ measures enrollment, equation (1) identifies the average treatment effect. When it measures contribution, it identifies intent-to-treat (ITT) effects. We also rely on two-stage least squares estimation. In the first stage, we instrument actual enrollment in each arm of the study with the treatment assignment variables. In the second stage, we estimate the impact of the predicted enrollment on contribution using the following equation:

$$Y_{i,j} = \beta_0 + \beta_1 \hat{T}_{1_{i,j}} + \beta_2 \hat{T}_{2_{i,j}} + \beta_3 M_j + \beta_4 X_{i,j} + \widetilde{w}_{ij} \qquad (2)$$

where $T_{1_{i,j}}$ and $T_{2_{i,j}}$ measures actual enrollment in the 50 percent and 100 percent match groups, respectively and they are instrumented by the treatment assignments $Z_{1_{i,j}}$and $Z_{2_{i,j}}$. This estimator allows us to recover, under mild assumptions, the average treatment effects (LATE) of each treatment on contribution.

4. Results

A. *Effects on Participation and Contributions*

Table 1 displays the primary outcomes of the experiment for the full sample and by treatment group. The introduction of a matching contribution significantly increased workers' enrollment (participation) in the Peruvian IRAs. In the full sample, 11.2% of workers in the control group

enrolled, compared to 15.1% in the 50% match group and 17.3% in the 100% match group. OLS estimates confirm that both matching offers raised the likelihood of participation by about 5.2–6.5 percentage points relative to the control (5.17 p.p. for 50% match; 6.45 p.p. for 100% match, both $p<0.01$). These effects are statistically significant and align with our hypothesis that financial incentives encourage informal workers to enroll. Notably, the magnitude of the participation increase falls within the range reported in studies on formal workers (approximately 5–11 percentage points in prior research), suggesting that even in a disadvantaged informal labor force, a similar response to matching incentives is observed.

A striking pattern emerges when we compare outcomes before and during the COVID-19 pandemic. In the pre-COVID-19 period, the matching incentives had a very large effect on participation. The 50% match group's enrollment rate was 25.9%, and the 100% match group's rate was 28.1%, versus only 12.1% in the control group. These differences correspond to OLS-estimated increases of 15.75 p.p. (50% match) and 16.72 p.p. (100% match) relative to the control, both highly significant. In contrast, during the COVID-19 crisis, the impact of the incentives was markedly weaker. Participation rates in the 50% and 100% match groups dropped to 9.6% and 12.2%, respectively, compared to 10.5% in the control group, and the estimated effects (–0.46 p.p. for 50% match; +1.28 p.p. for 100% match) were small and not statistically significant. This difference indicates that the financial hardship and uncertainty of the pandemic greatly dampened the effectiveness of the matching incentive. In normal times, even a 50% match substantially boosted enrollment, but under crisis conditions, even a 100% match was insufficient to induce significantly higher participation.

We also examine whether the matching contributions affected actual saving behavior—specifically, whether workers made deposits into their IRAs. Two measures of saving are considered in the 12 months following enrollment: the probability of making at least one contribution and the probability of making more than one contribution. The results show that only the 100% match led to a significant increase in contributions, whereas the 50% match had no discernible effect on saving. In the full sample, being offered a full 100% match raised the likelihood of contributing at least once by about 1.35 p.p. and of contributing multiple times by

1.16 p.p. compared to the control group. By contrast, the 50% match did not produce a significant change in either outcome (the point estimates are positive but small and not significant). This pattern is even more pronounced in the pre-COVID subsample: under normal economic conditions, the 100% match increased the probability of contributing at least once by 2.31 p.p. and of contributing more than once by 2.68 p.p., whereas the 50% match again showed no significant impact. During the pandemic period, virtually all treatment effects on contributions disappeared, mirroring the participation results. The only slight effect was a 0.97 p.p. increase in the probability of making any contribution for the 100% match group during COVID-19, but even this crisis-period effect is smaller than the pre-pandemic impact. We find no significant increase in repeated contributions for either match rate during the pandemic.

In summary, the matching incentive substantially raised both participation and saving for retirement in the Peruvian IRA among informal workers under normal circumstances, with the 100% match proving notably more effective than the 50% match in prompting actual contributions. The 50% match generated a similar increase in initial enrollment as the 100% match, but it failed to translate into additional savings, suggesting that a smaller financial incentive may encourage workers to sign up but not to follow through with deposits. In contrast, a larger 100% match induced more workers to contribute and to do so more than once. However, the comparison between the pre-pandemic and pandemic periods highlights that these positive effects are highly sensitive to broader economic conditions: the match incentives boosted enrollment and contributions in the absence of financial duress, but those effects largely vanished during COVID-19.

Table 1 – Effects on Participation and Contributions

	Mean (percentages)			OLS Estimates (p.p.)	
	Control group (1)	50% match (2)	100% match (3)	50% match vs control (4)	100% match vs control (5)
Panel A: Full sample					
Participation rate	11.22	15.14	17.33	5.17***	6.45***
	(1.06)	(1.11)	(1.18)	(1.81)	(1.86)
Contribute at least once	0.11	0.48	1.26	0.43	1.35***
	(0.11)	(0.22)	(0.35)	(0.32)	(0.46)
Contribute more than once	0.00	0.29	0.97	0.33	1.16***
	(0.00)	(0.17)	(0.30)	(0.20)	(0.37)
Panel B: Pre Covid-19					
Participation rate	12.07	25.85	28.06	15.75***	16.72***
	(1.62)	(2.33)	(2.45)	(3.24)	(3.46)
Contribute at least once	0.25	0.85	2.39	1.18	2.31**
	(0.25)	(0.49)	(0.83)	(0.84)	(1.06)
Contribute more than once	0.00	0.57	2.39	1.01	2.68***
	(0.00)	(0.40)	(0.83)	(0.63)	(0.99)
Panel C: During Covid-19					
Participation rate	10.52	9.64	12.18	-0.46	1.28
	(1.39)	(1.13)	(1.24)	(2.17)	(2.18)
Contributed at least once	0.00	0.29	0.72	0.16	0.97**
	(0.00)	(0.21)	(0.32)	(0.20)	(0.43)
Contributed more than once	0.00	0.15	0.29	0.03	0.41
	(0.00)	(0.15)	(0.20)	(0.04)	(0.29)

Notes: (i) N=(A)2,961 (B)1,093 (C)1,868 observations. (ii) All regressions report intention to treat estimates following equation (1). (iii) All regressions control for stratification variables (firm location, economic sector, and annual sales), individual level (female, age, marital status, education level and firm owner), household level variables (household size, head of household, dependent household members and any member associated to the pension system), and firm level variables (number of workers). (iv) Mean fraction of workers who contribute includes zeros for those with no enrollment and contributions (see Duflo et al. (2006) for a similar approach). (iv) Clustered standard errors at the level of treatment assignment (firm level) in parentheses. (v) Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

The LATE estimates (Table 2) reinforce the conclusions from the OLS analysis and suggest even larger effect sizes among compliers. For the full sample, being assigned to the 100% match group led to roughly a 7.6 p.p. increase in the probability of making at least one contribution, and a 6.5 p.p. increase in the probability of making multiple contributions, relative to the control group (both effects significant at the 1% level). By contrast, assignment to the 50% match group again showed no significant effect on saving. When we split the IV results by period, we find a similar pattern: under pre-COVID conditions, the 100% match significantly increased contributions (with particularly large gains in the likelihood of contributing more than once), while during COVID-19 the IV estimates are close to zero for the 50% match and greatly diminished for the 100%

match. In fact, the only statistically significant LATE during the pandemic is a marginal positive effect of the 100% match on the probability of any contribution (consistent with the small OLS effect noted above).

Table 2 – Local Average Treatment Effect on Contributions

	Contribute at least once			Contribute more than once		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full sample						
Matching 50	2.60	2.55	2.55	2.26*	1.96	1.97
	(1.67)	(1.89)	(1.94)	(1.22)	(1.24)	(1.25)
Matching 100	6.41***	7.62***	7.62***	5.56***	6.52***	6.53***
	(2.02)	(2.48)	(2.50)	(1.68)	(2.04)	(2.03)
Observations	2961	2297	2297	2961	2297	2297
Panel B: Pre Covid-19						
Matching 50	0.80	1.22	1.18	2.75	3.65	3.67
	(0.60)	(0.82)	(0.84)	(1.82)	(2.28)	(2.32)
Matching 100	2.01**	2.33**	2.31**	8.15***	9.28***	9.28***
	(0.83)	(1.06)	(1.06)	(2.75)	(3.30)	(3.30)
Observations	1093	859	859	1093	859	859
Panel C: During Covid-19						
Matching 50	2.80	1.46	1.45	1.76	0.26	0.27
	(2.04)	(1.85)	(1.85)	(1.55)	(0.38)	(0.39)
Matching 100	6.00**	7.92**	7.89**	2.48	3.34	3.35
	(2.64)	(3.39)	(3.38)	(1.73)	(2.31)	(2.32)
Observations	1868	1438	1438	1868	1438	1438
Stratification Variables	Yes	Yes	Yes	Yes	Yes	Yes
Individual and Household covariates	No	Yes	Yes	No	Yes	Yes
Firm Variables	No	No	Yes	No	No	Yes

Notes: (i) Clustered standard errors in parentheses. (ii) Significance levels: * p<0.1, ** p<0.05, *** p<0.01. (ii) All regressions control for stratification variables (firm location, economic sector, and annual sales). Columns 2, and 5, add controls for individual level (female, age, marital status, education level and firm owner) and household level variables (household size, head of household, dependent household members and any member associated to the pension system). Columns 3, and 6, add controls for firm variables (sales and number of workers) and the previous mention.

B. *Effects on Contributions after the Matching Period*

We next analyze whether workers continued to save in the Peruvian IRAs after the 6-month matching period ended. In other words, did the intervention have a lasting effect on savings behavior once the financial incentive was removed? To explore this question, we first examine the time pattern of contributions during the 12 months following enrollment. Figure 2 illustrates the monthly contribution rates (the fraction of enrolled workers contributing each month) for each group, separately for the full sample, the pre-COVID cohort, and the during-COVID cohort. The trends show that workers in both treatment groups continued to contribute even after the six months of matching ended, whereas the control group's contribution rate remained near zero

throughout. This suggests that our intervention induced some participants to keep saving beyond the period when contributions were being matched, indicating a potential persistent change in behavior. The figure also reveals differences by treatment intensity and timing. In the 100% match group, contribution activity was highest during the first few months after enrollment (peaking around 7% of workers contributing in a month for the full sample, and about 4.5% in the pre-COVID sample) and then declined over time, leveling off at roughly 2–3% of workers contributing per month after the match incentive was gone. The 50% match group exhibited a similar declining trend, but with a lower initial peak (around 2–3% contributing in the early months) and generally smaller month-to-month variation. As expected, the control group had minimal contribution activity throughout the year. We also observe that during the COVID-19 period, overall contribution rates were lower: in the 100% match group, the share of workers contributing each month never rose above 3% during the post-match months amid the pandemic.

To formally test for post-incentive saving, we created an indicator for whether a worker made any contribution in the 6–12 month period after enrollment (i.e. after the matching period ended) and compared this outcome across groups. Table 3 reports the effects on this post-treatment contribution behavior. Consistent with the time-series evidence, we find that workers who were offered the 100% match were significantly more likely to continue saving after the match subsidy was removed. In the full sample, assignment to the 100% match group raised the probability of contributing in the post-match period by about 0.90 p.p. relative to the control group. This effect is even larger for those who enrolled pre-COVID: in that subsample, the 100% match led to a 1.78 p.p. increase in the post-period contribution probability. By contrast, being offered a 50% match did not have a significant impact on saving after six months in any specification or subsample – the point estimates for the 50% group are near zero (and not significant) for both the pre-pandemic and pandemic cohorts. We also estimated IV versions of these regressions to gauge the LATE on post-period contributions. The LATE results indicate that among those who actually took up the IRA, the 100% match produced a very substantial improvement in long-term saving behavior: the probability of continuing to contribute after six months increases by roughly 5.1 p.p. in the full sample and 6.2 p.p. in the pre-COVID sample for workers who received the 100%

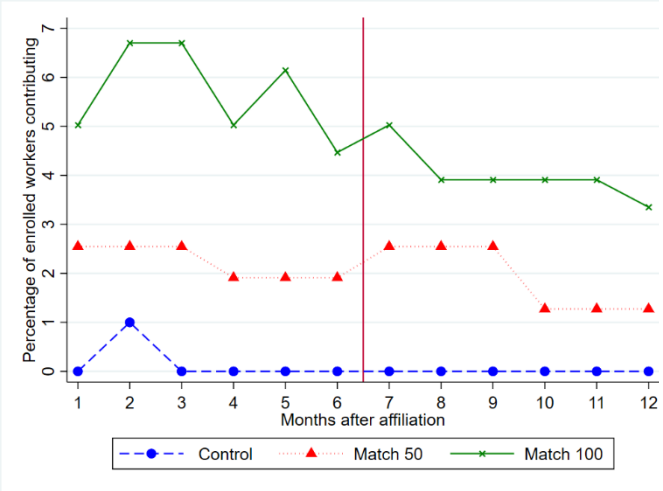
match offer (both effects significant at $p<0.01$). Once again, no significant effects are found for the 50% match group.[9]

These findings suggest that the presence of a generous matching incentive not only triggers initial participation and short-term contributions, but can also lead to persistent changes in saving habits even after the financial incentive is gone. In other words, some informal workers who were induced to start saving with a 100% match continued to save on their own once they had begun the habit of contributing to their retirement account. This behavior change is consistent with the idea that experiencing the process of saving—and seeing their balances grow—might alter individuals' financial habits or perceptions. For instance, Blumenstock et al. (2018) document that participants in a savings intervention reported feeling less financially constrained, attributing greater importance to saving, and more confidence in meeting future financial obligations after the program. In our context, the act of contributing to the pension account (and the accumulation of funds, which could not be immediately withdrawn) may have helped informal workers overcome inertia and develop a routine of saving for the long term.

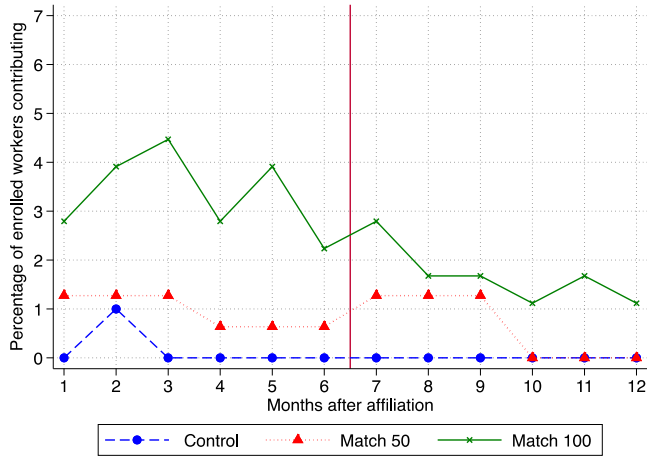
[9] Besides effects on probabilities, we also find effects of the match incentive on the amount of savings. Panel A of Table B-1 in the Online Appendix shows that the total savings amounts (defined as contributions plus match and returns of the Peruvian IRAs within 12 months after enrollment) were significantly higher in the 100 percent match group compared to the control group, while there were no effects among individuals in the 50 percent match group. Then, at Panel B and C we show the estimates for pre and during Covid-19. While we still find positive (and larger) effects on savings in the 100 percent match group during the pre Covid-19 period, the effect disappears during Covid-19, showing that economic stability is essential for the match incentive to effectively improve saving behavior of informal workers.

Figure 2 – Percentage of Workers Contributing During and After Treatment Period

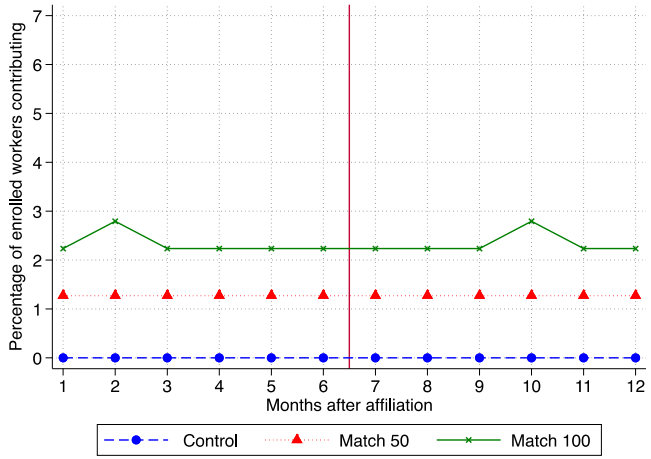
Panel A: Full sample



Panel B: Pre Covid-19



Panel C: During Covid-19



Notes: The figure displays the percentage of enrolled workers in each of the three experimental groups (control, 50 percent match, and 100 percent match) that contribute each month after being enrolled. The red line represents the end of the treatment period, after which no contribution is matched by the program.

Table 3 – Effects on Contributions after the Treatment Period

	Mean			OLS Estimates		LATE estimates	
	Control group	50% match	100% match	50% match vs control	100% match vs control	50% match	100% match
Panel A: Full sample							
Contribute after matching period	0.00	0.19	0.68	0.32	0.90***	1.93	5.09***
	(0.00)	(0.14)	(0.26)	(0.20)	(0.33)	(1.25)	(1.79)
Panel B: Pre Covid-19							
Contribute after the matching period	0.00	0.57	1.49	0.97	1.78**	3.59	6.17**
	(0.00)	(0.40)	(0.66)	(0.63)	(0.76)	(2.31)	(2.57)
Panel C: During Covid-19							
Contribute after the matching period	0.00	0.00	0.29	0.04	0.39	0.33	3.21
	(0.00)	(0.00)	(0.20)	(0.04)	(0.28)	(0.39)	(2.22)

Notes: (i) N=(A)2,961 (B)1,093 (C)1,868 observations. (ii) All regressions control for stratification variables (firm location, economic sector, and annual sales), individual level (female, age, marital status, education level and firm owner), household level variables (household size, head of household, dependent household members and any member associated to the pension system), and firm level variables (number of workers). (iii) Mean fraction of workers who contribute includes zeros for those with no enrollment and contributions (see Duflo et al. (2006) for a similar approach). (iv) Clustered standard errors at the level of treatment assignment (firm level) in parentheses. (iv) Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

C. *Heterogeneous effects*

We study whether the impact of the matching incentive differs across key demographic groups and economic conditions. In particular, we explore heterogeneity along three dimensions: gender, age, and the timing of enrollment relative to the COVID-19 shock. Table 4 presents regression estimates in which the treatment effect is interacted with these characteristics. Overall, we find no significant difference by gender or age in the propensity to enroll (participate) in the program – that is, women were about as responsive to the match offer in terms of initial enrollment as men, and older workers (above 45 years) were about as responsive as younger workers. However, when looking at contribution outcomes, the matching incentive had a notably larger effect for female and older participants. In the full sample, being a woman or being over 45 is associated with a greater increase in the likelihood of contributing (at least once, multiple times, and even after the six-month period) in response to the match treatment. In fact, the positive effects of the match on saving behavior are concentrated in these groups: the interaction terms in Table 4 indicate that women and older workers drove much of the improvement in contribution rates due to the treatment. For example, the probability of contributing at least once or more than

once increased significantly for women offered a match (relative to men), and similarly for older versus younger workers, even though the baseline (control group) saving rates of these subgroups were low. These patterns suggest that female and older informal workers were especially receptive to the financial incentive when it comes to actual saving, perhaps reflecting differences in risk aversion, retirement concerns, or financial responsibilities that make the prospect of retirement savings more salient for these groups.

In addition, the distinction between the pre-COVID and during-COVID periods further underscores the role of economic conditions in mediating the treatment effect. As discussed earlier, the matching intervention yielded significant increases in participation and contributions among those who were exposed to it before the pandemic, but it showed no tangible benefits for those exposed during the pandemic. This can be interpreted as a form of heterogeneous effect by economic context: the positive impact of matching incentives was effectively nullified by the adverse income shock of COVID-19.

Table 4 – Heterogeneous Effects on Participation and Contributions by Gender and Age

	Full sample			Pre Covid-19			During Covid-19		
	Heterogeneity	Treatment	Treatment*Heterogeneity	Heterogeneity	Treatment	Treatment*Heterogeneity	Heterogeneity	Treatment	Treatment*Heterogeneity
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Effect on Participation									
Woman	0.019	0.053**	0.009	0.034**	0.187***	-0.027	-0.086***	-0.022	0.017
	(0.026)	(0.02)	(0.031)	(0.017)	(0.04)	(0.024)	(0.024)	(0.03)	(0.029)
Older than 45	-0.036	0.066***	-0.016	-0.037	0.154***	0.020	-0.106***	0.011	-0.034
	(0.037)	(0.03)	(0.031)	(0.027)	(0.04)	(0.024)	(0.032)	(0.03)	(0.029)
Effect on the probability to contribute at least once									
Woman	-0.008	0.000	0.014**	-0.006	0.001	0.012**	-0.001	0.003	0.005
	(0.005)	(0.00)	(0.006)	(0.004)	(0.01)	(0.005)	(0.002)	(0.00)	(0.004)
Older than 45	-0.005	0.002	0.013**	-0.007	0.001	0.014**	0.002	0.004	0.003
	(0.005)	(0.00)	(0.006)	(0.005)	(0.01)	(0.006)	(0.005)	(0.00)	(0.005)
Effect on the probability to contribute more than once									
Woman	-0.003	0.002	0.008**	-0.002	0.009	0.007*	-0.001	0.000	0.003
	(0.002)	(0.00)	(0.003)	(0.002)	(0.01)	(0.004)	(0.001)	(0.00)	(0.002)
Older than 45	-0.004	0.002	0.011***	-0.005	0.005	0.012**	-0.000	0.000	0.004
	(0.004)	(0.00)	(0.004)	(0.004)	(0.00)	(0.005)	(0.003)	(0.00)	(0.003)
Effect on the probability to contribute after six months									
Woman	-0.003*	0.001	0.009***	-0.003**	0.002	0.008***	0.000	0.000	0.001
	(0.002)	(0.00)	(0.003)	(0.001)	(0.00)	(0.003)	(0.000)	(0.00)	(0.001)
Older than 45	-0.001	0.002	0.008**	-0.004	0.004	0.009**	0.001	0.000	0.001
	(0.003)	(0.00)	(0.004)	(0.003)	(0.00)	(0.004)	(0.001)	(0.00)	(0.001)

Notes: (i) N=(A)2,961 (B)1,093 (C)1,868 observations. (ii) All regressions control for stratification variables (firm location, economic sector, and annual sales), individual level (female, age, marital status, education level and firm owner), household level variables (household size, head of household, dependent household members and any member associated to the pension system), and firm variables (number of workers). (iii) The estimates in column (2) are the effect on participation and contributions of changing the corresponding covariate dummy variable from zero to one. (iv) The estimates in column (3) are the additional effect of the being assigned to the 50 or 100 percent match groups relative to the control group, for individuals with corresponding covariate dummy equal to one. (v) The variables of contribution include zeros for individuals with no contributions. (vi) Clustered standard errors at the level of treatment assignment (firm level) in parentheses. (vii) Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

D. *The power of information*

One important consideration in interpreting our results is the role of the information and outreach component of the intervention. All workers in the study (including the control group) received a basic informational session from trained sales agents about the importance of saving for retirement and the features of the Peruvian pension system. Only the treatment groups, however, were offered the financial match. Because the informational content was held constant across all groups, our experimental design ensures that the differences in outcomes can be attributed to the matching incentive rather than to information alone.

At the same time, our findings reveal that information by itself had a meaningful impact on behavior. We observe a non-negligible take-up rate in the control group: as shown in Table 1, about 11.2% of control workers (who received no financial incentive) nonetheless decided to open a pension account and enroll in the IRA during the study. This suggests that the personalized information and encouragement provided by the sales agents induced some workers to start saving for retirement even without any matching funds. In the context of a population that had previously shown extremely low participation in pension savings, a double-digit enrollment rate from information alone is noteworthy. It highlights the potential of low-cost informational interventions to improve pension coverage among informal workers.

This result is consistent with insights from other studies, which have found that providing information or simplifying the enrollment process can boost participation in retirement plans. For example, prior research in developed countries shows that modest interventions like information sessions or counseling can positively influence saving behavior (Duflo et al., 2006; Saez, 2009).[10] Most of that evidence, however, comes from settings involving formal workers or taxpayers who are already within a pension or tax system. By contrast, our findings pertain to informal-sector workers with no mandatory pension coverage, demonstrating that information can be a powerful tool for this hard-to-reach population as well. One plausible mechanism is that the intervention

[10] Other interesting studies are the ones by Fajnzylber and Reyes (2015) and Fuentes et al. (2022) who exploits experiments in Chile to analyze the impact of sending information about pension projections on worker's savings decisions. Results show that personalized information increases voluntary pension savings.

lowered the cognitive and procedural barriers to saving. The sales agents delivered the information in a very accessible manner, addressed questions on the spot (and even followed up via WhatsApp for further assistance), and generally made the process of signing up and contributing as straightforward as possible. Such hand-holding and simplification likely reduced the complexity and inertia that often prevent individuals from initiating a savings plan (Madrian and Shea, 2001; Saez, 2009). In effect, the information treatment may have helped participants overcome procrastination and confusion, thereby facilitating the decision to enroll.

5. Discussion

In this paper, we provide experimental evidence that workers who received a match offer were significantly more likely to enroll and save in the Peruvian IRA, and the effects were larger for the highest match offer (100-percent). These effects can be explained through the channel of the substitution effect (Madrian, 2013). The matching incentive increased the return rate of savings in the Peruvian IRA, which made todays consumption relatively more expensive, motivating the substitution between consumption and savings in the treatment group. For savers, we then can argue that matching incentive increases the magnitude of the substitution effect and then it dominates the income effect of the higher rate of return. For non-savers, but slightly below the breakpoint in their decision to save, the matching incentive helps to make them decide to save through a higher substitution effect. For those workers who anyway do not save, the match incentive is not effective to make them start contributing, probably because they have very low incomes and other more urgent consumption (Banerjee and Mullainathan, 2010).

Second, our results come from active decisions of informal workers, who must make an active decision to enroll and save, and it that sense, not entirely comparable with those from interventions with automatic contributions, where workers do not require to take any action after enrollment (Blumenstock et al., 2018; Chetty et al., 2014). Thus, treated workers in our experiment who decided to enroll and save had to overcome different obstacles to achieve it: from simple cognitive costs associated to the complexity of understanding the Peruvian IRA to the transactions and time costs of traveling to the bank to pay the contributions.

Third, the magnitude of the estimates we find are consistent with previous estimates of matching contribution plans in developed countries. Tables 5 and A-4 in the Online Appendix summarizes the literature on the impact of a match on participation, contributions, and net worth. The evidence comes from a variety of experimental and non-experimental papers which use observational data, natural experiments, and large-scale field experiments. Collectively, the evidence suggests that the match effect on participation is between 5 to 11 p.p., which is consistent with the estimates we find here. However, a key difference is that those effects are found on workers with much higher earnings compared to our population of study: individuals engaged in informal employment and with relatively low incomes. Importantly, note that the effects on enrollment we report in Table 1, which are between 5.2 to 6.5 p.p. for the 50 and the 100 percent match groups, respectively, are the average total effects between two economics periods, one pre Covid-19 period and other with severe labor restrictions imposed by the pandemic. The effects we found in the pre Covid-19 period are much higher, between 15.7 to 16.7 p.p. for the 50 and the 100 percent match groups, respectively. Thus, providing evidence of similar magnitudes for the total effects (or even higher for the pre Covid-19 period) on the relatively disadvantaged informal workers population is one of the main contributions of our study.

Fourth, as we can also observe in Table 5, our effects are even higher in magnitude compared to the effects of matching contributions in developed countries conditional on the size of the contribution rate. Most of the literature evaluated programs that require contribution rates between 2 to 8 percent of the income, being the most common rate 6 percent (Madrian, 2013). In contrast, in our experiment workers had to contribute a minimum rate of 10 percent. At this relatively high price of the retirement plan, we still get sizeable estimates similar (or even higher during the pre Covid-19 period) to those found on previous literature, which suggest that reducing the minimum contribution rate might lead to even higher demand for saving.

Table 5 – Matching effects on saving plan participation

Paper Title	Authors	Match Rate	Average income /country	Contribution rate	Effects on participation
Employer matching and 401(k) saving: Evidence from the health and retirement study	Engelhardt & Kumar (2007)	-	1640.0	6.0%	4.6%
The Impact of Employer Matching on Savings Plan Participation under Automatic Enrollment	Beshears et al. (2010)	-	4097.3	6.0%	6.0%
The Impact of Presentation and Information on the Take-up of Financial Incentives for Retirement Saving	Saez (2009)	-	2817.0	3.1%	6.0%
Saving incentives for low- and middle-income families: evidence from a field experiment with H&R blocks	Duflo et. al (2006)	match 20	3630.6	2.2%	4.8%
	Duflo et. al (2006)	match 50	3619.4	2.2%	11.1%
Saving For Retirement on the Path of Least Resistance * For Better or for Worse Default Effects and 401(k) Savings Behavior** Defined contribution pensions: plan rules, participants choices and the path of least resistance***	Choi et al (2002*,2004** and 2006***)	-	3200	8.0%	4.6%
Matching Matters in 401(k) Plan Participation	Dworak-Fisher (2011)	-	3520.0	5.2%	6.7%
The Effects of Employer Matching in 401(k) Plans	Even & Macpherson (2005)	-	5582.9	6.0%	5.2%
Defined Contribution Pension Plans: Determinants of Participation and Contributions Rates	Huberman et al. (2007)	-	5095.8	6.0%	6.1%
Does Matching Contribution incentivize informal workers to participate in retirement saving plans? A Randomized Evaluation in Peru	Bernal, Galiani and Molina (2024)	match 50	397.0	10.0%	5.2%
		match 100	397.0	10.0%	6.5%

Notes: The table displays the estimates in p.p. documented by the literature review summarized in Table A-4 in the Appendix.

Fifth, in developing countries, the baseline scenario for informal workers is having zero or very low retirement savings (in Peru, only 3.3% were saving in 2020). Therefore, observing a positive impact on retirement savings, as we do in this study, is already a meaningful and novel outcome in the context of informality. More importantly, the estimated effect on savings after the treatment period is key to understanding the potential of these types of incentives to shift long-term saving behavior within this population. In the same vein, another crucial finding is the importance of favorable economic conditions to enable workers to participate and contribute. Our results show that workers exposed to the intervention early—under normal economic conditions—are significantly more likely to participate and contribute toward retirement savings.

In contrast, workers in the During-Covid-19 period show no effects at all. This suggests that informal workers are particularly vulnerable to adverse income shocks, which substantially limit their ability to access and contribute to social insurance programs.

Our findings provide policymakers with a basis for assessing the potential of matching contributions as a viable tool to enhance savings among low-income and informal workers in developing countries. Considering the historically low rates of enrollment and savings among these workers, this type of intervention could ease the fiscal burden for social protection in the future. Nevertheless, its effects —specially on contributions— should not be overstated, and other reforms or interventions are needed to boost even more saving behavior.

6. References

Anderson, S. & J. Baland (2002). The Economics of Roscas and Intrahousehold Resource Allocation. *Quarterly Journal of Economics,* 117 (3): 963–95

Antolin, & Harrison. (2012). Annual DC Pension Statements and the Communication Challenge. *OECD Working Papers on Finance, Insurance and Private Pensions*(9).

Ashraf, N. (2009). Spousal Control and Intra-Household Decision Making: An Experimental Study in the Philippines. *American Economic Review*, 99 (4): 1245–77.

Ashraf, N., Karlan, D., & Yin, W. (2006). Tying Odysseus to the Mast: Evidence From a Commitment Savings Product in the Philippines. *The Quarterly Journal of Economics*, 635-672.

Banerjee, A.& S. Mullainathan (2010) The Shape of Temptation: Implications for the Economic Lives of the Poor. Unpublished Manuscript.

Bernheim, B., Fradkin, A., & Popov, I. (2015). The Welfare Economics of Default Options in 401(k) Plans. *American Economic Review*, 2798-2837.

Bhargava, S., & Manoli, D. (2015). Psychological Frictions and the Incomplete Take-Up of Social Benefits: Evidence from an IRS Field Experiment. *American Economic Review*, 3489-3529.

Blumenstock, Callen, & Ghani. (2018). Mobile-izing Savings with Automatic Contributions: Experimental Evidence on Dynamic Inconsistency and the Default Effect in Afhganistan. 1-54.

Börsch-Supan, Reil-Held, & Schunk. (2008). Saving incentives, old-age provision and displacement effects: Evidence from the recent German pension reform. *Journal of Pension Economics and Finance, 7*(3), 295-319.

Bosch, Melguizo, & Pagés. (2013). *Mejores pensiones, mejores trabajos: Hacia la cobertura universal en América Latina y el Caribe.* BID.

Box, Hunter, & Hunter. (2005). *Statistics for Experimenters: Design, Innovation and Discovery.*

Burgess, R.& R. Pande (2005). Do Rural Banks Matter? Evidence from the Indian Social Banking

Experiment. *American Economic Review,* 95 (3): 780–95.

Brune, L., Giné, X., Goldberg, J., & Yang, D. (2016). Facilitating Savings for Agriculture: Field Experimental Evidence from Malawi. *Economic Development and Cultural Change*, 187-220.

Bubb, R., & Warren, P. L. (2020). An Equilibrium Theory of Retirement Plan Design. *American Economic Journal: Economic Policy*, 22-45.

Callen, M., de Mel, S., McIntosh, C., & Woodruff, C. (2019). What Are the Headwaters of Formal Savings? Experimental Evidence from Sri Lanka. *The Review of Economic Studies*, 2491-2529.

Card, D., & Ransom, M. R. (2007). Pension Plan Characteristics and Framing Effects in Employee Savings Behavior. *Review of Economics and Statistics*, 228-243.

Chan , S., & Stevens, A. (2008). What You Don't Know Can't Help You: Pension Knowledge and Retirement Decision-Making. *The Review of Economics and Statistics*, 253-266.

Choi, James J., David Laibson, Brigitte C. Madrian, and Andrew Metrick. (2002). Defined Contribution Pensions: Plan Rules, Participant Decisions, and the Path of Least Resistance. In Tax Policy and the Economy, vol. 16, ed. James M. Poterba, 67‑113. Cambridge, MA: MIT Press.

(2004a). For Better or for Worse: Default Effects and 401(k) Savings Behavior. In Perspectives on the Economics of Aging, ed. David A. Wise, 81‑121. Chicago: University of Chicago Press.

(2004b). Plan Design and 401(k) Savings Outcomes. National Tax Journal 57 (2): 275‑98.

(2006). Saving for Retirement on the Path of Least Resistance. In Behavioral Public Finance: Toward a New Agenda, ed. Edward J. McCaffrey and Joel Slemrod, 304‑51. New York: Russell Sage Foundation.

Demirguc-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). *The Global Findex Database 2021 : Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19.* Washington, DC: World Bank.

Duflo, E., & Saez, E. (2003). The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence from a Randomized Experiment. *The Quarterly Journal of Economics*, 815-842.

Duflo, Gale, Liebman, Orszag, & Saez. (November de 2006). Saving Incentives for Low and Middle-Income Families: Evidence from a Field Experiment with H&R Block. *Quarterly Journal of Economics*.

Dupas, P., & Robinson, J. (2013a). Why Don't the Poor Save More? Evidence from Health Savings Experiments. *American Economic Review*, 103(4), 1138–1171.

Dupas, P., & Robinson, J. (2013b). Savings Constraints and Microenterprise Development: Evidence from a Field Experiment in Kenya. *American Economic Journal: Applied Economics*, 5(1), 163–192.

Eckel, & Grossman. (2016). Comparing rebate and matching subsidies controlling for donors' awareness: Evidence from the field. *Journal of Behavioral and Experimental Economics*, 1-8.

Engelhardt, & Kumar. (2007). Employer matching and 401(k) saving: Evidence from the health and retirement study. *Journal of Public Economics, 91*(10), 1920-1943.

Fajnzylber, Plaza, & Reyes. (2009). Better-informed Workers and Retirement Savings Decisions: Impact Evaluation of a Personalized Pension Project.

Field, E., Pande, R., Rigol, N., Schaner, S., & Moore, C. (2021). On Her Own Account: How Strengthening Women's Financial Control Impacts Labor Supply and Gender Norms. *American Economic Review*, 111(7), 2342–2375.

Fuentes, O., Lafortune, J., Riutort, J., & Tessada, J. (2022). Personalized Information as a Tool to Improve Pension Savings: Results from a Randomized Control Trial in Chile. *Economic Development and Cultural Change*.

Goldin, J., Homonoff, T., & Tucker-Ray, W. (2017). Retirement Contribution Rate Nudges and Plan Participation: Evidence from a Field Experiment. *American Economic Review*, 456-61.

He, W., Goodkind, D., & Kowal, P. (2016). *An Aging World: 2015.* United States Census Bureau.

INEI. (2017). *Perú: Estructura Empresarial 2016.*

Karlan, D., M. McConnell, S. Mullainathan, & J. Zinman (2016) Getting to the Top of Mind: How Reminders Increase Saving. *Management Science*, 62 (12): 3393–411.

Liebman, J. B., & Luttmer, E. F. (2015). Would People Behave Differently If They Better Understood Social Security? Evidence from a Field Experiment. *American Economic Journal: Economic Policy*, 275-99.

Madrian. (2012). Matching Contributions and Savings Outcomes: A Behavioral Economics Perspective . En *Matching Contributions for Pensions: A Review of International Experience* .

Madrian, B., & Shea, D. F. (2001). The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior. *The Quarterly Journal of Economics*, 1149-1187.

Mills, Gale, Patterson, Engelhardt, Eriksen, & Emil. (2008). Effects of Individual Development Accounts on Asset Purchases and Saving Behavior: Evidence from a Controlled Experiment. *Journal of Public Economics, 92*(5-6), 1509-1530.

Miranda, J. (2010). *Do personalized pension projections affect retirement decisions? Evidence for Chile.* Superintendencia de Administradoras de Fondos de Pensiones de Chile.

Palacios, & Robalino. (2009). Matching Defined Contributions: A Way to Increase Pension Coverage. En Holzmann, Robalino, & Takayama, *Closing the Coverage Gap: The Role of Social Pensions and Other Retirement Income Transfers.*

Ribe, Robalino, & Walker. (2010). *Achieving Effective Social Protection for All in Latin America and the Caribbean: From Fight to Reality.*

Rofman, & Oliveri. (2011). *La cobertura de los sistemas previsionales en América Latina: conceptos e indicadores.* Banco Mundial.

Saez. (2009). Details Matter: Thempact of Presentation and Information on the Take-up of Financial Incentives for Retirement Saving. *American Economic Journal: Economic Policy*, 204-228.

Seibold, A. (2021). Reference Points for Retirement Behavior: Evidence from German Pension Discontinuities. *American Economic Review*, 1126-65.

Schaner, S. (2015) Do Opposites Detract? Intrahousehold Preference Heterogeneity and Inefficient

Strategic Savings. *American Economic Journal: Applied Economics*, 7 (2): 135–74.

Online Appendix: Does Matching Contribution incentivize informal workers to participate in retirement saving plans? A Randomized Evaluation in Peru

Content

A Intervention design and data

The experiment took place in the city of Lima. Sampling was done using the Micro and Small Firms Directory, provided by the National Institute of Statistics and Informatics (INEI for its Spanish acronym), and the taxpayer database from the National Superintendence of Tax Administration (SUNAT for its Spanish acronym). The first contains information on a total of 1,022,325 micro firms in the city of Lima in 2017, while the latter comprises 1,691,462 firms located in Lima in 2015.

Before doing the randomization, we applied some criteria of selection. First, we kept firms with annual sales reported, with an active Unique Taxpayer Registry (RUC)[11] status (according to SUNAT), and we dropped outliers based on the annual sales level. Second, we preserved micro firms with a lifetime longer than five years, to guarantee their current functioning. And third, we restricted our sample according to the definition of micro firm[12]: a firm with less than ten workers and with annual sale's level less than 150 taxation units. Thus, our study focuses on the potential impact of the Matching Contribution (MC) incentive on workers of small-scale or micro firms with certain lifetime, observed sales and active taxpayer registry. We ended up with 259,574 microenterprises.

Table A-1. Firms selection for randomization

	Number of firms
Population of firms	1,022,325
(-) Firms with unreported sales	-399,792
(-) Firms with inactive RUC	-9,883
(-) Outliers based on sales	-353,076
Firms for randomization	259,574

Source: Micro and Small Firms Directory (INEI, 2017), Taxpayer database (SUNAT, 2017).

Own elaboration.

[11] The RUC is the number that identifies a Legal or Natural Person as a taxpayer.

[12] We restricted the sample to micro firms because they represent more than 90% of the total sample and the few small firms could generate a bias since this kind of firm possess a much larger number of workers.

The unit of randomization was the firm since there is a very high probability of contamination between workers from the same firm. We conducted a stratified randomization process by dividing the sample into stratas of similar observable characteristics, and then randomizing observations preserving the similarities within observations from the same strata. The stratification prevents possible imbalances between the treatment and control groups for observable variables used in the stratification. Micro firms were stratified as follows: i) by sales level: micro-firms were classified into quintiles considering their annual sales level because there is a high probability of conglomeration in specific quintiles related to legal boundaries, ii) by geographic location: micro-firms were historically conglomerated on specific locations in the city of Lima. Hence, we divided Lima in North Lima, South Lima, East Lima, Center Lima, and Callao[13], and iii) by economic sector: we compare firms which are in the same economic sector, and for this, we use the Uniform International Industrial Classification (CIIU). These were the only variables we observed before initiating the field work.

An overall random sample of 29,241 micro firms was then selected for the field work based on the power calculations. 9,714 micro firms were assigned to the control group, 9,789 to the MC100 treatment group and 9,729 to the MC50 treatment group. Balance between groups was verified by conducting an orthogonality test considering the variables for stratification.

Table A-2. Orthogonality Test of the Overall Sample

Mean of	Control group	Treatment MC100	Treatment MC50	p-val	N
Quantiles of sales	1.355	1.357	1.354	0.968	29.241
CIIU	1.883	1.888	1.861	0.484	29.241
Geographic location	3.265	3.268	3.266	0.983	29.241
N	9,714	9,789	9,729		

Source: Selected sample from the Micro and Small Firms Directory (INEI, 2017) and Taxpayer database (SUNAT, 2017).

Own elaboration.

[13] Callao is a constitutional province which is economically related to Lima.

The field work of the experiment was challenging due to different reasons. First, it was difficult to locate the micro firms. Before visiting them, we verified the addresses using information from the SUNAT to reduce the number of non-located firms. However, during the visits, we still found an important number that could not be located (about 30%). Second, another important group were the firms that were closed all the times we visited them (about 20%). Although we made efforts to reach these firms and they were located, doors were closed to our professionals, so they could not continue with the presentation of the study. Third, about 45% of the workers of these firms (located and open) refused to be surveyed. This is not a problem for our design because even though workers were randomized to the arms of the study, they rejected to participate before they knew their treatment status. We exclude these individuals from the analysis.

For all these reasons we were left with 6,504 micro firms and about 7,789 workers which could effectively be located and surveyed. Importantly, we verified the balance between treatment and control groups and confirm that these firms still preserve the characteristics of our stratified randomization. The baseline survey was conducted from November 2018 to July 2019[14] and we did not survey workers younger than 18 years and those who were not present at the day of the visit.

Although we collect information on 7,789 workers from the baseline survey, not all the individuals were eligible for the experiment. Our design focuses on exploring the effects of MC on enrollment and saving of workers who do not belong to any pension system (the Peruvian IRA, SPP, or the national pension system, SNP). Therefore, for our design we had to filter 2,783 workers already affiliated to a pension system[15] and keep only 5,006 workers to visit and offer to be part of the experiment. From these workers, 1,968 did not agree to participate after being

[14] Part of the baseline survey had to be executed at the same time of the intervention, since there is a high job rotation in micro firms, and we needed to locate the same workers in both phases.

[15] For that purpose, we employ two sources of information: (i) the website of the Superintendence of Banking, Insurance and Pension Funds (SBS, acronym in Spanish), which allows to check if the worker already belongs to the SPP, and (ii) our baseline survey linked with the administrative data of the SNP, to verify whether the worker already belongs to the public pension system. The website of the Social Health Insurance of Peru (EsSalud, acronym in Spanish) was additionally used for this purpose.

randomized. Since this happens before treatment status was communicated, we also exclude these workers from the study.

Our final sample comprises 2,961 workers from 2,702 micro firms located in Lima and it is representative of workers in informal employment who are not enrolled in any pension system and work at small-scale firms with active taxpayer registry status and observed sales information. Assignment is as follows: 891 workers were assigned to the control group, 1,037 to the 50% matching treatment arm, and 1,033 to the 100% matching treatment arm.

Besides collecting information using the baseline survey, we gathered administrative data on enrolment and contributions from the two pension funds we worked with, "AFP Prima" and "AFP Integra". Every two years, all of the pension funds in Peru compete following an auction scheme in which the one which offers the lowest fee gains the right to enroll new workers until the next auction. "AFP Prima" held that right from June, 2017 to May, 2019, whereas "AFP Integra" had it from June, 2019 until May, 2021. Because of this change, we work with both pension funds. Both pension funds are well-known among workers and similar in terms of fees and other characteristics.

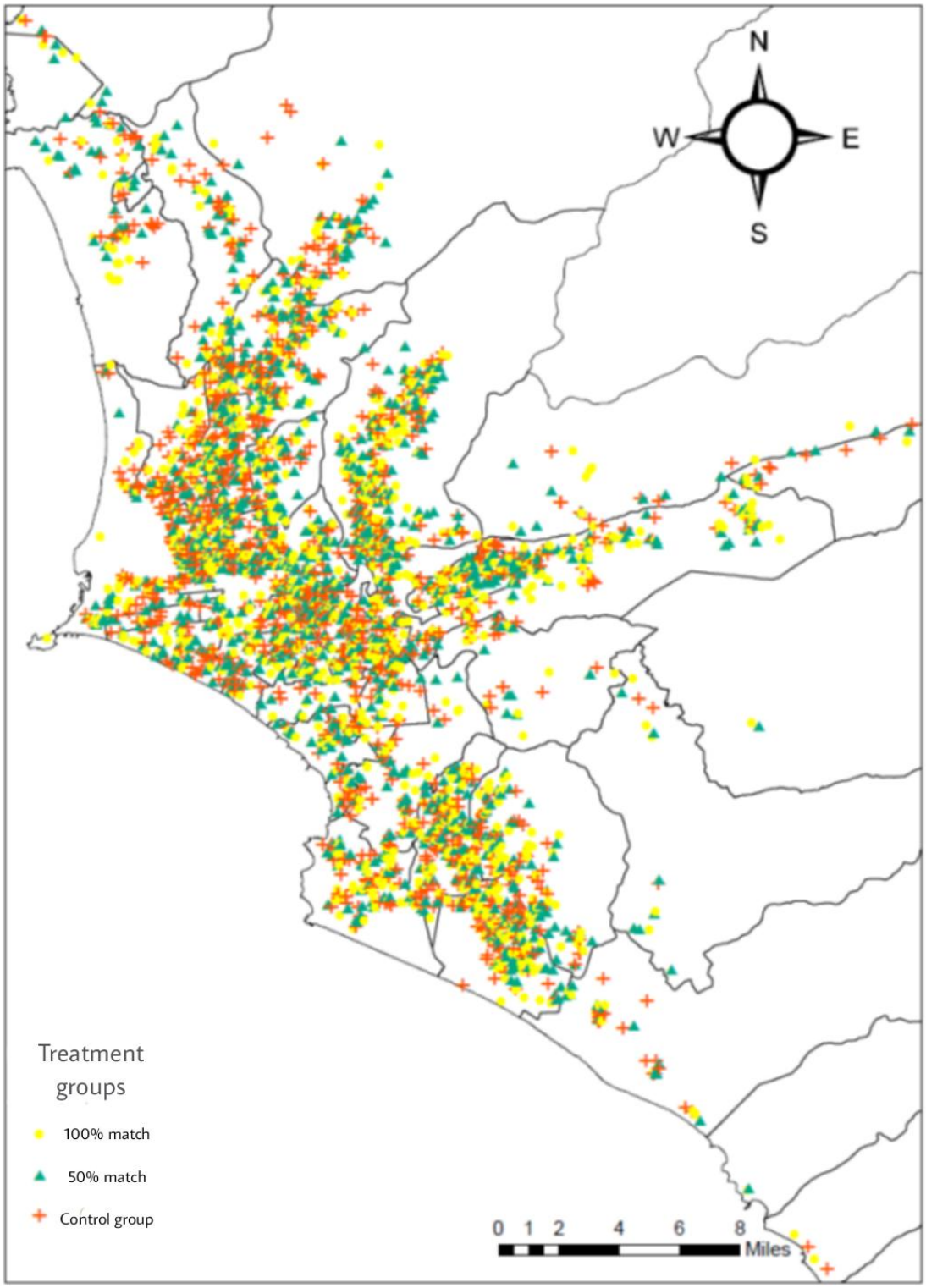
Enrollment in the Peruvian IRAs, through both pension funds, is easy and can be done through the Internet. For the field work, the professionals were provided with tablets and Internet connection; so, if workers were interested, enrollment proceeded immediately.

In terms of contribution, the standard channel is through "AFPnet", which is a virtual platform managed by the pension funds. Through this website, the worker obtains a voucher that she has to hand over at the bank agency to pay the contribution. Both pension funds offered this channel. However, "AFP Prima" allowed its affiliates to use, in addition, another contribution channel through branchless-banking agents, which are commercial properties affiliated to banks such as grocery stores or drug stores.

The minimum monthly contribution was 10 percent of the minimum salary plus a management fee and an insurance premium. The minimum salary during our experimental period was 930 PEN (about USD 278), the management fees were between 0% and 0.23% of the salary depending on the pension fund, and the disability and surviving insurance's premium was about

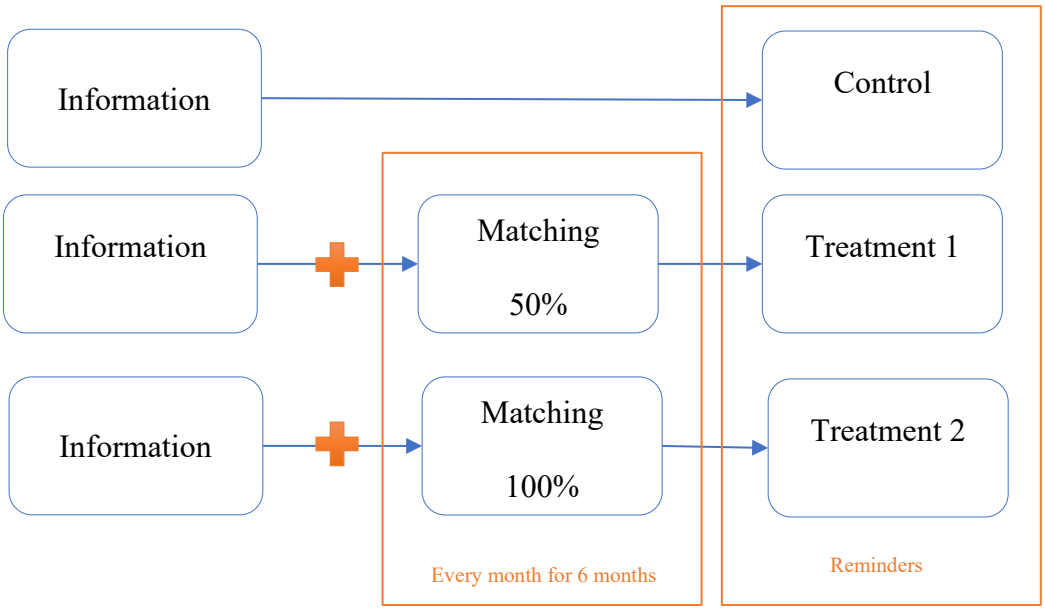
1.74% of the salary. The exchange rate was 3.35 soles per dollar (December 2018). This means that the minimum monthly contribution was about 32 USD during the period of our study. Another important feature of the regulation is related to the time individuals need to wait to start contributing. When the workers become enrolled, the pension funds send a welcome message through email and a unique code of identification for the Peruvian IRAs in two business days. Following that, the pension fund creates the individual account and workers can start contributing after the second working day of the month following the enrollment. This means that a worker can have a short waiting time to start contributing if she was enrolled close the end of the month, but a long waiting time if she was enrolled at the beginning of the month. This heterogeneity on the waiting times can have important effects on contributions. Online Appendix Figure A-3 shows an example of an individual who was enrolled at the end of the month, so she can start contributing relatively quickly to her pension account.

Figure A-1. Sample coverage by district and treatment group



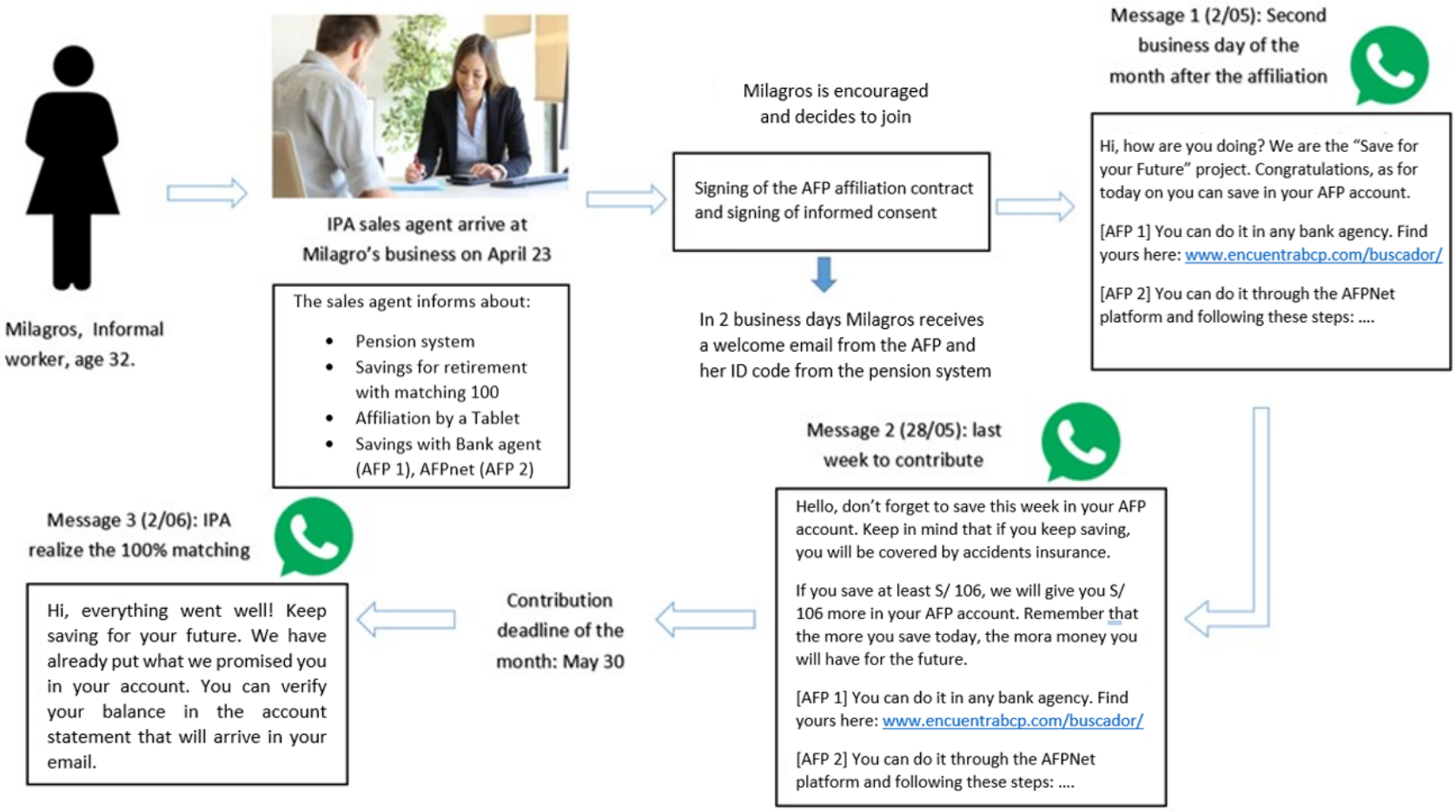
Source: Own elaboration.

Figure A-2. Intervention Scheme



Source: Own elaboration.

Figure A-3. Example of intervention on a worker of the 100% match group



Source: Own elaboration

Table A-4. Related papers on Matching Contributions and Automatic Enrollment

Paper	Authors	Year	Study population	Plan characteristics	Main results
Why Do Defaults Affect Behavior? Experimental Evidence from Afghanistan	Joshua Blumenstock, Michael Callen, Tarek Ghani	2018	**949 full-time employees** of the Afghanistan's largest mobile phone operator. **Average monthly income: $ 535** (paid through deposits in their M-Paisa mobile money account).	New product called "M-Pasandaz". Employees randomly assigned to: i) **automatic saving accounts with default contribution rates of 0% or 5% of salary** (using mobile money, do not earn interest); and ii) **employer matching incentives of 0%, 25% or 50% match.** 6 months' trial. Allows to compare default relative to matching contributions. Once enrolled, contributions are automatic and do not require any action from individuals. **Withdraw money was possible at any time without penalty.**	*Default assignment has large and significant impacts on participation and savings, comparable to developed countries. ***Employees assigned to default contribution rate of 5% were 40 p.p. more likely to contribute** than those assigned default contribution rate of 0%. Monthly contribution increased by USD 40. **Default effect on average monthly M-Pasandaz savings: USD 7.7.** ***Default assignment increases participation by roughly the same as a 50% match on contributions.** ***Participation rate increased 27% for employees with 25% match and 57% for those with 50% match. Match effect on average monthly M-Pasandaz savings (50% match): USD 31.9.** *Elasticity of participation with respect to the match rate is about one, independent of default status. *45% of employees contributed after the treatment period, with participation 25% higher in the group of default contribution rate of 5%.
Active vs. Passive Decisions and Crowd-Out in Retirement Savings Accounts: Evidence from Denmark	Chetty, Raj, John N. Friedman, Soren Leth-Petersen, Torben Helen Nielsen, and Tore Olsen	2014	Panel data set for **4 million individuals** (41 million obs. on savings) of the **population of Denmark**. **Average monthly income: $ 2,602.**	Two policies to raise saving: i) **price subsidy** (reduction of subsidy for contributing for individuals in the top income tax bracket) and ii) **automatic contribution to a retirement account.** Analyze the effects on: i) **active savers** who make savings decisions by maximizing utility, taking into account the subsidies and automatic contributions and, ii) **passive savers** who make fixed pension contributions that are invariant to the automatic contribution and subsidy.	*Effects of policies on wealth accumulation depend on whether they change savings rates by active or passive choice. ***Price subsidies, which rely on individuals to take an action, are less effective than automatic contributions, where individuals take no action.** Each $1 of government expenditure on subsidies on prices increases total saving by only 1 cent. In contrast, automatic employer contributions increase wealth accumulation substantially. *Three reasons: i) approx. **85% of individuals are passive individuals** who save more when induced to do so by an automatic contribution but do not respond at all to price subsidies; ii) individuals who respond do so primarily by **shifting savings across accounts** rather than raising the total amount they save and; iii) a**ctive savers**

				Median savings rate is 8.7% (including pension contributions).	who respond to price subsidies tend to be those who are **planning and saving for retirement already.**
Matching Contributions and Savings Outcomes: A Behavioral Economics Perspective	Brigitte C. Madrian	2013		The paper summarizes the literature on the impact of matching on savings outcomes, including participation, contributions, and net worth. Evidence comes from observational data, surveys, natural experiments, and large-scale field experiments; basically using the following literature on matching: i) Engelhardt and Kumar (2009), ii) Duflo et.al. (2006), iii) Mills et.al. (2008) (Individual Development Accounts-IDA), and iv) Choi et.al. (2002, 2004 and 2006).	***Including a matching contribution increases savings plan participation and contributions, but the impact is lower than that of nonfinancial approaches**. *Conditional on participation, a higher match rate has only a small effect on contributions. The match threshold has a substantial impact, probably because it serves as a natural reference point when individuals are deciding how much to save and may be viewed as advice from the savings program sponsor on how much to save. *Other nonfinancial approaches —automatic enrollment, simplification, planning aids, reminders, commitment features—potentially have a much greater impact on savings outcomes than do financial incentives, often at a much lower cost.
Matching Matters in 401(k) Plan Participation	Dworak-Fisher, Keenan	2011	**Microdata of 2,708 jobs in 587 establishments** from the National Compensation Survey. **Average monthly income: $3,619.**	Study the effects of the matching contributions made by employers to 401(k) plan accounts on plan participation rates. The average **match rate** on the first dollar contributed by employees in the sample is **75.37%.** Matches are provided on employee contributions up to 5.16% of the corresponding salary. The average total potential match in the sample is 3.57% of salary.	*Employer matches have substantial effects. Higher match rates tend to be correlated with workers having lower propensities to save; correcting for this endogeneity produces estimates that are bigger than those seen through direct cross-sectional comparisons. *The average partial effect of the match is in the range of 0.131–0.261, so one standard deviation increase in the **match applied to the first dollar is found to raise participation by 6.5–12.9 p.p.**
The Impact of Employer Matching on Savings Plan	Beshears, John, James J. Choi, David Laibson,	2010	**645 full-time employees** at a U.S. administration and consulting firm. In	Studied a large firm using automatic enrollment to **401 (k) plan** that replaced **employer match (25% percent on the first 4% of**	*Automatic enrollment participation rates are positively related to match generosity, but the magnitude of the effect is modest. ***Among new hires, participation decreased by 5 to 6 p.p. after the firm eliminated the employer match, and average contribution rate fell by 0.65%.**

Participation under Automatic Enrollment	and Brigitte C. Madrian		addition, they pooled data on plan participation at nine firms with automatic enrollment. **Average monthly income: $4,097.**	**contribution**) with an employer contribution (of 4% plus profit contribution). Unconditional on employee's contributions. **Loans and withdrawals were possible** (other 401 (k) plan benefits).	*1 p.p. decrease in the max. match as a fraction of salary is associated with a 1.8 to 3.8 p.p. decrease in participation. ***Moving from a typical match of 50%** (on the first 6% of contribution) to 0% match would **reduce participation under automatic enrollment by 5 to 11 p.p. and average contribution rate from 3.6% to 2.9% of salary.** *Relative to the standard opt-in approaches**, automatic enrollment increases savings plan participation**, particularly among younger, low-tenure, and lower-income employees.
Details Matter: The Impact of Presentation and Information on the Take-Up of Financial Incentives for Retirement Saving	Emmanuel Saez	2009	**48,300 tax filers** of the H&R Block St. Luis in U.S. in 2005 and 2006. **Average monthly income: $2,817** (adjusted gross income, control group).	Examined the effects of presentation and information on the take-up of financial subsidies for retirement saving. Randomized experiment with H&R Block. *Control group: no match. **Treatment group: 50% match on individual Retirement Account (IRA)** contributions made at the time of filing. Setup fees were waived. *Subsets of treatment group received: i) **33% credit rebate** (cash back, typical in the Saver's Credit) rather than the match, ii) **advance notification** of the fee waiver (if in the control group) or of the match and the fee waiver (if in the treatment group) via a phone call and letter; and iii) also **the match for regular monthly IRA contributions.** *The match was offered for contributions of $300 to $1,000. Contributions above $1,000	***The matching offer raises take-up and contributions to IRAs.** ***The match raised take-up by almost 6 p.p. overall** and by more than 10 p.p. for returns filed later in the season (between March 5 and March 31, 2006). *The subsidies raise take-up and contributions to IRAs with **larger effects when the subsidy is characterized as a matching contribution rather than an equivalent-value tax credit, and when filers are informed before the tax season about the subsidy.** *Almost all of this effect occurred because filers made a specific type of suboptimal choice, leaving money on the table. ***Advance notification more than doubled IRA take-up rates** among filers who were assigned to the match treatment. *The opportunity to receive matches on future monthly IRA contributions had little effect on take-up or contributions. *Both pure incentives and the presentation of those incentives affect consumer choices and the efficacy of policy interventions. Hence, many of the informational and presentational characteristics of public policies can be changed at relatively low cost.

				received a total match of $500 so that the match was effectively capped at $500.	
Employer matching and 401 (k) participation: evidence from the health and retirement study	Engelhardt, Gary V.; Kumar, Anil	2009	**1,042 older eligible employees (55 years old, on average) for U.S. 401(k) plans** in the Health and Retirement Survey in 1991 **Average monthly income: $1,606** (after tax, 1991 dollars)	Formulated a life-cycle-consistent econometric specification of 401(k) saving plan and estimated the determinants of saving accounting for **non-linearities in the household budget set induced by the employer matching**. Characteristics: i) median match rate was 50%, but 27% of the plans offered matches of 100%; ii) **median cap was 6%**. Average annual contribution: i) unconditional $1,377; ii) conditional $2,446.	***An increase in the match rate by 25 cents per dollar of employee contribution raises 401(k) participation plan by 5 p.p. and contributions by $365.** *The estimated marginal effect of an increase in the match rate ($1 per $1 dollar contributed) is an increase in participation of 18 p.p. ***Elasticity of participation with respect to the match rate was 0.048, suggesting that 401(k) plan participation is very inelastic**. Contributions are quite inelastic with respect to employer matching as well. Eligible employees in 401(k) plans are not typically lower income individuals.
Saving incentives, old-age provision and displacement effects: evidence from the recent German pension reform	Börsch-Supan, A; Reil-Held, A; Schunk, D	2008	German SAVE panel data 2001-2006 on **3,500 households**.	Analyze the impact of a voluntary subsidized saving scheme for retirement, "Riester Pensions" in low-income families in Germany. Low and middle-income households received a benefit subject to contribution (4% of annual income) and submission of application for the subsidy. Subsidies average about 45% of contributions, varying between 24% and 90% depending on income and number of children (similar to minimum contribution). Individuals could withdraw up to 50,000 euros to purchase a property; but had to repay at the age of 65; otherwise return the subsidies.	*After a slow start, private pension plan took off very quickly. Coverage of subsidized plans is about 23%. ***Saving incentives were effective in reaching parents and individuals between 30 and 49 years, but not for households' heads with more than 50 or less than 30 years and low-income earners;** although Riester pensions exhibit a more equal pattern by income than occupational and unsubsidized pension plans. * Low-income households seemed to utilize other income resources to accumulate savings for retirement. *Circumstantial evidence on displacement effects between saving for old-age and other purposes. Households who plan to purchase housing and attach high importance to a bequest motive are less likely to have a Riester pension.

Defined Contribution Pension Plans: Determinants of Participation and Contribution Rates	Gur Hyberman, Sheena Iyengar, Wei Jiang	2007	**793,794 employees** eligible to participate from 647 defined contribution pension plans. **Average monthly income: USD 5,095.**	*Study the variables associated with individual participation in and contribution to 401(k) plans. *Most of employers offer to match the employee's contribution up to 6% of the employee's salary, and the match rates range from 10 to 250%, mostly between 50 and 100%.	*Income and wealth are the most important determinants for participation in DC plans. On average, a $10,000 increase in annual compensation is associated with about 3.7% higher probability of participation. Older and longer tenured employees are more likely to participate. ***The mere existence of a match (regardless of the magnitude) increases participation by 6.3%**, and each 1% rise in match rate further increases participation by 0.08%. **At low-income levels (annual compensation $10,000-$20,000), a 100% match could increase participation probability by nearly 20%**; at higher incomes (above $90,000), the incentive effect drops to about 5%. *The main findings are participation rates, contributions and (most remarkably) savings rates increase with compensation; availability of a match by the employer increases employees' participation and contributions; the effect is strongest for low-income employees.
Saving incentives for low- and middle-income families: Evidence from a field experiment with H&R Block	Duflo, Gale, Liebman, Orszag, Saez	2006	**14,000 low and middle - income tax filer clients** of the H&R Block St. Luis in U.S. **Average monthly income: $3,583** (control-group) Two-thirds of the sample have a federal refund larger than $500.	Studied how the presence of a match and variations in the matching rate affect take-up and contribution levels. **Three matching rates: 0% (control), 25% and 50% (treatment).** *The minimum annual contribution was $300, paid on a one-time basis. *Contributions were matched up to $1,000. *Money deposited directly into the **Individual Retirement Account (X-IRAs).** Accounts can be funded with tax refund. *Annual maintenance fee: $10, waived for accounts with balances over $1,000.	***Take-up rates were 3%, 8%, and 14%,** respectively. **Increasing match rates from 0 to 20%, from 20 to 50% and from 0 to 50% increases plan participation by 5, 6 and 11p.p., respectively.** *Average annual contributions (excluding match): -among contributors: $765, $1,102 and $1,108, respectively -unconditional: $22, $85, and $155, respectively. ***The 50% match rate raised take-up and aggregate contributions further and did not reduce average contributions among participants.** *Heterogeneity: individuals with large refund, positive investment income, or with higher overall income were more likely to enroll. *Behavioral effects: framing and information affect decisions (take-up rates far below 100% and never exceeded 20%). *Individuals did not strategically receive a match and withdraw funds. *Tax professionals influenced contribution choices.

1) Saving for Retirement on the Path of Least Resistance **2) Plan Design and 401(k) Savings Outcomes** **3) Defined contribution pensions: plan rules, participant choices and the path of least resistance**	James J. Choi, David Laibson, Brigitte C. Madrian, and Andrew Metrick	2006 2004 2002	**Administrative data of employees** at companies with employer-sponsored savings plans. **Average monthly income: $3,333** (Company D in Defined contribution pensions)	Examine the impact of a change in the employer match: *A first company introduced a 25% match up to 4 percent of income in October 2000; before that date, the plan offered no match. *Another company increased its match threshold in its savings plan in January 1997 while keeping its match rate constant (before: 50% on the first 5-6% of income contributed, after: 50% on the first 7-8% of income contributed).	*The adoption of 25% match leads to a **4.7 p.p. increase in savings plan participation for 40-year-old men with three years of tenure.** *No impact of the increase in the match threshold on participation, consistent with theory; this does not affect marginal incentives to participate. ***Positive impact of the match threshold on contributions**: in the absence of a match, very few employees chose to contribute 4%; with the employer match, there was a **large increase in the fraction of participants who contribute at the new 4% match threshold. It became the modal contribution rate.** *The distribution of contribution rates is concentrated between 5 to 8% before the companies implemented the match and 4% after they implemented the match. *This suggests an important role for both employers in determining how to structure their plans and government regulators in creating institutions that encourage or discourage particular aspects of 401(k) plan design.
The Power of Suggestion: Inertia in 401 (k) Participation and Savings Behavior	Brigitte C. Madrian and Dennis F. Shea	2001	29,267 **employees** in a large U. S. company (period: June 97 to June 99). **Average monthly income: USD 3,348.**	*Studied the impact of a change on automatic enrollment on 401(k) savings plan. *Before: active choice (employees had to elect participation). Option to contribute up to 15%; first 6% receiving a 50% employer match. *After: new employees were automatically enrolled (**3% contribution** rate allocated to the money market fund) unless they opt out of the plan. ***Loans and withdrawals were available** and there were 9 investment options.	*In the short run, automatic enrollment has substantially increased 401(k) participation for recently hired employees: take-up was 86%; whereas participation for the "window" cohort ("control group") was 37%. Regression adjusted difference or **impact of automatic enrollment was 50%.** *Participation rate increases with tenure in the absence of automatic enrollment but is relatively constant under automatic enrollment. ***Automatic enrollment results in a decline in the average contribution rate by 2.9 p.p. among those newly eligible** (from 7.3 to 4.4%). *76% of participants hired under automatic enrollment retain both the default contribution rate (3%) and fund allocation even though few employees (10%) hired before automatic enrollment picked this particular outcome. ***"Default" behavior results from participant inertia and from employee perceptions of the default as investment advice. Six out of ten employees do nothing to change from the default.**

					***Procrastination is an important factor of explanation**: i) before automatic enrollment, this is evidenced by low participation rates, ii) after, this is evidenced by the high initial fraction of participants in the default along with the decline over time.
The Effects of Employer Matching in 401(k) Plans.	William Even, David Macpherson	2005	Sample **of 5,272 employees that were offered a 401(k) plan**. Data from the Current Population Survey (CPS).	*Investigate the impact of employer matching and employee tenure on participation levels in 401 (k) plans.	*Correcting for the endogeneity of employer matching substantially increases the estimated effect of matching on participation levels. ***The estimated effect of matching on participation in different specifications range from 24 to 53p.p.** ***Assuming exogenous matching, employer matching is estimated to increase the probability of participation by only 5 to 10 p.p.** *There is large positive association between employee tenure and 401(k) participation and it is because "stayers" tend to be "savers."

Table A-5: Descriptive Statistics and Balance Checks

	Descriptive Statistics			Full sample			Pre Covid-19			During Covid-19		
	Control	50 match	100 match	Control	50 match	100 match	Control	50 match	100 match	Control	50 match	100 match
Women	0.61	0.60	0.62	0.611	0.006	-0.007	0.609	0.357	0.936	0.611	0.537	-1.441
	(0.48)	(0.48)	(0.48)	(0.017)	(0.023)	(0.023)	(0.025)	(3.652)	(3.688)	(0.023)	(2.944)	(2.938)
Age	43.50	43.75	44.01	43.500	0.513	0.248	43.621	-62.317	-82.541	43.191	111.333	87.128
	(12.55)	(12.15)	(12.11)	(0.438)	(0.590)	(0.591)	(0.673)	(95.907)	(99.692)	(0.576)	(75.079)	(74.258)
Married or cohabiting	0.53	0.58	0.54	0.528	0.013	0.049**	0.548	-0.557	-1.459	0.510	3.383	8.671***
	(0.49)	(0.48)	(0.49)	(0.017)	(0.023)	(0.023)	(0.025)	(3.747)	(3.795)	(0.023)	(3.020)	(2.993)
Educational level	7.85	7.80	7.71	7.848	-0.135	-0.051	7.882	-18.962	-1.188	7.817	-8.795	-5.345
	(1.75)	(1.72)	(1.80)	(0.061)	(0.085)	(0.083)	(0.092)	(13.825)	(13.679)	(0.081)	(10.759)	(10.550)
Monthly individual income (log)	6.01	6.03	5.96	6.014	-0.052	0.011	5.979	-5.602	4.055	6.047	-7.074	-1.938
	(0.72)	(0.71)	(0.66)	(0.032)	(0.042)	(0.044)	(0.045)	(6.401)	(6.573)	(0.045)	(5.670)	(5.825)
Working hours in a day	9.60	9.76	9.60	9.600	0.002	0.159	9.642	1.353	-16.043	9.564	-0.127	31.271*
	(2.85)	(3.04)	(2.95)	(0.100)	(0.139)	(0.141)	(0.142)	(21.062)	(22.293)	(0.140)	(18.477)	(18.551)
Principal Occupation	0.89	0.93	0.90	0.895	0.009	0.030**	0.882	0.622	2.665	0.906	0.439	2.710
	(0.30)	(0.26)	(0.29)	(0.011)	(0.014)	(0.014)	(0.017)	(2.405)	(2.314)	(0.013)	(1.745)	(1.661)
Currently can save	0.33	0.33	0.29	0.327	-0.035	0.003	0.328	-5.178	2.316	0.331	-2.891	-0.749
	(0.46)	(0.46)	(0.45)	(0.017)	(0.022)	(0.023)	(0.025)	(3.557)	(3.687)	(0.022)	(2.891)	(2.908)
Thinks about retirement	0.48	0.47	0.48	0.482	0.002	-0.009	0.495	-0.215	-2.526	0.469	0.670	0.190
	(0.49)	(0.49)	(0.49)	(0.017)	(0.024)	(0.024)	(0.026)	(3.823)	(3.843)	(0.023)	(3.046)	(3.038)
Has stable income	0.28	0.24	0.27	0.276	-0.008	-0.035*	0.274	0.251	-3.195	0.275	-0.748	-3.501
	(0.44)	(0.42)	(0.44)	(0.016)	(0.022)	(0.021)	(0.023)	(3.460)	(3.407)	(0.022)	(2.777)	(2.735)
Is financially risky	0.47	0.47	0.44	0.465	-0.029	0.005	0.461	-1.277	1.986	0.466	-4.002	-0.409

	Descriptive Statistics			Full sample			Pre Covid-19			During Covid-19		
	Control	50 match	100 match	Control	50 match	100 match	Control	50 match	100 match	Control	50 match	100 match
	(0.49)	(0.49)	(0.49)	(0.018)	(0.024)	(0.024)	(0.026)	(3.854)	(3.912)	(0.024)	(3.120)	(3.125)
Has taken actions for retirement	0.12	0.12	0.12	0.122	-0.004	-0.002	0.172	0.699	-1.158	0.079	1.024	2.216
	(0.32)	(0.32)	(0.32)	(0.011)	(0.016)	(0.016)	(0.020)	(2.921)	(2.864)	(0.013)	(1.703)	(1.734)
Has health insurance	0.81	0.80	0.82	0.814	0.002	-0.017	0.779	-2.104	0.659	0.841	0.322	-3.907*
	(0.38)	(0.40)	(0.38)	(0.014)	(0.019)	(0.019)	(0.022)	(3.234)	(3.175)	(0.017)	(2.241)	(2.324)
Has informal labor contract	0.89	0.88	0.91	0.889	0.025	-0.007	0.898	1.963	0.389	0.884	2.668	-1.568
	(0.31)	(0.32)	(0.28)	(0.017)	(0.022)	(0.024)	(0.023)	(3.327)	(3.465)	(0.024)	(3.024)	(3.282)
Financial literacy index	5.77	5.87	5.72	5.766	-0.050	0.100	5.774	15.665	20.573	5.760	-15.056	5.011
	(2.54)	(2.58)	(2.66)	(0.090)	(0.126)	(0.124)	(0.138)	(19.501)	(20.082)	(0.118)	(16.197)	(15.784)
Risk aversion index	6.98	7.06	6.95	6.978	-0.024	0.086	6.929	6.984	10.993	7.022	-9.548	5.273
	(1.77)	(1.80)	(1.85)	(0.068)	(0.094)	(0.093)	(0.095)	(14.007)	(13.540)	(0.094)	(12.449)	(12.449)
Owns household	0.67	0.67	0.63	0.666	-0.032	0.005	0.643	-1.313	4.722	0.682	-5.164*	-1.598
	(0.47)	(0.47)	(0.48)	(0.016)	(0.023)	(0.022)	(0.025)	(3.665)	(3.645)	(0.022)	(2.887)	(2.849)
Head of household	0.51	0.55	0.52	0.512	0.012	0.037	0.507	3.711	0.765	0.514	-0.126	4.602
	(0.49)	(0.49)	(0.49)	(0.017)	(0.023)	(0.023)	(0.025)	(3.732)	(3.786)	(0.023)	(3.023)	(3.004)
Household size	3.96	3.97	3.95	3.965	-0.014	0.002	3.976	1.684	-3.324	3.945	0.516	3.649
	(1.18)	(1.14)	(1.19)	(0.045)	(0.062)	(0.060)	(0.066)	(9.876)	(9.747)	(0.061)	(7.973)	(7.780)
Has children	0.75	0.76	0.76	0.749	0.012	0.010	0.754	1.722	-5.042	0.741	1.481	4.133
	(0.42)	(0.42)	(0.42)	(0.015)	(0.020)	(0.020)	(0.022)	(3.183)	(3.391)	(0.020)	(2.618)	(2.568)
Number of children	1.79	1.82	1.80	1.795	0.010	0.025	1.815	-0.877	-15.865	1.762	4.795	13.104
	(1.35)	(1.32)	(1.34)	(0.053)	(0.073)	(0.072)	(0.080)	(11.671)	(11.695)	(0.071)	(9.335)	(9.163)
Partner works	0.40	0.41	0.39	0.395	-0.006	0.020	0.408	-2.276	-2.436	0.384	1.099	4.457
	(0.48)	(0.48)	(0.48)	(0.017)	(0.023)	(0.023)	(0.025)	(3.676)	(3.716)	(0.023)	(2.961)	(2.973)
Is firm owner	0.58	0.63	0.60	0.584	0.015	0.046**	0.537	3.936	3.942	0.618	-1.472	3.235
	(0.48)	(0.47)	(0.48)	(0.017)	(0.023)	(0.023)	(0.025)	(3.717)	(3.779)	(0.022)	(2.937)	(2.895)
Number of workers	2.63	2.59	2.64	2.632	0.012	-0.038	2.626	5.271	11.497	2.649	0.290	-11.143

	Descriptive Statistics			Full sample			Pre Covid-19			During Covid-19		
	Control	50 match	100 match	Control	50 match	100 match	Control	50 match	100 match	Control	50 match	100 match
	(0.85)	(0.86)	(0.89)	(0.041)	(0.057)	(0.056)	(0.062)	(9.547)	(9.735)	(0.054)	(7.284)	(6.991)
Monthly sales level (log)	6.61	6.57	6.57	6.607	-0.041	-0.032	6.683	-7.028	-3.825	6.554	-1.443	-0.926
	(1.14)	(1.14)	(1.24)	(0.069)	(0.097)	(0.092)	(0.105)	(16.276)	(16.702)	(0.092)	(12.205)	(11.376)
Economic sector	1.68	1.72	1.74	1.683	0.055	0.042	1.690	8.883	21.034*	1.682	4.346	-4.408
	(1.42)	(1.41)	(1.38)	(0.049)	(0.067)	(0.068)	(0.075)	(10.839)	(11.616)	(0.065)	(8.514)	(8.365)
Annual sales	1.37	1.38	1.34	1.372	-0.031	0.005	1.377	-3.489	-2.666	1.371	-3.288	2.024
	(0.66)	(0.65)	(0.63)	(0.023)	(0.031)	(0.031)	(0.034)	(4.826)	(4.882)	(0.031)	(3.965)	(4.052)
Geographic location	2.47	2.60	2.59	2.472	0.119**	0.132**	2.454	-3.269	9.309	2.486	19.962***	16.005**
	(1.25)	(1.25)	(1.30)	(0.043)	(0.061)	(0.060)	(0.067)	(10.000)	(10.075)	(0.056)	(7.546)	(7.412)

B Results

Table B-1. Effects on Enrolment, Contributions and Saving Amounts

	Mean (p.p.)			Estimates (p.p.)	
	No match	50% match	100% match	50% match vs no match	100% match vs no match
	(1)	(2)	(3)	(4)	(5)
Panel A: Full Sample					
Affiliated to a Pension Fund (%)	11.22	15.14	17.33	3.92**	6.10***
	(1.06)	(1.11)	(1.18)	(1.55)	(1.60)
Contributed to a Pension Fund (%)	0.11	0.48	1.26	0.37	1.15***
	(0.11)	(0.22)	(0.35)	(0.25)	(0.39)
Amount contributed	0.14	1.75	6.90	1.61	6.76***
	(4.33)	(30.48)	(72.16)	(1.03)	(2.42)
Amount contributed, inclusive of match	0.14	2.36	11.35	2.22	11.20***
	(4.33)	(40.04)	(115.44)	(1.35)	(3.87)
Savings inclusive match	0.18	2.21	8.28	2.03	8.10***
	(5.37)	(38.97)	(86.41)	(1.32)	(2.90)
Total savings, inclusive of match	0.18	2.97	13.67	2.79	13.49***
	(5.37)	(51.04)	(138.92)	(1.72)	(4.66)
Panel B: Pre Covid-19					
Affiliated to a Pension Fund (%)	13.98	28.88	33.06	14.91***	4.17
	(34.72)	(45.38)	(47.11)	(2.87)	(3.43)
Contributed to a Pension Fund (%)	0.24	1.09	2.78	0.85	1.69*
	(4.91)	(10.40)	(16.46)	(0.57)	(1.02)
Amount contributed	0.31	4.29	18.13	3.97	13.84**
	(6.34)	(49.54)	(119.95)	(2.45)	(6.78)
Amount contributed, inclusive of match	0.31	5.67	29.60	5.36*	23.93**
	(6.34)	(64.41)	(191.33)	(3.18)	(10.55)
Savings inclusive match	0.39	5.47	21.73	5.08	16.27**
	(7.86)	(63.70)	(143.64)	(3.15)	(8.22)
Total savings, inclusive of match	0.39	7.22	35.64	6.83*	28.42**
	(7.86)	(82.70)	(230.22)	(4.08)	(12.78)
Panel C: During Covid-19					
Affiliated to a Pension Fund (%)	10.52	9.64	12.18	-0.88	1.66
	(30.71)	(29.53)	(32.73)	(1.78)	(1.89)
Contributed to a Pension Fund (%)	0.00	0.29	0.72	0.29	0.72*
	(0.00)	(5.40)	(8.44)	(0.25)	(0.38)
Amount contributed	0.00	0.62	2.33	0.62	2.33
	(0.00)	(11.58)	(38.04)	(0.53)	(1.73)
Amount contributed, inclusive of match	0.00	9.61	30.07	9.61	30.07
	(0.00)	(55.57)	(157.40)	(7.79)	(22.07)
Savings inclusive match	0.00	1.08	4.41	1.08	4.41
	(0.00)	(20.25)	(66.80)	(0.92)	(3.03)
Total savings, inclusive of match	0.00	11.22	36.19	11.22	36.19
	(0.00)	(64.82)	(189.37)	(9.09)	(26.56)

Notes: (i) Standard errors are in parentheses. (ii) Significance levels: * p<0.1, ** p<0.05, *** p<0.01. (iii) The table reports affiliation and contribution statistics for the three experimental groups (columns 1 - 3). Columns 4 - 5 report the differences across experiment groups. (iv) Amounts are presented in Peruvian currency. (v) Savings represents the amount contributed plus the compound return from the pension fund.