Preliminary

Does Tax Deductibility Increase Retirement Saving? Lessons from a French Natural Experiment

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October 2024

Abstract

This paper presents new evidence on how employees respond to tax incentives for retirement saving. Using administrative data from a large retirement plan administrator in France, we examine the voluntary saving choices of approximately 1.4 million workers before and after the implementation of the 2019 Loi Pacte, a reform that introduced tax-deductible voluntary contributions into employer-sponsored retirement plans. One of the features of this multi-part reform was a change in the provisions for voluntary individual contributions to employer-sponsored saving plans. While such contributions were previously allowed on an after-tax basis, similar to Roth IRAs and 401(k)s in the US, the reform allowed pre-tax contributions that provided an immediate tax deduction for contributors. The reform increased contributions to retirement saving accounts, especially among higher-income, older workers and those who contributed to a voluntary saving plan on a post-tax basis before the pre-tax option became available. We also observe workers' contributions to "medium term" saving plans that are provided by employers and can be accessed after five years; we do not find any substitution between contributions to these accounts.

* The authors thank Alberto Abadie, John Beshears, Taha Choukhmane, Marcel Gehrung, and David Laibson for useful comments and discussions and are grateful to Corinne Laboureix, Sophie Lebeau, Catherine Leroy, for insightful explanations on the institutional setting, and to Sébastien Cadot and Arnaud Delavoet for the data gathering process. Poterba is a trustee of the College Retirement Equity Fund, which provides tax-deferred retirement products in the US market. The data used to carry out this study, which have been analyzed anonymously for scientific, statistical, and historical research purposes, come from the processing of record keeping and account keeping of AMUNDI ESR employee and pension savings accounts.

In response to aging populations, many countries are raising the retirement age for public pensions, relaxing pension guarantees, and promoting private pension plans. Many reforms encourage private saving by introducing tax incentives for voluntary pension contributions. Empirical evidence on the effect of tax subsidies has reached different conclusions in different institutional settings. Chetty et al. (2014), Ramnath (2013), and Roll et al. (2023) are examples of relatively recent contributions that also summarize previous work.

A related question is how the structure of tax incentives affects saving. This question has arise in particular in the US, where there are two types of tax-preferred retirement saving accounts. In "traditional" accounts, contributions are made with pre-tax income – the contribution is deductible from income tax – and withdrawals from the account are included in the savers' taxable income. An alternative structure permits contributions of post-tax income to the saving plan. In this case, withdrawals from the plan are not taxed. When the contributor faces the same tax rate when contributing and withdrawing funds, the net-of-tax rate of return on these two alternatives is the same. When the contributor's tax rate is lower when retired than when working, the pre-tax option will generally deliver a higher net-of-tax return. Contributors who are liquidity constrained may also find the pre-tax option more attractive than the post-tax, because it saves on current taxes. Some research in the US, notably Beshears et al. (2017), has analyzed the effect of growing availability of post-tax plans on participant behavior.

This paper contributes to this debate by analyzing saving responses to Loi Pacte, a French law that took effect in October 2019 and was designed to encourage retirement saving contributions to supplement public pensions. Loi Pacte was a multi-faceted reform that improved the portability of retirement saving across employers and introduced a new tax deduction for personal voluntary contributions to employer-sponsored retirement accounts (Mercer, 2019 ; Ernst, 2023). It also

expanded the set of financial institutions that could offer retirement saving products, by allowing insurers and banks to compete with employer-sponsored saving plans by offering individual saving products that could be funded with assets previously contributed to employer-sponsored schemes. This expanded set of other saving options may have resulted in some outflows from employer-sponsored plans.

This paper employs administrative panel data from one of the largest retirement plan providers in France to examine the voluntary saving choices of nearly 1.4 million workers at 2,679 French firms between 2017 and 2022. We focus on whether the new availability of tax-deductible voluntary contributions raised the level of inflows to employer-sponsored plans. The French case is particularly revealing because the defined contribution (DC) saving plans offered to workers include not only retirement saving opportunities, denoted LT, for long-term saving, but also medium-term (MT) saving vehicles, which allow withdrawal of contributions after five years. The presence of these parallel saving programs, one of which received a new tax benefit, the other of which did not, allows us to test for substitution between LT and MT savings.

Our identification strategy exploits the fact that employers needed to take action to make the pre-tax voluntary saving plan option available to their workers, and that firms differed in whether, and when, they did this. We compare the saving behavior of workers at firms that introduced the new option, focusing on their behavior before and after this introduction. We use the saving behavior of workers at firms that would eventually adopt the new option, but had not yet done so, as our control. Only about half of the firms in our sample adopted the voluntary contribution option by 2022. We focus on the workers at the subsample of "adopter" firms to avoid the potential endogeneity of the adoption decision in the cross-section of firms.

Our data enable us to examine changes in voluntary post-tax MT and LT contributions – the analogue to Roth 401(k) contributions in the US -- around the introduction of the new pre-tax savings option, which is like a traditional 401(k) plan. We find that voluntary contributions to LT plans were affected by the adoption of Loi Pacte, but that contributions to MT plans were not. This suggests little substitution between LT and MT savings. While gross contributions to LT plans rose, we also find an increase in withdrawals of previously-invested funds, which is likely the result of transfers to banks and insurance companies that received new opportunities to compete for retirement saving accounts as a result of the Loi Pacte reform.We do not find any evidence of a trade-off between the voluntary pension contributions and saving through mandatory pension schemes, a result that is parallel to the comparative analysis of 20 European pension plans by Marcinkiewicz (2019).

This paper contributes to the growing literature on how the structure of retirement saving incentives affects saver behavior. Beshears et al. (2017) study the quasi-random variation around the rollout of "Roth" 401(k) retirement plans in the US. These plans differ from the widely-studied traditional 401(k) plans in requiring contributions with after-tax rather than pre-tax dollars, a change which reduces the immediate tax saving from retirement plan contributions. They find that the introduction of Roth 401(k) plans had no significant impact on retirement savings. In a controlled laboratory setting, Bohr et al. (2023) show that individuals tend to be influenced by behavioral biases when choosing between Roth and traditional accounts. For example, time-inconsistent savers may favor pre-tax systems if they fail to anticipate their required post-retirement tax obligations. Blaufus and Milde (2020) suggest that low levels of tax knowledge, combined with tax misperception, may explain the small effect of tax nudges on retirement savings.

We find a modest but statistically significant impact of access to up-front tax savings on retirement saving; the most pronounced effects are observed among those who were making voluntary

contributions before tax relief became available. These may be "active savers" in the language of Chetty et al. (2014) who are focused on the details of retirement saving plans and modify their behavior when plan parameters change. We also study the cross-sectional distribution of the response to the Loi Pacte reform. One criticism of tax incentives for retirement saving is that the benefits depend on the taxpayer's marginal tax rate, which can result in larger benefits for high-income taxpayers in higher tax brackets than for lower income households. Horneff et al. (2023) suggest that shifting from pre-tax to post-tax contributions can reduce such inequalities, at least at the time contributions are made. We compare the response to Loi Pacte among workers in different age, retirement balance, and income quartiles, and find that the take-up of the pre-tax LT contribution option was greatest among older employees with higher incomes and retirement plan balances. This pattern is consistent with the take-up pattern for pre-tax 401(k) retirement saving plans in the US.

The remainder of this paper is divided into four sections. The first describes the data underlying our analysis and explains our identification strategy. The second and third sections present our core findings, and then a set of extensions of our analysis. There is a brief conclusion.

1. Context, Data, and Identification

The Loi Pacte was enacted in May and implemented in October 2019. It created a new retirement savings vehicle, the Plan d'Epargne Retraite (PER), to address the challenges posed by an aging population and increasing life expectancy in France. The goal was to unify and simplify the various retirement savings plans into a more flexible framework that would allow individuals to consolidate their retirement savings from different sources into a single plan that could be used throughout their careers.

There are two broad categories of PER. First, PERIN and PERO collect retirement savings made individually or under an employment contract. PERIN and PERO are bank or insurance contracts.[1] While Loi Pacte did not create new individual accounts, it did make it easier for participants in collective plans to transfer funds to individual accounts. Second, the collective PER, or PERCOL, includes retirement savings plans, which companies incorporate into their DC plans to facilitate workers' investment of variable compensation under a favorable pre-tax regime. The change introduced by the Loi Pacte to PERIN and PERO is merely a new, more integrated designation, facilitating the transfer of funds from one vehicle to another in an expedient manner.

Voluntary contributions to PERIN and PERO, both before and after Loi Pacte, were made on a pre-tax basis – savers received a tax reduction at the time of their contributions. Loi Pacte extended this pre-tax treatment to voluntary contributions to PERCOL, which were previously made only a post-tax basis. While post-tax contributions may offer higher long-run net of tax returns for some saving plan participants, notably those who expect to face higher tax rates when retired than when working, for many potential participants the combination of up-front tax saving and the deferral of income realization to retirement, when they may face lower tax rates than when working, may be attractive. This could result in an expansion of both participation in, and contributions to, voluntary employer-sponsored retirement saving accounts as a result of the Loi Pacte reform, which allowed firms to add a pre-tax contribution option to their saving plans. We examine the introduction of these features to PERCOL plans.

Our data sample is draw from Amundi, the largest provider of retirement plan administration and investment services to employer-provided plans in France. The full sample comprises 1,396,579

[1] "IN" stands for "individual" and "O" for "obligatory". The latter is mandatory in the sense that the employment contract may impose contributions on the employee.

employees who are below the age of 62, the retirement age during our sample and who worked at firms with more than 50 employees, a total of 4,098,000 employee-year observations.

To measure the effect of the introduction of the pre-tax option for voluntary contributions, while addressing the endogeneity of employer decisions to implement the new framework, we restrict the analysis to employees at firms that adopted pre-tax PERCOL options between 2019 and 2022. We compare changes in retirement plan contributions at early versus late adopters. This reduces our sample to 852,177 employees and 2,563,263 employee-year observations. The limitation to large firms is motivated by a regulatory consideration: Firms with at least 50 employees are legally obliged to provide their employees with variable compensation that can be contributed to a saving plan.

Table 1: Summary Statistics for the Full Sample and the Restricted Sample (2017-2022)

Variable	Full sample (N=4,098,000)		Restricted sample (N=2,563,263)	
	Mean	Standard Dev.	Mean	Standard Dev.
Age	44.47	10.25	44.77	10.34
Female	0.34	0.47	0.36	0.48
Total assets $_{t-1}$ (ln)	8.61	2.40	9.03	2.31
Variable remuneration	3170.41	4004.05	3949.90	4369.11
Voluntary contribution: New LT pre-tax	60.28	881.32	96.37	1112.79
Voluntary contribution LT post-tax	132.34	765.36	179.28	895.70
Voluntary contribution: LT	192.62	1192.49	275.65	1458.33
Voluntary contribution: MT	782.34	13195.76	903.52	16580.40
Voluntary contribution: Total	974.96	13271.37	1179.17	16668.39
Variable remuneration: LT	600.40	1307.31	883.39	1521.91
Variable remuneration: MT	2570.01	3438.08	3066.52	3702.86
Withdrawals: LT	168.90	2323.57	244.55	2853.13
Withdrawals: MT	2461.20	16992.05	3019.61	20355.14
Net contribution: LT	624.12	2870.45	914.48	3490.88
Net contribution: MT	891.15	12350.25	950.44	14081.39
Net contribution: Total	1515.27	13251.98	1864.92	15271.08

Note: The full sample comprises 1,396,579 employees who are below the age of 62 and worked at firms with more than 50 employees. This restricted sample comprises 852,177 employees working at firms that adopted PRECOL between 2019 and 2022. The contributions are expressed in euros. The net contributions are the sum of the voluntary contributions and the contributions from the variable remuneration, minus the withdrawals in the same year.

Table 1 compares the summary statistics for the full and restricted samples. The demographic characteristics (age and gender) are similar in the two samples. Table 2 shows the same statistics for the restricted sample pre- and post-treatment. Table 1 suggests that the set of firms that adopted PERCOL were not systematically different than those that did not. One characteristic that does differ is total assets held in the pension plan in the previous year. This variable, a proxy for wealth, is slightly higher in the restricted subsample. Firms with wealthier employees may be more inclined to implement Loi Pacte provisions for pre-tax voluntary contributions, given the that their workers' tax rates may be higher than those at other firms.

Table 2: Summary Statistics for the Restricted Sample: Pre- vs. Post-Treatment

Variable	**Pre-treatment** (N=1,295,475)		**Post-treatment** (N=1,267,788)	
	Mean	Standard Dev.	Mean	Standard Dev.
Age	45.07	10.28	44.46	10.40
Female	0.34	0.47	0.38	0.49
Total assets $_{t-1}$ (ln)	9.21	2.17	8.85	2.43
Variable rem	3858.93	4140.27	4042.86	4589.32
Voluntary contribution: **New LT pre-tax**	0.00	0.00	194.85	1576.22
Voluntary contribution LT post-tax	174.60	955.32	184.05	830.33
Voluntary contribution: LT	174.60	955.32	378.90	1829.26
Voluntary contribution: MT	958.21	14033.08	847.64	18830.54
Voluntary contribution:Total	1132.82	14086.54	1226.55	18946.49
Variable remuneration: LT	803.08	1371.45	965.45	1657.63
Variable remuneration: MT	3055.86	3484.38	3077.41	3913.50
Withdrawals: LT	217.76	2699.88	271.93	3001.40
Withdrawals: MT	3124.60	19793.95	2912.32	20912.49
Net contribution: LT	759.92	3095.89	1072.42	3846.49
Net contribution: MT	889.47	14319.83	1012.74	13833.23
Net contribution : Total	1649.38	15383.00	2085.16	15152.71

Note: Contributions are denominated in EUR. The net contributions are the sum of the voluntary contributions and the contributions from the variable remuneration, minus the withdrawals in the same year.

Contributions of variable remuneration to LT and MT plans have always been made on a pre-tax basis. This remuneration was not taxed at the time of contribution, but withdrawals from the saving plans, which consist of both return of contribution and subsequent investment income, are fully taxed. The Loi Pacte reform extended the pre-tax treatment from variable compensation to a new class of LT voluntary savings options. Pre-tax LT voluntary contributions are accessible only to individuals in the restricted sample and after their firms implement PERCOL.

Figure 1 plots the annual average contribution to LT pretax as well as LT post-tax plans in the years just before and just after the Loi Pacte reform. LT pre-tax voluntary contributions (the new option) and the total LT voluntary contribution increased over time while the LT post-tax voluntary contributions (the old option) remained stable. Voluntary MT contributions were subject to post-tax treatment throughout the sample period. At an aggregate level, this pattern suggests little substitution between pre-tax and post-tax LT voluntary contributions. A key question is whether the introduction of the pre-tax voluntary contribution option led some PERCOL participants who were previously contributing after-tax funds to switch to pre-tax contributions, and also drew in new contributors who did not previously contribute. The average amount contributed to the new pre-tax voluntary accounts is EUR 195. Figure 2 shows the evolution of MT and LT voluntary contributions; there is no evidence of a decline in MT contributions as LT voluntary contributions rise.

Figure 1: Average Yearly LT Voluntary Contributions (in EUR)

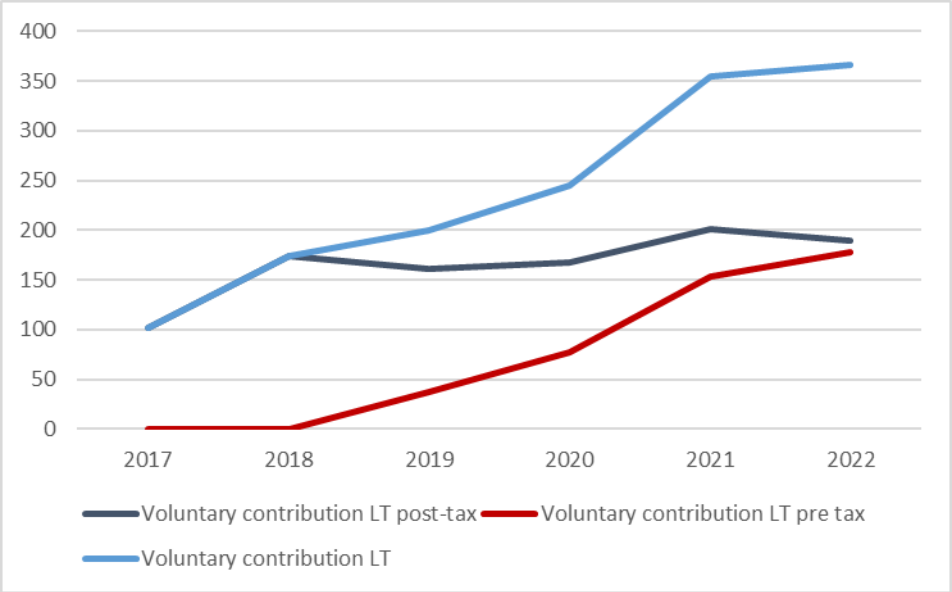
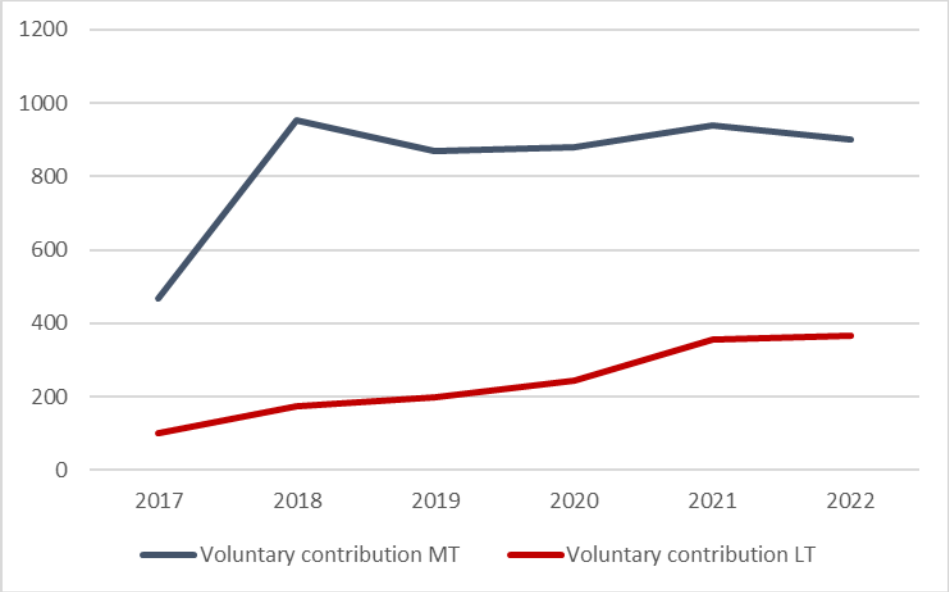


Figure 2: Average Yearly MT and LT Voluntary Contributions (in EUR)



To provide evidence on potential substitution between the new pre-tax savings instrument and pre-existing post-tax saving options, we consider contributions to employer-sponsored saving accounts from variable compensation, which is set by the employer according to a formula that applies to all employees, as well as voluntary contributions. For completeness we also show withdrawals from PERCOL accounts, which as we will discuss below, also increased following the Loi Pacte reform.

Table 2 shows that both contributions related to variable remuneration and withdrawals exhibit more variation than voluntary contributions.

Table 3 presents data on take-up rates. The adoption of Loi Pacte provisions was associated with modest changes in the take-up of voluntary saving plans The 8% take-up of the new pre-tax LT investment option was partly offset by the drop in take-up of post-tax LT investment from 17% to 13%. Take-up of all voluntary LT savings only rose from 17% to 19%. The average take-up of voluntary contributions fell from 45% before the treatment to 40% after. This suggests that the new option attracted interest mainly from individuals already familiar with the voluntary savings system, and that a substantial group of these workers found the pre-tax saving opportunity introduced by Loi Pacte more attractive than the voluntary post-tax option that existed previously.

Table 3. Take-up of Voluntary Savings

Take-up of	**Pre-treatment** (N=1,295,475)		**Post-treatment** (N=1,267,788)	
	Mean	Standard Dev.	Mean	Standard Dev.
Voluntary contribution LT: pre-tax	0.00	0.00	0.08	0.26
Voluntary contribution LT: post-tax	0.17	0.37	0.13	0.34
Voluntary contribution LT	0.17	0.37	0.19	0.39
Voluntary contribution MT	0.37	0.48	0.30	0.46
Any voluntary contribution	0.45	0.50	0.40	0.49

There is considerable dispersion in the amounts saved, which calls for an analysis of heterogeneity. For this reason we will consider variation in take-up by wealth, proxied by account balance in the plan, income, age, and gender. Wealth and income provide a rough indication of the expected spread between the marginal tax rates on pre- and after-tax contributions. We expect wealthier individuals or individuals with higher income to be more interested in the new opportunity to invest pre-tax. These individuals are also more less likely to be liquidity constrained, and more likely to be able to fund a voluntary pre-tax contribution. Age is crucial in determining how long the money will be locked in the

LT (retirement) plan. If workers prefer liquid investments, LT investments will be less attractive to young workers than to those who are closer to retirement.

2. Impact of Access to a Pre-tax Voluntary Retirement Saving Program

To assess the impact of the introduction of the new pre-tax option for voluntary LT savings we estimate a diff-in-diff model in our restricted sample, which consists of employees in firms that adopted the new framework within our sample period. We estimate the following model

$$y_{it} = \alpha_i + \beta\, Post_{it} + X'_{it}\,\gamma + \mu_t + \varepsilon_{it}, \qquad (1)$$

where y_{it} is a given type of voluntary contribution (LT pre-tax, LT post-tax, LT, MT, total voluntary contribution) of individual *i* at time *t*. The binary variable $Post_{it}$ equals 1 after the introduction of the new option for individual *i*. X_{it} is a vector of individual time-varying characteristics (total assets accumulated in the plan in year *t-1* (in ln) and variable remuneration received in year *t*); α_i and μ_t are individual and year fixed effects. The year fixed effects control for changes in economic conditions, which is crucial given that the COVID-19 pandemic falls within our sample period. Standard errors are clustered at the firm level, reflecting the variation in savings plan design at the firm level.

Table 4 presents the estimation results for each type of LT voluntary savings, with and without the controls. Columns (1) and (2) report the number of euros invested in the new option (LT pre-tax), which is necessarily equal to zero before the option is available. The coefficient of the Post variable is positive and significant, with a value close to EUR 150. Column (3) and (4) demonstrate that the change had no significant impact on the investment in the LT post-tax option. Column (5) and (6) suggest that contributions to the two types of LT voluntary plans rose after the pre-tax option has become available. Total LT savings increased by about EUR 150; remember that the average savings pre-treatment was EUR 175. Regressions explaining all take-ups (not shown here) suggest that only the take-up of the new LT pre-tax voluntary contribution plan rose significantly (by 7%) after the

introduction of the treatment. There is no significant effect on the other voluntary savings (LT post-tax, MT, and total). To test for external validity, we estimated the equations in Table 4 on the full data sample, including firms that never adopted. The results are shown in Appendix Table A1. The estimate of "Post" coefficient for pretax LT accounts is EUR 108, and for post-tax LT accounts is 14, so the estimate for the two together is EUR 122. For combined MT and LT contributions, the Post coefficient is EUR 151.

Table 4: Diff-in-diff estimation of the Impacts on LT Voluntary Contributions

	(1)	(2)	(3)	(4)	(5)	(6)
LT voluntary contribution	**LT Pre-tax**	**LT Pre-tax**	**LT Post-tax**	**LT Post-tax**	**LT Total**	**LT Total**
Post	148.9***	151.1***	-8.189	-2.973	140.7***	148.2***
	(18.04)	(18.88)	(31.85)	(35.49)	(36.56)	(42.20)
Controls	No	Yes	No	Yes	No	Yes
R-squared (adjusted)	0.22	0.22	0.26	0.27	0.28	0.28

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. All equations include individual and year fixed effects. The sample size is 2,563,263.

Table 5: Impacts of the Treatment on MT and Total Voluntary Contributions

	(1)	(2)	(3)	(4)
Voluntary Contribution	**MT**	**MT**	**LT+MT**	**LT+MT**
Post	121.6	161.3	262.3	309.5*
	(181.3)	(165.9)	(170.9)	(161.6)
Controls	No	Yes	No	Yes
R-squared (adjusted)	0.88	0.88	0.87	0.87

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01
All equations include individual and year fixed effects. The sample size is 2,563,263.

Table 5 shows the diff-in-diff results for the MT and total voluntary contributions. There is no evidence of a spillover between MT and LT voluntary contributions. One consideration that makes MT and LT saving at large firms imperfect substitutes is that contributions to MT voluntary saving plans can be invested in employer stock, often at a discount or with a match. Column (4) demonstrates a positive (statistically significant at 10% level) effect on the total voluntary contribution. Another potential explanation for imperfect substitution, developed by Guariglia and Markose (2000) among others, is that voluntary contributions to personal pension plans are associated with retirement purposes while other savings are predominantly motivated by precautionary motives..

Figures 3 and 4 illustrate the differences in the amounts invested in each type of voluntary savings by wealth quartiles (based on total assets in the employer-provided retirement plan), and by age.

Figure 3: Evolution of LT Pre-Tax Voluntary Contributions by Wealth-Based Quartiles

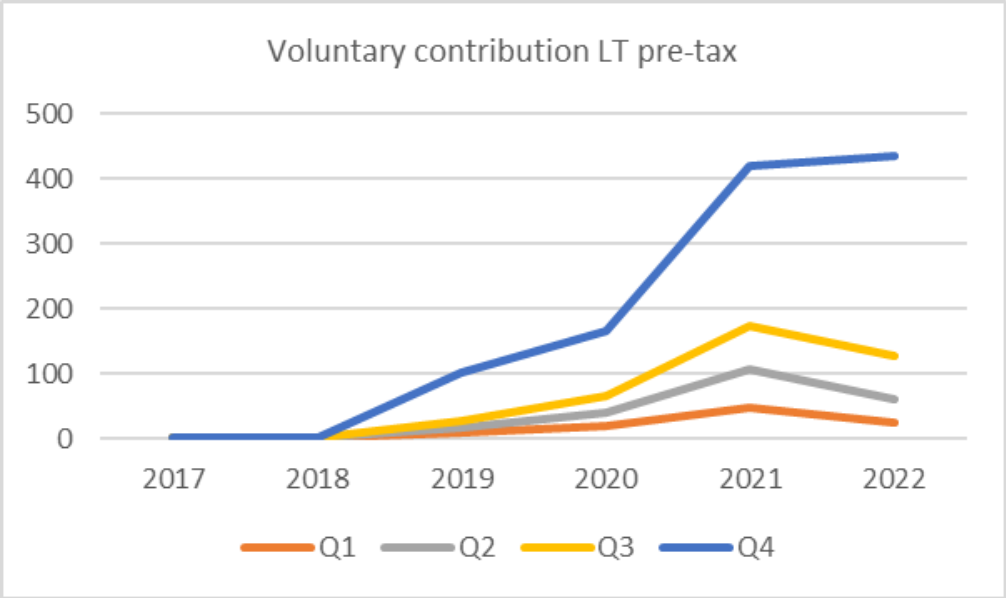
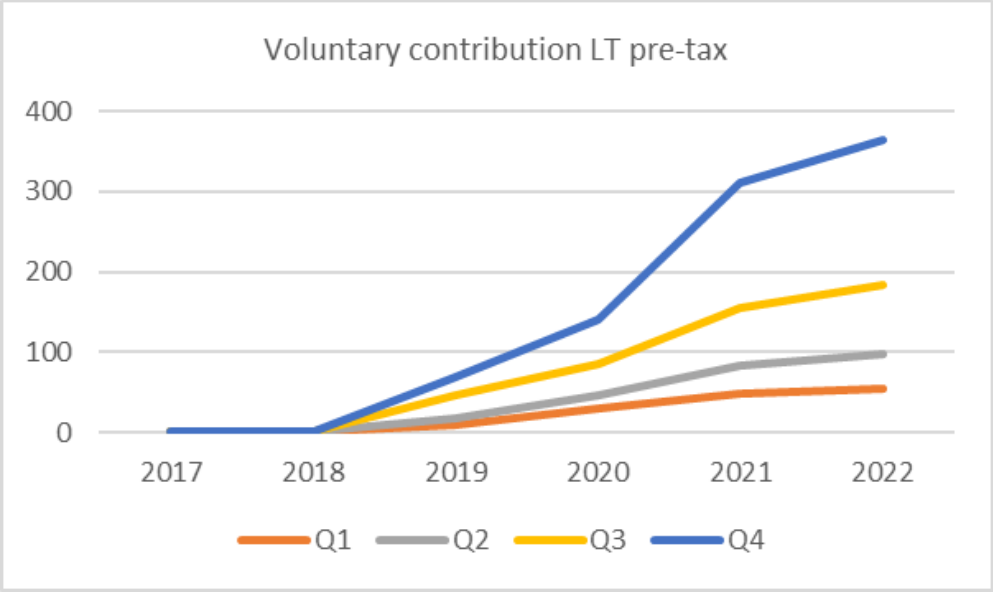


Figure 4: Pre-Tax Voluntary Contributions by Age-Based Quartiles



The amount of pre-tax contributions by workers in the top quartile of retirement assets is about five times greater than the amount invested by those in the bottom quartile. With respect to age, the first

quartile includes those under the age of 34, and the fourth, those over the age of 54. Older workers also contribute more to the Loi Pacte voluntary saving plans.

Table 6 employs the same regression methodology as Table 4 (with control variables included), but it examines heterogeneity by introducing interactions between the *Post* variable and dummy variables representing quartiles of wealth (saving plan balances), income (variable remuneration), age, and gender. The analysis yields several noteworthy findings. First, we do not find significant spillover effects between pre-tax and post-tax LT contributions (column (2)) and between LT and MT contributions (column (4)) for any subgroups. These findings suggest that individuals invested new funds in the new option rather than by reducing other voluntary savings contributions. Second, higher quartile the higher the quartile for plan assets, variable remuneration, and age, the higher the contribution to the new pre-tax option. There is no evidence of any impact on the workers with the lowest account balances, a similar finding to Aguila (2011). This may reflect, in part, the smaller tax benefits that these workers derive from saving through the post-tax plan; we elaborate this point in appendix C.

Table 6: Impact on Voluntary Contributions: Heterogeneity

	(1)	(2)	(3)	(4)	(5)
Voluntary Contribution	**LT: pre-tax**	**LT: post-tax**	**LT : Total**	**MT**	**LT+MT**
			Panel A: Wealth (Total Saving Plan Assets)		
Post*Assets t-1 in Q1	28.99*	-4.208	24.78	108.9	133.7
	(17.00)	(23.75)	(34.65)	(135.4)	(128.4)
Post*Assets t-1 in Q2	75.95***	-1.967	73.99*	169.0	243.0*
	(17.25)	(27.81)	(37.77)	(144.9)	(139.7)
Post*Assets t-1 in Q3	136.8***	2.933	139.7***	160.8	300.5**
	(21.48)	(37.53)	(45.36)	(154.0)	(149.8)
Post*Assets t-1 in Q4	365.6***	-8.999	356.6***	205.0	561.6**
	(43.40)	(55.27)	(74.40)	(248.4)	(249.1)

R-squared (adjusted)	0.22	0.27	0.28	0.88	0.87
Panel B: Income (Variable Remuneration)					
Post*Rem t-1 in Q1	44.79***	-11.17	33.62	70.09	103.7
	(17.27)	(22.43)	(35.65)	(258.7)	(265.0)
Post*Rem t-1 in Q2	93.75***	20.37	114.1	146.7	260.8
	(22.60)	(52.42)	(71.41)	(194.5)	(210.0)
Post*Rem t-1 in Q3	148.7***	-2.014	146.7***	369.2**	515.8***
	(32.56)	(27.89)	(46.42)	(173.3)	(160.4)
Post*Rem t-1 in Q4	258.3***	-16.85	241.5***	43.52	285.0
	(50.91)	(49.16)	(79.62)	(243.1)	(249.8)
R-squared (adjusted)	0.22	0.27	0.28	0.88	0.87
Panel C: Age					
Post*Age in Q1	27.71*	-7.408	20.30	157.3	177.6
	(14.73)	(21.54)	(28.13)	(173.2)	(170.4)
Post*Age in Q2	62.64***	-3.761	58.88	155.2	214.1
	(14.87)	(37.16)	(40.12)	(163.5)	(163.9)
Post*Age in Q3	153.2***	-1.998	151.2***	154.9	306.1*
	(19.14)	(40.03)	(43.96)	(170.4)	(170.1)
Post*Age in Q4	334.8***	0.226	335.0***	177.9	512.8***
	(33.35)	(42.71)	(57.91)	(170.0)	(164.0)
R-squared (adjusted)	0.22	0.27	0.28	0.88	0.87
Panel D: Gender					
Post*Female	128.6***	-3.258	125.3***	100.8	226.1
	(17.82)	(29.55)	(35.86)	(175.7)	(173.0)
Post*Male	163.7***	-2.825	160.9***	195.3	356.2**
	(20.97)	(39.26)	(46.65)	(168.2)	(163.0)
R-squared (adjusted)	0.22	0.27	0.28	0.88	0.87

In this table, the Post treatment variable is interacted with quantiles of wealth, income, age and with gender. For age, the first quartile includes individuals under the age of 34, the second those between 35 and 44, the third those between 45 and 53 and the fourth, those over 54. All equations are estimated on 2,563,246 observations. Diff-in-diff, individual fixed effects, year fixed effects, w/ controls. Standard errors in parentheses. Same sample as in Tables 4 and 5. * p<0.10, ** p<0.05, *** p<0.01

The impact of access to pretax contributions is slightly smaller for women than for men. Context for financial decisions appears to be particularly important for women (Nelson, 2015; Schubert et al., 1999). It is possible that women are more attuned to the risks associated with uncertainty about future tax rates, which is more important when evaluating pre-tax than post-tax contributions.

3. Further Analysis

3.1. Impact of Loi Pacte on PERCOL Withdrawals

For completeness, we also analyze withdrawals from both MT and LT accounts, but the interpretation of withdrawals is complicated by the provisions of Loi Pacte that facilitated transfers from PERCOL to individual retirement saving accounts managed by banks and insurance companies. Withdrawals from PERCOL accounts in our dataset do not necessarily correspond to increased spending; rather, they may be transfers to a different type of retirement saving account. Withdrawals may be made from available funds after five years for MT savings or after retirement age for LT savings. They may also be taken on a hardship basis in a number of special circumstances, such as job loss or an episode of poor health and associated expenditures.[2] The conditions are more restrictive for LT savings than for MT ones. We aggregate withdrawals from MT and LT accounts, and then compute net contributions (LT, MT, and total) by adding voluntary contributions and contributions from variable remuneration and subtracting withdrawals.

[2] In 2022, the French government allowed households facing liquidity constraints due to rising inflation to make exceptional withdrawals of up to EUR 10,000. However, this opportunity was not widely used; see for example: https://www.ouest-france.fr/economie/banques-finance/le-deblocage-exceptionnel-de-l-epargne-salariale-est-un-flop-2869ae18-8d99-11ed-9545-6a86069fe887.

Table 7 presents a diff-in-diff analysis of net contributions, and shows that the rise in outflows from MT accounts was larger than the increase in pre-tax contributions to LT plans. This pattern holds across sub-groups of the participant population. We suspect, based on aggregate evidence on the rise on individual PER balances held at banks and insurance companies during the period following Loi Pacte implementation, that most of the outflows from MT accounts were movements of funds to these other institutions, rather than transfers to pretax LT voluntary accounts.

Table 7: Contributions from Variable Remuneration, Withdrawals and Net Contributions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Variable remuneration		**Withdrawals**		**Net Contribution**		
	LT	**MT**	**LT**	**MT**	**LT**	**MT**	**Total**
Post	74.39	-74.39	42.66	365.5	179.9**	-278.6	-98.69
	(53.93)	(53.93)	(49.77)	(312.2)	(87.79)	(444.7)	(454.2)
Observations	2,563,263	2,563,263	2,563,263	2,563,263	2,563,263	2,563,263	2,563,263
R-squared (adjusted)	0.71	0.95	-0.03	0.53	0.13	0.04	0.04

Diff-in-diff, individual fixed effects, year fixed effects, w/ controls. Same sample as in Tables 4 and 5. Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

3.2. Immediate vs. Cumulative Changes

We also consider whether the impact of the Loi Pacte reform grows larger over time. In line with the ideas of investor passivity and inattention developed in Chetty et al. (2014) and Beshears et al. (2017), we might expect a growing effect. With regard to the take-up of the voluntary pre-tax LT contribution option, Figure 5 suggests that the take-up jumped in the first year but was stable afterward. Because of declining numbers of observations for longer-horizon effects, the standard errors of the multi-year treatment effects are larger than for immediate effects.

Figure 5: Take-up of LT Pre-Tax Contributions: Treatment and Subsequent Years

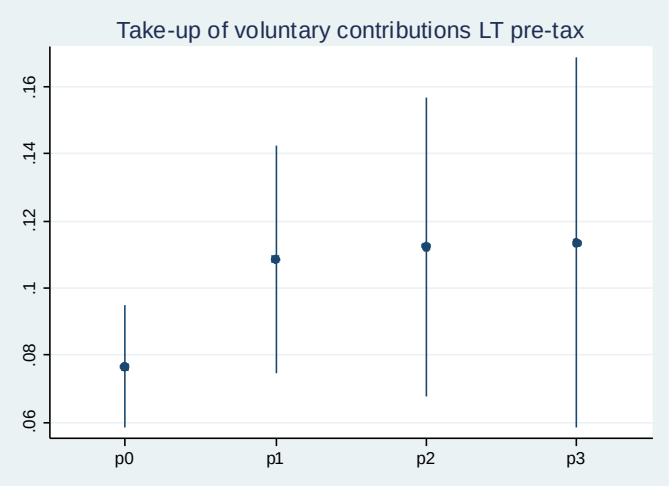
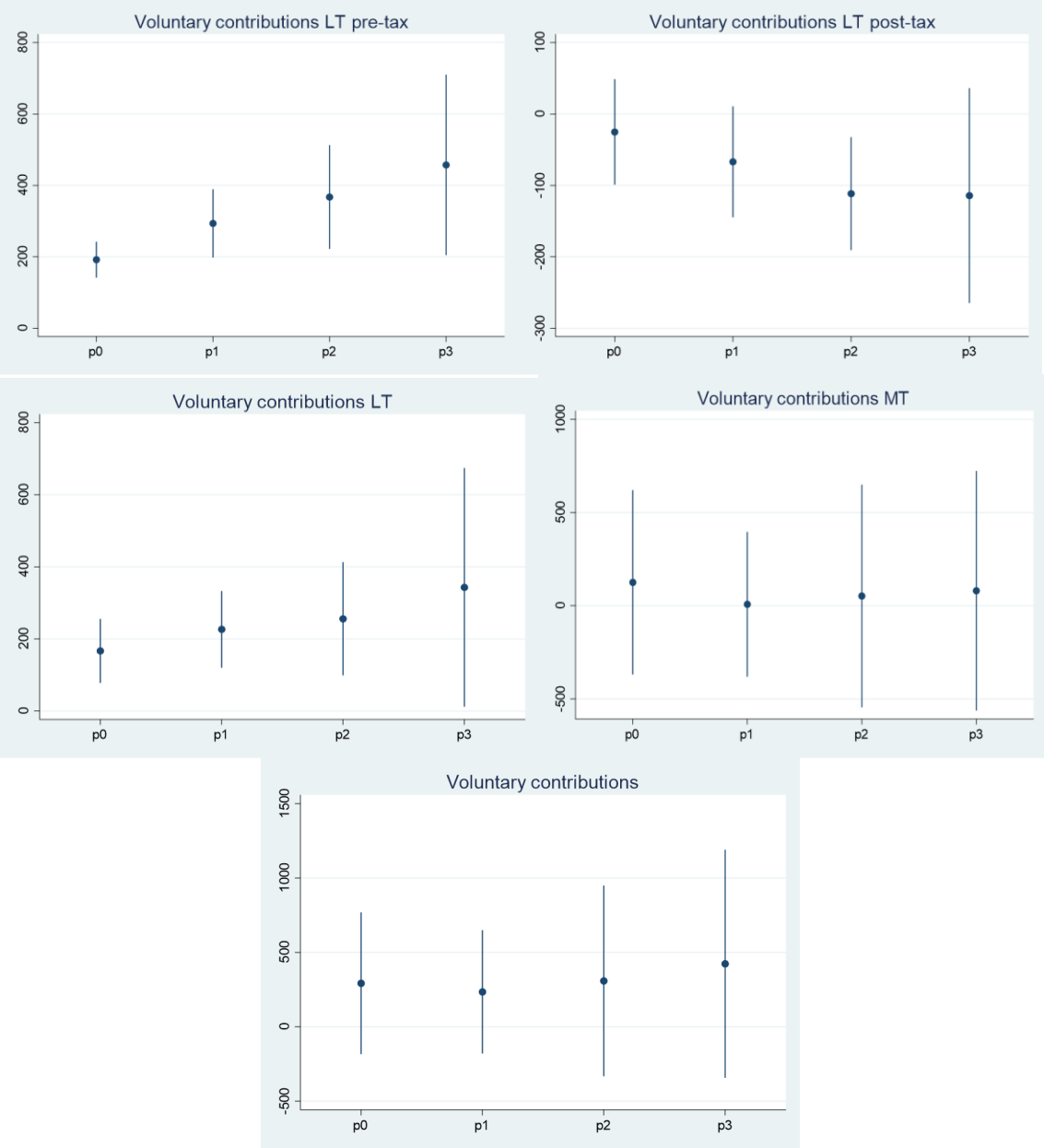


Figure 6 shows the effects on different types of voluntary contributions in the treatment year and three following years. The impact on LT pre-tax voluntary contributions rises over time, but so do the confidence interval widths, reflecting declining sample size for longer post-Loi Pacte effects. The Investment in LT post-tax voluntary contributions also declines with time after the treatment. As the upper right graph shows, the impact of the treatment on the LT post-tax voluntary contribution is significantly negative two years after the implementation of the pre-tax option. This may reflect learning about the benefits of the substitution of the post-tax saving option for outside-the-plan saving.

Figure 6: Impact on Voluntary Contributions Depending on the Interval between Treatment and Impact



This figure depicts the yearly responses in voluntary savings subsequent to the treatment (coefficient computed from the model in Table 4 with control variables). The year p0 refers to the year in which the treatment was implemented, and p1 to p3 refer to the following years. The top panels illustrate the effects on pre-tax and post-tax voluntary LT savings, respectively. The middle left panel depicts the effects on total LT voluntary savings. The middle right panel depicts the effects on MT voluntary savings. The bottom panel depicts the impact on total voluntary savings.

3.3 Impact of Familiarity with LT Voluntary Savings

We also explore the extent to which previous contributions to a post-tax LT voluntary account is associated with worker response to the introduction of a pre-tax voluntary saving option. We classify workers in the dataset according to their previous LT investments.[3] Table 8 presents a comparison of the impact of the treatment on two mutually exclusive groups of workers. The first group, designated as "savers with familiarity," (533,806 individuals) comprises those who made LT voluntary contributions prior to the Loi Pacte treatment. The second group, "savers without familiarity," (318,371 individuals) did not make any such investments between 2017 (the starting year of our sample) and the implementation of the treatment.

Table 8: Impact of Familiarity with LT Voluntary Savings

	(1)	(2)	(3)	(4)	(5)
Voluntary Contribution	**LT pre-tax**	**LT post-tax**	**LT Total**	**MT**	**MT+LT**
Post*saver w/ familiarity	357.7***	-212.2***	145.6**	143.8	289.4
	(48.95)	(50.45)	(68.51)	(222.1)	(235.1)
Post*saver w/o familiarity	94.15***	54.73*	148.9***	166.1	315.0**
	(18.70)	(32.79)	(42.42)	(155.6)	(149.3)
R-squared (adjusted)	0.22	0.27	0.28	0.88	0.87

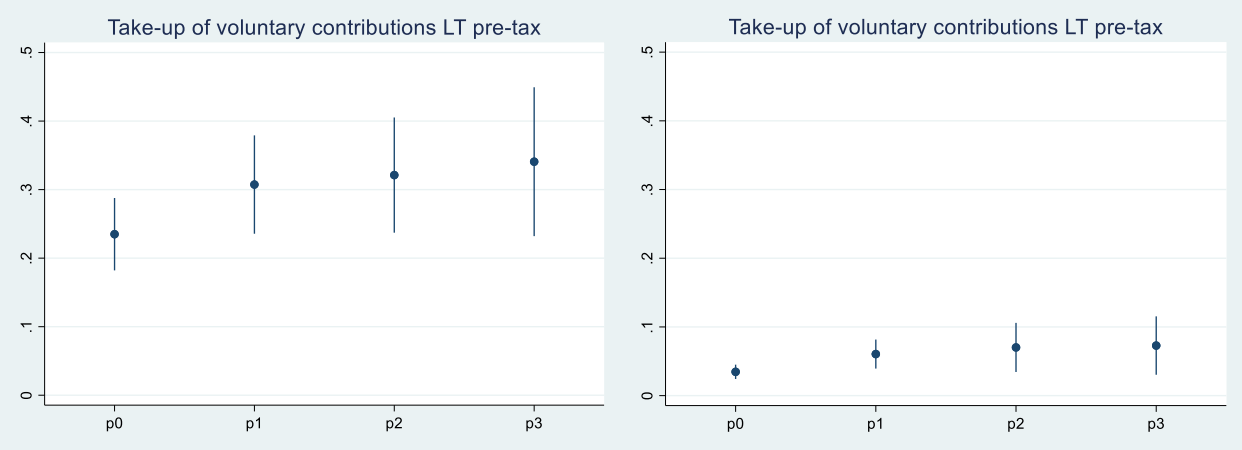
All equations include individual and year fixed effects and the control variables included in Table 7. There are 2,563,263 observations in the estimation sample.

The estimation results indicate that savers with experience invested a greater amount of money in the new option, and they also reduced their investment in post-tax LT voluntary savings. The overall effect of the introduction of post-tax voluntary plans on both LT and MT savings was more pronounced in the case of newcomers than in that of savers with experience. Figure 7 shows that the

[3] We consider only LT voluntary savings. Nevertheless, comparable outcomes are observed when examining LT + MT voluntary contributions instead of LT ones.

take-up is steadily increasing in both groups, but the impact on the take-up level of newcomers after three years (7%) is still significantly below that of experienced savers at treatment time (23%).

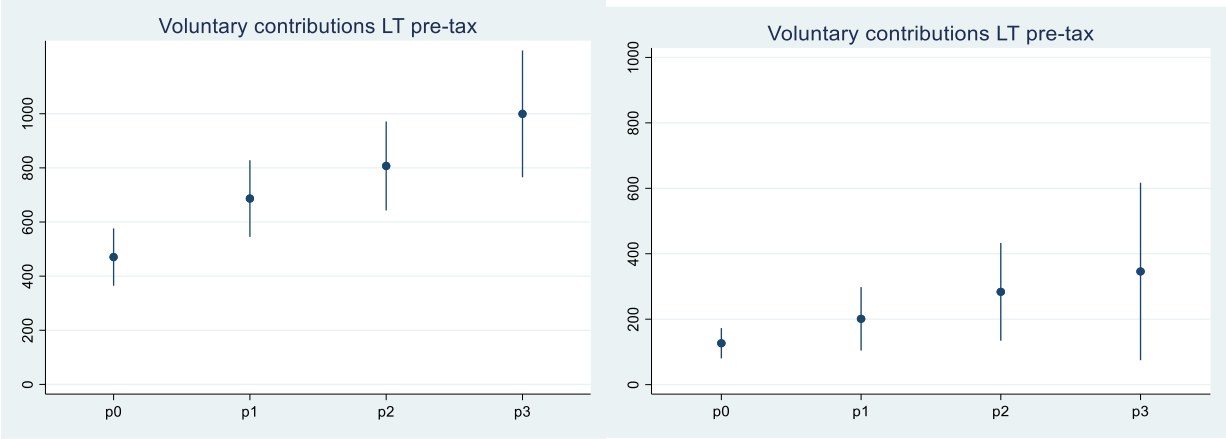
Figure 7: Impact on Take-up of LT Pre-Tax Voluntary Contributions: Savers with Familiarity in Voluntary Savings vs. Newcomers



The two figures depict the yearly responses to the treatment of the take-up in LT pre-tax voluntary savings. The year p0 refers to the year in which the treatment was implemented, and p1 to p3 refer to the following years. The left, respectively right, panels illustrate the effects on pre-tax voluntary LT savings on the take-up of the pre-tax voluntary contributions of savers with familiarity in LT voluntary savings and newcomers, respectively.

Figure 8 suggests that some increase with time in the amount contributed to the newly-available post-tax account, although the standard errors are too large to reject the null hypothesis of constant values from one year to the next. For savings with familiarity in the LT savings plan, we notice that after 2 or 3 years however, the contributions are significantly larger than the first year of treatment.

Figure 8: Impact on LT Pre-Tax Voluntary Contributions: Savers with Experience in LT Voluntary Savings vs. Newcomers



The two figures depict the yearly responses to the treatment of the amounts invested in LT pre-tax voluntary savings (coefficients computed from the model in Table 7). The year p0 refers to the year in which the treatment was implemented, and p1 to p3 refer to the following years. The left, respectively right, panels illustrate the effects on pre-tax voluntary LT savings on the amounts of the pre-tax voluntary contributions of savers with familiarity in LT voluntary savings and newcomers, respectively.

4. Conclusion

This paper offers new evidence on how tax incentives affect the take-up of retirement saving programs and the amount invested in such programs. The reaction to the Loi Pacte reform in France suggests that offering a voluntary pre-tax contribution option in an employer-sponsored retirement plan, where there were only post-tax voluntary options before, can boost contributions without a notable reduction in other employer-sponsored saving contributions. It also corroborates previous findings of heterogeneous responses to such incentives. Workers with larger pre-reform retirement saving balances, higher income, and who were closer to retirement were more likely to take advantage of the new saving option. Those with prior familiarity with voluntary saving plans had a higher take-up rate than others, but they also appear to have withdrawn more funds from their previously-funded accounts. One lesson of heterogeneous response is that tax incentives may motivate some workers to raise their saving contributions, while others may be more sensitive to other saving plan provisions

such as flexibility in making cost-free withdrawals. Locking in the tax rate to be paid at retirement could significantly reduce the uncertainty associated with pre-tax savings.

There are several reasons why our findings may be difficult to extrapolate to other settings. First, the outcomes we examine are limited to voluntary contributions and savings from variable remuneration in employer-sponsored savings plans. Besides the saving vehicles we observe, there are other financial instruments, such as individual retirement savings products offered by insurers or banks, which attracted contributions under the new denominations of PERIN and PERO introduced by the Loi Pacte. The French Treasury has reported that the total accumulated savings on collective retirement vehicles as of September 2023 amounted to EUR 21.8 billion, while the total accumulated savings on individual retirement vehicles reached EUR 55.2 billion.[4] Advertisements by banks and insurance companies appear to have been an important determinant of the PERIN purchasing behavior, a finding that is reminiscent of the role of financial intermediaries in advertising Individual Retirement Accounts (IRAs) that Venti and Wise (1989) describe in the US in the early 1980s. This expanded set of other saving options may explain the rise in withdrawals from employer-sponsored plans during our sample period.

Another limitation arises from the specificities of both the period and the place of our investigation. Two concerns stand out. First, the post-period in our diff-in-diff analysis has significant overlap with the COVID-19 pandemic. While individual and time-fixed effects may absorb most of the spurious effects, there may be effects of work-from-home, a need to tap retirement saving for other reasons in 2020 and 2021, that makes it difficult to extrapolate our findings. Second, the French pension system is distinguished by a high degree of public retirement benefits and a pension age set by the

[4] These figures can be found at https://www.tresor.economie.gouv.fr/Articles/2024/02/19/le-succes-du-plan-epargne-retraite-plus-de-95-milliards-d-euros-d-encours-par-pres-de-10-millions-de-francais

government. It is similar to many other systems in the EU and elsewhere, but it contrasts with the US and other jurisdictions that rely more heavily on private sector defined contribution (DC) and defined benefit (DB) pension funds (Poterba et al., 2000; Poterba, 2014). Even against the backdrop of these institutional differences, we find heterogeneities in the impact of tax-incentivized retirement savings across wealth and age groups that are similar to those in countries with quite different structures.

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Appendix A: Full-Sample Diff-in-Diff

Table A1: Full-Sample Regressions

	(1)	(2)	(3)	(4)	(5)
Voluntary Contribution	**LT: pre-tax**	**LT: post tax**	**LT : total**	**MT**	**LT+MT**
Post	108.2***	14.19	122.4***	28.37	150.8***
	(8.926)	(20.80)	(22.57)	(56.98)	(56.71)
Total assets $_{t-1}$ (ln)	2.235***	1.890	4.124***	-4.604	-0.479
	(0.546)	(1.392)	(1.258)	(6.197)	(6.319)
Variable remuneration	0.0107***	0.0254***	0.0361***	0.170**	0.206***
	(0.00240)	(0.00406)	(0.00515)	(0.0669)	(0.0669)
Observations	7,759,432	7,759,432	7,759,432	7,759,432	7,759,432
R-squared (adjusted)	0.18	0.23	0.24	0.74	0.74

All equations include individual fixed effects, year fixed effects, and control variables as in Table 4.

Appendix B: Evolution of Withdrawals

Figure B1: Average Regular Withdrawals from MT Accounts (EUR)

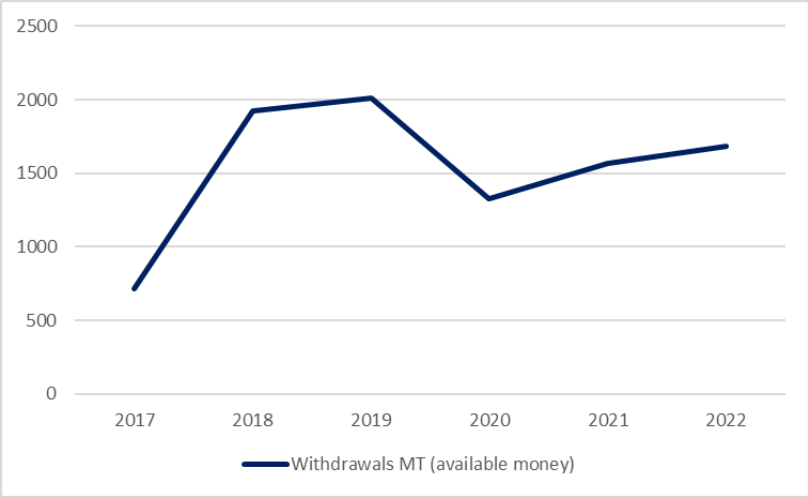


Figure B2: Average Hardship Withdrawals from MT Accounts (EUR)

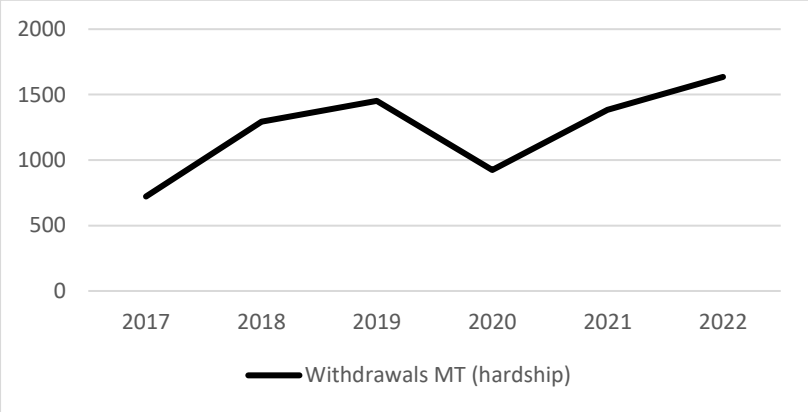
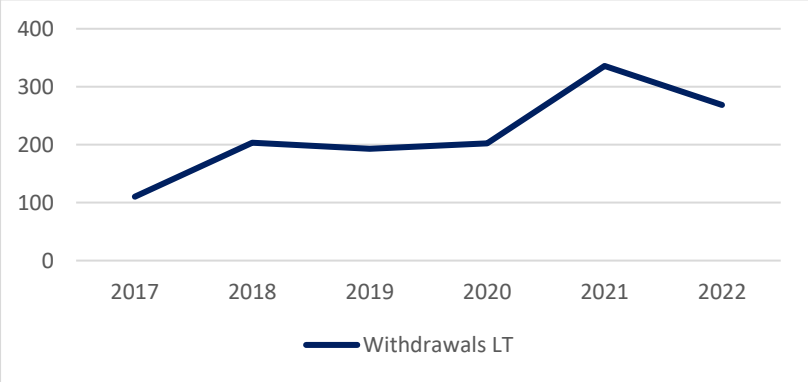


Figure B3: Average Hardship Withdrawals from LT Accounts (EUR)



Appendix C: The Advantage of Pre-Tax Savings

To illustrate the favorable effect of pre-tax saving on wealth accumulation, we consider a worker ten years from retirement who considers making an LT voluntary contribution with earnings of 10,000 EUR. First , consider the post-tax case that prevailed prior to Loi Pacte. The worker receives earnings, pays tax on them at the labor income tax rate, and invests the after-tax amount in a PERCOL. Investment returns are taxable when earned. We consider three potential marginal tax rates: 11% (low rate), 30% (medium rate), and 45% (high rate). We assume that the worker's marginal tax rate on interest, dividends, and capital gains is the same as the tax rate on labor income, and that the worker consumes the account balance at the retirement date; no additional taxes are due at that time.

If instead the worker pursues a pre-tax saving strategy, she invests the full amount of 10,000 EUR and does not pay tax on this amount until retirement. There are no taxes on the accumulating PERCOL balance until retirement. When the funds are withdrawn, the full balance is taxable at the labor income tax rate. We consider cases in which the marginal income tax rate in retirement is one bracket lower than that while working. We further assume that funds in both after-tax and before-tax accounts are invested in a bond that pays 4% each year – roughly the return Bianchi and Briere (2024) estimate as the net-of-fees return on retirement plan assets over the 2016-2021 period. We assume that the worker knows her present and post-retirement marginal tax rates.

Table C1 presents a summary of the after-tax balance available after ten years for a worker who accumulates in a taxable account or in a retirement saving plan. It reports five cases: (1) assumes an 11 percent tax rate in the present and at retirement; (2) assumes a 30 percent tax rate while working and 11 percent when retired; (3) assumes a 30 percent rate both while working and retired; (4) assumes a 45 percent tax rate now and 30 percent when retired; and (5) assumes a 45 percent tax rate while working and while retired. The tax on financial revenues is assumed to be the flat tax at 30% for "high

income" workers or equal to the income tax for low income workers.[5] In all scenarios, the retirement wealth available is greater when the individual chooses a pre-tax accumulation vehicle. The gain from pre-tax saving is largest when the marginal tax rate is higher when working than when retired, and when the marginal tax rate while working is higher. The latter result is due to the benefits of accumulating at the before-tax rather than after-tax rate of return; the gap between the two is increasing in the individual's marginal tax rate.

Table C1: Advantage of Pre-Tax Savings: 10 Year Investment Horizon

Simulations	(1)		(2)		(3)		(4)		(5)	
	Pre-tax	Post-tax	Pre-tax	Post-tax	Pre-tax	Post-tax	Pre-tax	Post-tax	Pre-tax	Post-tax
Marginal tax rate while working	11		30		30		45		45	
Marginal tax rate when retired	11		11		30		30		45	
Tax on financial revenue	11		30		30		30		30	
Amount invested net of taxes	10,000	8,900	10,000	7,000	10,000	7,000	10,000	5,500	10,000	5,500
Net amount at retirement	13,174	12,704	12,262	9,353	10,362	9,353	10,362	7,349	8,862	7,349
Increase in Amount at Retirement from Pre-Tax Saving	**470**		**2,909**		**1,009**		**3,013**		**1,513**	

[5] In practice, under the Loi Pacte, individuals have the choice to be taxed at their marginal income tax rate or at the flat tax (30%). Only low income workers would chose the income tax.

Notations:

- Pre-tax labor income to be put on the savings account: M
- Marginal labor income tax when employed: τ_{LE}
- Marginal labor income tax when retired: τ_{LR}
- Tax on financial revenue: τ_F
- Saving duration: D
- Expected annual rate of return: R

Scenario 1: Post-tax savings (baseline situation)

- Invest: $M\,(1 - \tau_{LE})$
- A maturity : Expected value from investment – tax on financial revenue
- Expected final amount: $M(1-\tau_{LE})(1\ +\ R)^D - \tau_F M(1-\tau_{LE})[(1\ +\ R)^D - 1]$

Scenario 2: Pre-tax savings

- Use own money (same as in baseline): $M\,(1 - \tau_{LE})$
- Invest : M
- At maturity: expected final amount from investment – loan repayment ($\tau_{LR}\ M$) – tax on financial revenue:
- Expected final amount: $M(1\ +\ R)^D - \tau_{LR}M - \tau_F M[(1\ +\ R)^D - 1]$