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The Effects of Overwithholding and Retroactive Savings Options on Retirement Savings: An Experimental Analysis

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Abstract

In three experiments, we examine how the widespread phenomenon of overwithholding affects retirement savings and how the additional option of saving retroactively for retirement at tax time affects total savings levels. Our results show that overwithholding significantly reduces retirement savings. We show that this outcome can be explained by individuals' anchoring on their take-home pay when making savings decisions and by individuals' reduced motivation to save in the presence of overwithholding. Moreover, we find that the introduction of an additional retroactive savings option at tax time increases overall savings by providing information about the correct after-tax income and by emphasizing the importance of a savings norm that nudges individuals to save. Furthermore, our findings demonstrate that immediate taxation (back-loaded retirement plans) results in greater effective savings than deferred taxation (front-loaded retirement plans), irrespective of whether there is overwithholding or the existence of an additional option to save. Policymakers may therefore consider both the introduction of an additional savings option at tax time and immediate taxation as policy tools to encourage retirement saving.

Keywords

Retirement savings, tax incentives, overwithholding, nudging, deferred taxation, immediate taxation

JEL Codes

D9, D14, D15, G51, H31

Data

Data are available from the authors upon request.

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1 | INTRODUCTION

In recent decades, the retirement landscape has changed significantly, with fewer defined benefit plans being available in many countries. Thus, voluntary participation in private plans is increasingly important for building sufficient retirement savings. As a result, there is a need to understand how tax rules can either encourage or discourage retirement savings. Previous research has focused on the attractiveness and effectiveness of specific tax incentives (e.g., Chetty et al., 2014; Beshears et al., 2017; Blaufus and Milde, 2021; Stinson et al., 2021; Cuccia et al., 2022). However, this focus overlooks the possibility that the widespread phenomenon of overwithholding income taxes may also affect retirement savings. The first objective of this study is, therefore, to investigate how overwithholding affects retirement savings under different tax treatments (i.e., immediate taxation (back-loaded retirement plans) and deferred taxation (front-loaded retirement plans)).

In the United States, for example, approximately one-third of all tax payments made to the Internal Revenue Service (IRS) are eventually returned to taxpayers in the form of tax refunds. In 2021, more than 70% of all individual U.S. income tax returns resulted in a refund due to overpayment (IRS, 2021). Since withheld taxes are not final taxes but simply lead to a difference in the timing of taxation, overwithholding should not affect savings behavior in the absence of any tax misperception or liquidity constraints. However, due to behavioral biases and the use of simple decision heuristics, individuals often misperceive taxes (Blaufus et al., 2022). In particular, we expect individuals to anchor on their current take-home pay when making savings decisions using the anchoring and adjustment heuristic (Tversky and Kahneman, 1974). This means that individuals place too much weight on their current take-home pay and insufficiently adjust for an expected tax refund. Because overwithholding reduces current take-home pay, we hypothesize that overwithholding reduces retirement savings (*anchoring effect*). Additionally, we argue that overwithholding decreases the motivation to save when savings are subject to deferred taxation (*motivation effect*). In the case of overwithholding, the tax refund from tax-deductible savings is added to an already received refund. According to prospect theory, gains are valued using a concave value function (Kahnemann and Tversky, 1979). This implies that the marginal value of receiving a $100 refund is greater than

the value of increasing a refund from $1,000 to $1,100. Thus, overwithholding should reduce the marginal motivation to save compared to accurate withholding with no refund.

This study's second objective is to investigate how an additional retroactive savings option at tax filing time affects overall retirement savings under deferred and immediate taxation. Some countries, such as the United States and Canada, already provide this option. Prior research has already examined whether interventions during the filing process can encourage taxpayers to save part of their refund (e.g., Duflo et al., 2006; Saez, 2009; Tufano, 2011; Bronchetti et al., 2013; Azurdia et al., 2014; Grinstein-Weiss et al., 2015, 2017; Roll et al., 2019, 2020, 2021). While this research examines how an option to save the tax refund should be designed to increase savings, it is unclear whether the additional savings option will increase overall retirement savings at all and why this should occur. We address this research gap by examining the effect of an additional retroactive savings option at tax time on overall savings under deferred vs. immediate tax treatments and accurate withholding vs. overwithholding scenarios.

We expect that adding a retroactive savings option at tax time will increase retirement savings. First, information about actual after-tax income is provided at tax time. Thus, taxpayers who previously did not properly account for their overwithheld taxes are able to adjust their savings to reflect their actual after-tax income when making savings decisions at tax time. Second, we propose that the additional savings option acts as a nudge (*nudging effect*). Nudges change the choice architecture to facilitate decisions without restricting individual freedom of choice (Mertens et al., 2022). The additional option to save at tax time reminds individuals that saving for retirement is important. We predict that this also implies a savings norm and nudges them to save.

To test our predictions, we conduct three incentivized online experiments with more than 1,600 participants. Such experiments have several advantages in the current context. First, we can perfectly control for participants' overall savings, which is often not possible with administrative data. Second, in contrast to field data, we can exogenously vary overwithholding. Third, only in an experiment can one control the current and future tax rates and ensure that the immediate and deferred tax treatments are equivalent in net present value.

Regarding our first study objective, we find a significant *overwithholding effect*. Despite having all the information necessary to compute the correct tax burden, overwithholding significantly reduces retirement savings under both deferred and immediate taxation. We provide evidence that individuals rely heavily on their take-home pay when making savings decisions; thus, as overwithholding reduces take-home pay, it also reduces savings. However, compared to accurate withholding, overwithholding reduces retirement savings more under immediate taxation than it does under deferred taxation. We show that this difference arises because under deferred taxation, significantly more individuals adjust their take-home pay and account for their overwithholding refund when making savings decisions, thereby reducing the *anchoring effect* compared to immediate taxation. Thus, although we find evidence of the proposed *motivation effect* under deferred taxation, the negative impact of overwithholding on retirement savings is smaller under deferred taxation than under immediate taxation. Notably, both effects persist over time, although the *anchoring effect* diminishes due to regular feedback on the tax refund.

Regarding our second study objective, we find that introducing an additional retroactive savings option at tax time has two consequences. First, it increases total savings substantially under both tax systems, regardless of whether overwithholding is present. Our results suggest that the additional savings option increases the perceived importance of saving for retirement. We provide evidence of this outcome by showing that the perceived importance of saving for retirement fully mediates the effect of the additional savings option. We also find that either reducing the strength of the nudge by introducing additional 'costs' for using the additional savings option, reducing the transparency of the option or changing the default to no additional savings also reduces the perceived importance of saving for retirement and, hence, retirement savings. Second, the additional retroactive savings option eliminates the *overwithholding effect* under immediate taxation but not under deferred taxation. At tax time, everyone has accurate after-tax income information; thus, they can adjust their savings to reflect their true preferences. This eliminates the *anchoring effect*. However, the *motivation effect* can still occur under deferred taxation, which explains why the *overwithholding effect* remains under deferred taxation.

Our study has several implications for research and policy. First, we contribute to research on the behavioral effects of overwithholding (Chang and Schultz Jr, 1990; Jackson and Hatfield, 2005; Jackson et al., 2005; Bobek et al., 2007; Falsetta and Tuttle, 2011; Vossler et al., 2021) by showing that overwithholding not only can significantly reduce retirement savings but also has different effects under deferred and immediate taxation; we also show that introducing additional savings options at tax time can reduce an *overwithholding effect*.

Second, we contribute to research on how tax incentives affect retirement savings. Previous research has shown that individuals often ignore tax incentives out of ignorance, cognitive limitations, or other non-economic preferences (e.g., Chetty et al., 2014; Beshears et al., 2017; Blaufus and Milde, 2021; Stinson et al., 2021; Cuccia et al., 2022; Austin et al., 2024). We extend this line of research by showing that an additional option for retroactive saving at tax time can significantly increase the effective savings rate and thus lead to higher average after-tax withdrawals. Moreover, we contribute to the recent debate on whether immediate or deferred tax plans lead to more or less effective retirement savings (Beshears et al., 2017; Blaufus and Milde, 2021; Tschinkl et al., 2021; Bachmann et al., 2023; Bohr et al., 2023; Duffy and Li, 2024; Blaufus et al., 2025) by showing that while the tax-savings gap between immediate and deferred taxation reported in previous research is significantly moderated by overwithholding and by the additional savings option, immediate taxation still leads to greater effective savings than deferred taxation, irrespective of whether there is overwithholding or the existence of an additional savings option.

Third, our study has implications for tax policy promoting retirement savings. We show that allowing retroactive savings options at tax time, which is already possible in some countries such as the United States and Canada, may increase savings. Tax filing affects almost every working individual; thus, very small changes in the tax code or filing process can be highly effective.

2 | THEORY AND HYPOTHESIS DEVELOPMENT

2.1 | Overwithholding and retirement savings

Although withholding taxes do not affect final tax liability but only create a difference in the timing of taxation, prior research provides evidence that withholding taxes affects decision making (Chang

and Schultz Jr, 1990; Jackson and Hatfield, 2005; Jackson et al., 2005; Falsetta and Tuttle, 2011; Vossler et al., 2021). In the context of retirement savings decisions, withheld taxes help reduce early withdrawals from tax-privileged savings accounts, as they likely act as a commitment mechanism by increasing the perceived cost of accessing funds. This effect can be explained by present bias, which leads individuals to overvalue immediate spending, and fiscal illusion, which causes them to perceive withheld taxes as a loss, discouraging premature withdrawals (Messacar, 2018). Moreover, Cuccia et al. (2022) show that preferences for an immediately taxed retirement plan are negatively related to a tax-due settlement position. Consistent with this, Messacar (2023) reports that taxpayers make additional tax-deductible retirement savings at tax time when they are in a tax-due settlement position. In contrast to these two studies, we focus not on underwithholding but on overwithholding and its effect on retirement savings.

When individuals make savings decisions, they often rely on simple heuristics (Benartzi and Thaler, 2007).[1] When deciding how much to save, individuals may use the so-called anchoring and adjustment heuristic (Tversky and Kahneman, 1974). Prior research shows that individuals tend to anchor on information that is easy to process and salient and then make insufficient adjustments to this anchor (Epley and Gilovich, 2001, 2004, 2006). For example, individuals anchor on nominal values, leading them to overestimate the value of nominally larger tax deductions compared to economically equivalent but nominally smaller credits (Morrow et al., 2018). They also anchor on nominal tax rates, leading them to overestimate the effect of nominal tax rate reductions compared to equivalent tax base reductions (Blaufus et al., 2013; Amberger et al., 2023). In addition, they anchor on pre-tax values and thus tend to invest in lower-risk assets under deferred taxation compared to immediate taxation (Stinson et al., 2021; Blaufus et al., 2023).

When making their retirement savings decision, we expect that individuals will anchor on their current take-home pay and then adjust upward to account for their expected tax refund to determine their after-tax income before applying a preferred savings rate. However, the upward adjustment may be insufficient because individuals tend to either ignore or forget taxes that are not salient in their

[1]For a review on how heuristic decision making and biases can help to explain different accounting phenomena, see Hanlon et al. (2022).

decision making (e.g., Rupert and Wright, 1998; Chetty et al., 2009; Finkelstein, 2009; Blumkin et al., 2012; Goldin and Homonoff, 2013; Fochmann and Weimann, 2013; Weber and Schram, 2017; Taubinsky and Rees-Jones, 2018). Because overwithholding reduces the current take-home pay and individuals will not fully adjust for their expected refund, we predict that overwithholding reduces retirement savings under deferred and immediate taxation. We refer to this as the *anchoring effect*.[2]

However, we expect important differences between immediately taxed plans and deferred taxed plans. While the initial anchor point may be current take-home pay in both tax systems, the adjustment process may be different because of the tax treatment. Research suggests that factors increasing individuals' ability, motivation, and willingness to think about an adjustment can reduce the *anchoring effect* (Epley and Gilovich, 2006). In the case of deferred taxation, individuals can actively increase their tax refund through additional tax-deductible savings. Thus, taxpayers should be more inclined to consider the tax consequences on their tax returns when making savings decisions. Adjustments to the tax refund should therefore be more sufficient than in the case of immediate taxation. For example, Blaufus and Milde (2021) show that taxpayers' behavior under deferred taxation is in line with the assumption that the tax refund from tax-deductible savings is almost correctly perceived. In contrast, under immediate taxation, retirement savings are not tax deductible and withdrawals are tax free. Thus, taxpayers who save in immediately taxed plans should be less inclined to consider the tax consequences of their decisions and thus neglect the overwithholding tax refund. This would result in a weaker effect of overwithholding on savings under deferred than under immediate taxation.

In contrast, overwithholding may reduce the motivation to save under deferred taxation but not under immediate taxation. Prior research shows that the tax refund from tax-deductible savings incentivizes individuals to save more (Blaufus et al., 2025). Moreover, it has been argued that individuals frame expected tax refunds as gains (e.g., Falsetta and Tuttle, 2011). According to

[2] In addition to the proposed *anchoring effect*, overwithholding can create a liquidity constraint, where individuals may reduce their retirement savings because they lack sufficient available funds. This constraint can significantly impact saving behavior, as individuals may need to reduce savings, cut expenses, or borrow to compensate for the overwithheld amount. The liquidity effect would thus amplify the predicted overwithholding effect. However, this study limits its scope to a scenario that excludes this liquidity effect.

prospect theory, gains are valued using a concave value function (Kahnemann and Tversky, 1979). This means that as the size of the tax refund increases, the value of further increasing the refund decreases. In the case of overwithholding, the tax refund from tax-deductible savings is added to an existing refund. As a result, the perceived value of saving more decreases, which reduces the motivation to save compared to a scenario with no refund, as in the case of accurate withholding. We refer to this as the *motivation effect*.

Therefore, we predict that overwithholding reduces retirement savings under immediate and deferred taxation due to anchoring on current take-home pay (*anchoring effect*) and a reduced motivation to save under deferred taxation (*motivation effect*). Therefore, our first hypothesis is as follows:

H1a. Overwithholding reduces retirement savings under both deferred and immediate taxation.

Moreover, we expect differences in the effect of overwithholding between deferred and immediate taxation. Given the reduced *anchoring effect* and the additional *motivation effect* under deferred taxation, we expect the effect of overwithholding on retirement savings is moderated by the tax treatment (immediate vs. deferred taxation), leading to the following hypothesis:

H1b. The effect of overwithholding on retirement savings is moderated by the tax treatment (immediate vs. deferred taxation).

The theoretical framework for not only these but also the following predictions is summarized in Figure 1.

2.2 | Additional retroactive retirement savings at tax time

A few countries, such as the United States and Canada, allow taxpayers to make retroactive retirement savings decisions at tax time. The tax consequences of overwithholding are highly salient when taxpayers make savings decisions while filing their tax return. For example, an estimate of the tax return balance is routinely available at tax time (e.g., Brink and Lee, 2015), and tax preparation software often provides customers with a running refund or tax due balance (e.g., TurboTax, H&R Block, FreeTaxUSA). Therefore, providing taxpayers with an additional option to save for retirement

while filing should reduce the *overwithholding effect* because taxpayers receive information about their actual after-tax income at tax time.

In the previous section, we argued that under immediate taxation, any *overwithholding effect* is due only to the *anchoring effect*. Thus, under immediate taxation, the *overwithholding effect* should be fully corrected when individuals have the option to save more at tax time. In contrast, under deferred taxation, there is an additional negative effect of overwithholding on the motivation to save. Providing an additional option to save at tax time should not influence this effect. Thus, an additional saving opportunity at tax time should eliminate the *overwithholding effect* under immediate taxation but only reduce it under deferred taxation. Our next two hypotheses are therefore as follows:

H2a. Under immediate taxation, introducing an additional retroactive savings option at tax time eliminates the negative *overwithholding effect* on retirement savings.

H2b. Under deferred taxation, introducing an additional retroactive savings option at tax time reduces but does not eliminate the negative *overwithholding effect* on retirement savings.

In addition to reducing the *overwithholding effect* by providing information on actual after-tax income, we expect that the option to make additional savings at tax time nudges taxpayers to increase retirement savings. Nudges are defined as changes in the choice architecture to direct behavior (Thaler and Sunstein, 2009). Recent literature has demonstrated that nudges can enhance savings behavior in several ways (e.g., Madrian and Shea, 2001; Beshears et al., 2021). For example, Blaufus and Milde (2021) show that numerical informational nudges can increase savings and decrease tax misperceptions under deferred taxation, while Grinstein-Weiss et al. (2017) show that saving prompts at tax time can raise savings.

Reminders are an important form of nudges. They influence decision making by increasing the salience of the intended behavior (Mertens et al., 2022). In the case of the additional option to save at tax time, individuals are implicitly reminded that saving for retirement is important. We expect that this underscores the importance of a savings norm and nudges them to make additional retirement savings. Previous research shows that individuals tend to follow such norms (e.g., Kast

et al., 2018). Repeated confrontation with the savings decision (i.e., once during the year and then additionally at tax time) could also increase the effect of the nudge, as repeated confrontation with a stimulus can increase the positive response to that stimulus (Zajonc, 1968). Our final hypothesis is therefore as follows:

H3. Introducing an additional retroactive savings option at tax time increases retirement savings through a *nudging effect*, irrespective of overwithholding and the tax treatment (immediate vs. deferred taxation).

3 | EXPERIMENT 1: OVERWITHHOLDING AND ADDITIONAL RETROACTIVE SAVINGS

3.1 | Experimental design

3.1.1 | Procedure

To test our hypotheses, we conducted an incentivized online experiment in a life-cycle framework (Modigliani and Brumberg, 1954). The participants' task was to make savings decisions for retirement. The life-cycle consisted of 10 periods, divided into a seven-period income phase and a three-period retirement phase.

In each period of the income phase, participants received a certain and increasing amount of income from which to save for the retirement phase.[3] In the first period of the income phase, participants receive a pre-tax income of 2,500 experimental currency units (ECU; 100 ECU = €0.18) subject to a withholding tax. This pre-tax income increases by 100 ECU each period until it reaches 3,100 ECU in the last period of the income phase.[4] Participants then had to decide how much of their income to save in each period. After making their savings decision, they completed a tax return for that period, reporting their pre-tax income and, if applicable, their tax-deductible

[3]For simplicity, we omitted restrictive caps and limits for making tax-privileged savings as we are interested only in comparing the differences between treatments and not the absolute amount of savings (see footnote 11). Thus, it may be that the treatment effects are smaller in reality than in our experiment. However, it is important to note that experiments generally provide limited insights into the precise magnitude of an effect in actual saving decisions and are primarily suited to identifying the direction of the effect. Therefore, we do not consider this a major limitation.

[4]We used an increasing amount of income stream rather than a constant income stream to maintain participants' attention. It also allows us to clearly distinguish between the simple heuristic of always saving the same absolute amount and the rational choice of consumption smoothing.

savings (see Section 3.1.2). In treatments that included an additional savings opportunity at tax time, participants also had the opportunity to make an additional savings contribution at this time (see Section 3.1.2). The withheld taxes were then offset against the actual taxes. Each period ended with an overview of all relevant payments. The income tax rate was 30%, but the withholding tax rate varied between treatments (see Section 3.1.2). In the retirement phase, the participants received no exogenous income but a constant withdrawal that depended only on their savings during the income phase. The retirement payment in each period of the retirement phase was calculated as the sum of all savings made by the participant during the income phase divided by the number of retirement periods. The interest rate on savings was 0% to reduce the complexity of the savings decision.

To incentivize participants to save, we followed the experimental paradigm developed by Blaufus and Milde (2021). Participants were informed that only one of the 10 life-cycle periods, which was randomly selected at the end of the experiment, would determine their payout. The potential payout for each period was determined as pre-tax income less savings and taxes in the income phase and as withdrawal amount less taxes, if any, in the retirement phase. Thus, participants were incentivized to maximize their experimental wealth by smoothing their income over all 10 periods.[5] Suppose, for example, that a participant did not save; then, the participant would not receive any withdrawals during the three periods of the retirement phase. Thus, if one of these three periods were selected to determine the participant's payoff, the participant would receive no variable compensation in the experiment.[6]

[5]With the potential payoff in each period reflecting participants' consumption in that period, participants maximized their experimental wealth by choosing their savings according to the following expected utility function of their payoffs: $E[u(Payoff)] = \frac{1}{10}\sum_{t=1}^{10} u(C_t)$, with u denoting the participants' utility function and C_t denoting the consumption in period t. This mirrors the objective function in a life-cycle model, in which saving for retirement is the primary motive for saving.

[6]The advantage of this design choice is that the decision task is much easier for participants to understand than inducing a specific utility function as an alternative to inducing consumption smoothing (Bachmann et al., 2023). One drawback, however, is that this approach assumes that participants are risk-averse (i.e., have a concave utility function). In the current experiment, the percentage of non-risk-averse participants amounted to only 14%. Thus, in our opinion, the benefit of the design simplicity largely outweighed this drawback. Moreover, in the empirical analysis, we controlled for whether the results were affected by non-risk-averse participants. In addition, we ran all analyses with only risk-averse subjects (untabulated), and the results remained qualitatively unchanged.

Before starting the experiment, the participants received a comprehensive introduction to the experimental procedure and the tax rules.[7] At the beginning of the study, a training session was conducted to ensure that the participants were familiar with the savings and payout mechanism. To avoid learning effects related to tax treatment, taxes were not introduced in the training session, making it identical for all participants. Additionally, we included a series of comprehension questions after each set of instructions. We also included an attention check question and an honesty test in the study to confirm participants' engagement. To ensure high data quality, only data of participants who answered all comprehension questions correctly,[8] who answered the attention check question correctly, and whose initially reported date of birth matched the age reported at the end of the survey (honesty test) were retained in the data.[9] At the end of the experiment, the participants filled out a questionnaire with socio-demographic questions. We present translated instructions and screenshots of all experiments in Appendix S1 and S2.[10]

3.1.2 | Treatments

We used a $2 \times 2 \times 2$ between-participants design, varying the taxation of savings (immediate vs. deferred), the accuracy of withholding (accurate withholding vs. overwithholding), and the number of savings decisions (only a single savings decision in the income phase (*Regular Saving*) vs. two savings decisions, one in the income phase and an additional one at tax time (*Add Savings Option*)).

In the case of deferred taxation (*Deferred*), savings are tax deductible, while withdrawals are fully taxable. The tax rate on withdrawals, like the income tax rate, is 30%. Accordingly, participants

[7] All instructions and task descriptions were written in neutral language to prevent participants from applying personal interpretations to potentially loaded terms. For example, terms such as "pension" or "retirement" were avoided in favor of phrases such as "income phase", "rest phase", "savings decision", and "payoff".

[8] Each question could be answered incorrectly only once.

[9] Across all experiments, 34.5% of participants failed the comprehension test and 3.4% of participants answered the attention check question or the honesty test incorrectly. The completion rate observed in our experiment is consistent with the completion rates commonly observed in other life-cycle experiments (e.g., Bachmann et al., 2023). In addition, across all three experiments, we examined whether there was a systematic difference in the dropout rate between treatments (*dropout bias*). To do this, we conducted a Pearson Chi^2 test in each experiment, comparing treatments according to whether participants completed the experiment or failed the comprehension or attention test. We found no *dropout bias* in any of the three experiments, as indicated by the p-values of the chi-squared tests: Experiment 1: 0.979; Experiment 2: 0.989; Experiment 3: 0.184.

[10] All appendices are available online in the Supporting Information at osf.io/s4htn.

received a refund on their return equal to 30% of their tax-deductible savings. Under immediate taxation (*Immediate*), the savings are not tax deductible and withdrawals are tax free.[11]

In the treatment *Accurate Withholding*, the withholding rate equaled the actual tax rate of 30%. In contrast, in the treatment *Overwithholding*, the withholding rate was 50%, resulting in a refund of at least 20% of income at tax filing. In all treatments, we provided information on pre-tax income, withheld taxes, and the resulting take-home pay to help participants make their savings decisions. The following example illustrates the procedure for the first period with a pre-tax income of 2,500 ECU. In the *Accurate Withholding* treatments, (2,500 ECU × 30% =) 750 ECU of tax was withheld. This resulted in a take-home pay of 1,750 ECU. Since the actual tax rate was also 30%, there was no tax refund in this case (not including any tax-deductible savings). In the *Overwithholding* treatments, on the other hand, (2,500 ECU × 50% =) 1,250 ECU of tax was withheld, resulting in a take-home pay of 1,250 ECU. This resulted in an overwithholding refund of 500 ECU.[12] For the additional savings treatments, participants could enter an additional savings contribution in a field provided on the tax return.

3.1.3 | Participants and data

We recruited participants through the survey platforms Prolific, Clickworker, and Bilendi & respondi.[13] All experiments were programmed using oTree (Chen et al., 2016). To incentivize

[11]The maximum achievable after-tax withdrawal is, in principle, higher under immediate taxation than under deferred taxation because the savings are theoretically limited to the same after-tax income in both tax systems. However, under deferred taxation, withdrawals are still taxed. To address this issue, we implemented different savings limits depending on the tax system. Thus, we ensured that if the maximum possible amount was saved in both tax systems (immediate [deferred]: 40.00% [57.14%] of pre-tax income), then the effective savings rate was the same. However, the limit was not particularly restrictive, as the maximum allowable amount was reached in only 8.1% [5.6%] of the savings decisions under immediate [deferred] taxation.

[12]The experimental design, in particular the adjustment of the level of withholding, ensured that participants had sufficient income remaining after (over)withholding to achieve optimal savings rates for consumption smoothing; thus, this design excluded the possibility of a liquidity constraint, where insufficient funds would prevent individuals from saving as intended (see footnote 2).

[13]These widely recognized survey platforms maintain high standards in participant recruitment and data quality. Clickworker (6+ million users) is certified for information security management (ISO 27001). Bilendi & respondi (2.5 million users) holds a certification for market, opinion, and social research (ISO 20252). Prolific (200,000+ active users) was rated the highest in data quality among crowdsourcing platforms in a 2022 study (Eyal et al., 2021). Many studies in management accounting and psychology have used Prolific (e.g., Cardinaels et al., 2024), Clickworker (e.g., Mrkva and Van Boven, 2017), and Bilendi & respondi (e.g., Maske et al., 2021; Maske and Sohn, 2023) to recruit participants for experimental research. To account for potential biases from using multiple platforms, we conducted additional analyses controlling for platform effects (results untabulated), and the results remained qualitatively unchanged.

participation in our experiment, we offered participants fixed compensation of €2.00 and variable compensation linked to their savings behavior (see Section 3.1.1). Additionally, participants received variable compensation for answering two post-experimental questions related to risk-taking and loss aversion. On average, participants received a total payment of €4.93 (SD €1.22). The median time required to complete both the experiment and the questionnaire was 26 minutes, resulting in a median hourly wage of €11.38.[14]

A total of 819 individuals participated in the experiment. All participants were at least 18 years or older and native German speakers. An average of 102 (SD 4.1) participants were randomly assigned to the eight treatment conditions. The majority of participants were male (53.0%), and the mean age of participants was 40.2 years (SD 16.1). Descriptive statistics on the average socio-demographic characteristics of the participants are presented in Table 1 (Columns 1 and 2).[15]

3.2 | Variable measurement

3.2.1 | Dependent variable

Our dependent variable is the *Effective Savings Rate*, which is the average of the effective savings rate s_t over all seven periods t of the income phase.[16] The variable is determined as follows:

$$\frac{1}{7}\sum_{t=1}^{7} s_t = \frac{1}{7}\sum_{t=1}^{7} \frac{S_t(1-\tau D)}{Y_t(1-\tau)}. \tag{1}$$

The numerator is the after-tax savings amount $S_t(1-\tau D)$, using the savings contributions to the retirement plan S_t, the tax rate τ, and the binary variable D indicating the tax treatment (deferred

[14]The expected duration for proper study completion was approximately 20 minutes. While most participants completed the study within this time, some participants took much less time (5th percentile: 13.8 minutes), while others took considerably longer (95th percentile: 68.6 minutes). Although all participants passed the comprehension test, the attention check and the honesty test, they may have either not spent enough time or taken too long to complete the study properly (e.g., due to excessive breaks). To test the robustness of our results, we excluded participants who completed the study in less than 10 minutes (0.86% of all participants) or more than 120 minutes (2.32% of all participants). All our results remained qualitatively unchanged (results untabulated).

[15]To analyze potential systematic variations in socio-demographic characteristics across treatments, we conducted a joint Chi^2 test using a multinomial logit model. The aim of the test was to evaluate the null hypothesis that there are no differences in socio-demographic characteristics across treatments. The results show that our randomization process successfully achieved balanced socio-demographic characteristics across treatments (p = 0.870). Despite the balanced randomization, we still include control variables in our analyses to account for any residual effects or potential confounding factors that might influence the results.

[16]This approach accounts for intra-individual correlation by aggregating data points into a single value per person.

taxation: $D = 1$; immediate taxation: $D = 0$). The denominator is the pre-tax income Y_t less 30% taxes. Thus, in the case of deferred taxation, the effective savings rate accounts for the fact that savings are tax-deductible.

3.2.2 | Independent and control variables

We used the treatment variables *Deferred*, *Immediate*, *Overwithholding*, *Accurate Withholding*, *Regular Saving*, and *Add Savings Option* as described in Section 3.1.2 as independent variables. These are dummy variables that equal one if the observation belongs to the respective treatment.

In the multivariate analyses, we controlled for the following socio-demographic variables.[17] *Male* [*Married*] is a dummy variable equal to one if the participant is male [married]. *Age* is a categorical variable consisting of three levels: 18-35, 36-50, 51 years or older. *Income* is a categorical variable that measures individual take-home pay per month after taxes and social security including less than €1,500, €1,501-3,000, and €3,001 or more. Regarding tax knowledge, the participants rated their personal knowledge on a scale ranging from 1 (*no knowledge*) to 9 (*tax expert*). The dummy variable *Tax Knowledge* equals one if the participant chose an option above the midpoint of the scale. We also used the binary variable *Propensity to Save*, which is set to one for participants who stated that they would use a potential tax refund to save for retirement. To account for tax aversion (Blaufus and Möhlmann, 2014), we asked whether participants preferred a taxable bond or a less favorable tax-free bond. *Tax Aversion* is a dummy set to one for the choice of the tax-free bond (Sussman and Olivola, 2011). In addition, we controlled for participants' risk attitude using a simplified version of the incentivized lottery task of Holt and Laury (2002) because income smoothing over the experimental life-cycle is rational only for risk-averse participants. The dummy variable *Non-risk-averse* was assigned a value of one for those who did not exhibit risk aversion. Cognitive ability was assessed

[17] We used dichotomous or categorical variables in all analyses for several reasons. First, some variables, such as *Income* and *Tax Aversion*, were originally collected in categorical form. Second, we anticipated non-linear relationships for certain variables, particularly scales such as *Tax Knowledge*, which was measured on a 1 to 9 scale. Categorizing this variable allowed us to better capture potential non-linear effects that might be overlooked with a continuous approach. Third, *Age* was categorized to account for outliers, such as two participants over the age of 80, which could skew the results if *Age* were treated as a continuous variable. Nonetheless, we also conducted our ANCOVA analyses using continuous variables for *Age*, *Tax Knowledge*, *Cognitive Ability*, *Loss Aversion*, and *Risk Aversion*, and we found the results to be robust across both approaches (untabulated).

using the three-item cognitive reflection test developed by Frederick (2005). The dummy variable *Cognitive Ability* equals one for participants who scored three out of three. Loss aversion was measured using an incentivized lottery choice task adapted from Gächter et al. (2022). Participants faced six lotteries with a constant win and increasing losses. *Loss Aversion* is a binary variable set to one for participants whose loss aversion, as indicated by their lottery choices, was above the experiment-wide median. Finally, we accounted for prepayment preference, a key determinant in retirement savings behavior (Cuccia et al., 2022), by measuring participants' payment terms for expected living expenses according to Patrick and Park (2006). The dummy variable *Preference for Prepayment* indicates a preference for early payment. The translated questionnaire for all three experiments is presented in Appendix S3.

3.3 | Results

We begin our analysis by examining the effect of overwithholding on retirement savings when no additional savings option is provided. Hypothesis H1a posits that overwithholding reduces savings under both deferred and immediate taxation. Table 2 provides a descriptive overview of the dependent variable *Effective Savings Rate* across all treatment conditions.

In line with Hypothesis H1a, we find that overwithholding reduces the savings rate under both tax systems. The average savings rate is reduced by 6.0 percentage points under immediate taxation (M_{Diff} = 6.0; $p < 0.001$; Cohen's d = 0.480), and 2.9 percentage points under deferred taxation (M_{Diff} = 2.9; p = 0.057; Cohen's d = 0.269). To examine the bivariate effect of a treatment (here: *Overwithholding*) on a dependent variable (here: *Effective Savings Rate*), we report the mean difference in parentheses (M_{Diff}), followed by the p-value of a two-tailed t-test and the effect size (Cohen's d). This approach applies to all subsequent bivariate tests in our analysis. To control for socio-demographic variables and participant characteristics, we also conduct an analysis of covariance (ANCOVA).[18] The results are reported in Panel A of Table 3. The simple effects (1) and (2) in Panel B support our bivariate findings. Thus, our results are consistent with Hypothesis H1a.

[18] In addition to two-tailed t-tests, we conduct (untabulated) nonparametric Mann-Whitney U-tests. In addition to ANCOVAs, we run random effects panel regressions with robust standard errors clustered at the participant level (unreported). The results remain qualitatively unchanged.

To test whether the *overwithholding effect* is moderated by the tax treatment (Hypothesis H1b), we include an interaction of *Overwithholding* and *Deferred* in the ANCOVA. In line with Hypothesis H1b, the result in Panel A of Table 3 show that the *overwithholding effect* is significantly moderated by the tax system ($p = 0.081$). In the experiment, overwithholding reduces savings in the case of deferred taxation by approximately 4.0 percentage points less than in the case of immediate taxation.

Next, we examine how an additional savings option affects savings rates. We begin by analyzing the effect under immediate taxation (H2a). With accurate withholding and additional savings option, participants saved an average of 38.6%. In the case of overwithholding and additional savings option, the mean savings rate was 38.8% ($M_{Diff} = 0.2$; $p = 0.909$; Cohen's $d = 0.252$). The insignificant simple effect (1) in Panel B of Table 4 of *Overwithholding* within the treatments with an additional retroactive savings option under immediate taxation demonstrates that the additional retroactive savings option fully eliminates the previously observed negative *overwithholding effect* on retirement savings, which is consistent with Hypothesis H2a.

Under deferred taxation (H2b), the *overwithholding effect* is not significantly reduced by the additional savings option, as indicated by the insignificant simple effect (4) of the interaction between *Overwithholding* and *Add Savings Option* within *Deferred* in Panel B of Table 4. In other words, the *overwithholding effect* under deferred taxation persists regardless of whether there is only a regular or a regular and an additional savings decision; thus we do not find statistically significant support for H2b. The additional savings option in the case of overwithholding has a significantly different effect under immediate compared to deferred taxation, as shown by the significant three-way interaction of *Overwithholding* × *Deferred* × *Add Savings Option* (Panel A of Table 4).

Finally, we examine whether the introduction of an additional savings option increases retirement savings, independent of the presence of an *overwithholding effect* (H3). With accurate withholdings, we find that the additional savings option significantly increases the effective savings rate. As demonstrated by the two simple effects (5) and (6) of *Add Savings Option* within *Accurate Withholding* in Panel B of Table 4, the additional savings option raises the savings rate by 3.2 (*Immediate*) to 5.4 (*Deferred*) percentage points. The insignificant simple effect (9) of the interaction between *Deferred*

× *Add Savings Option* within *Accurate Withholding* shows that the increase due to the additional savings option is independent of the tax system. In the case of overwithholding, the effect is even more pronounced under immediate taxation, due to the reduction in the *overwithholding effect*. As the simple effects (7) and (8) of *Add Savings Option* within *Overwithholding* in Panel B show, the effect ranges from 4.8 (*Deferred*) to 9.8 (*Immediate*) percentage points.

3.4 | Discussion

Overall, the results of Experiment 1 support the hypotheses. We find that overwithholding reduces savings under both tax systems (H1a). Moreover, we show that overwithholding reduces retirement savings more under immediate taxation than under deferred taxation (H1b). However, whether these results are actually driven by the proposed *anchoring effect* and *motivation effect* remains unclear and requires further investigation in Experiment 2. To provide an initial starting point, we examine how the *overwithholding effect* changes over the seven periods in the income phase. Given the regular feedback on the tax refund after each period and the fact that income changes only slightly, we expect that participants learn over time how to adjust their saving decisions adequately. This learning should lead to a significant reduction in under-adjustment and hence a reduction in the *anchoring effect* over the periods. An untabulated mixed-effects regression with an interaction term between *Overwithholding* and *Period*[19] shows that the *overwithholding effect* decreases significantly under immediate taxation over time. However, the effect remains present until the last period. As expected, the *anchoring effect* decreases due to learning. Under deferred taxation, we do not observe a significant decrease in the *overwithholding effect* over time, suggesting that the effect under deferred taxation is mainly driven by the *motivation effect*. This would imply that the *anchoring effect* is stronger under immediate taxation, as individuals initially focus more on their take-home pay and only gradually adjust their saving behavior as they receive repeated feedback on their tax refund. This is consistent with our learning results, which show that the *overwithholding effect* declines over time under immediate taxation but remains stable under deferred taxation, where tax

[19]The variable *Period* measures the respective period from one to seven.

implications are considered from the outset. We gain deeper insights into these effects in Experiment 2, which collects several process measures to test whether the underlying theory holds.

With respect to external validity, the following objections could be raised: a) the amount of overwithholding is relatively high in the experiment, b) the amount of the tax refund provided via the tax return (in cases of overwithholding) and the amount received through lower tax withholdings during the income phase (in cases of accurate withholdings) was always the same in the experiment, which prevents cases where overwithholding increases savings due to mental accounting (Chambers and Spencer, 2008; Feldman, 2010)[20], and c) in practice, overwithholding can create a liquidity constraint, where individuals may reduce their retirement savings because they lack sufficient available funds. To address objections a) and b), we conduct additional experiments (reported in Appendix S4). These experiments confirm that the *overwithholding effect* persists even for much smaller amounts of overwithholding and even when we consider that income phase refunds are nominally lower because they are distributed on a monthly basis. Regarding objection c), we acknowledge that our design (intentionally) excludes a liquidity effect in order to focus on the proposed *anchoring effect*. However, we recognize that in real-world settings, the liquidity effect could either complement or substitute for anchoring. While a liquidity effect could amplify the negative impact of overwithholding, it is also possible that overwithholding reduces savings primarily due to liquidity constraints rather than anchoring. In either case, this would underscore the importance of an additional retroactive savings option at tax time, since the liquidity effect would no longer be a constraint on the savings decision at that point.[21]

[20] For example, in the real world, an end-of-year tax refund of $1,200 would be equivalent to a reduced tax withholding increasing take-home pay by $100 per month. This difference could lead to different mental accounting processes, where a lump sum refund might be more likely to be saved, while smaller monthly increases might be more likely to be spent (Bobek et al., 2007)

[21] Myopic behavior could also play a role in the real world, where the time lag between the decision to save and the tax refund can be several months. In such cases, individuals may focus excessively on their current take-home pay and not adequately consider the future refund. This short-term focus could lead them to overvalue immediate losses (reduced income due to overwithholding) and undervalue future gains (the tax refund). In the experimental setting, however, where the time between the decision to save and the feedback about the tax refund is only a few seconds, myopic behavior should theoretically be less pronounced. Participants receive almost immediate feedback about the refund, which should make it easier for them to adjust their decisions. We therefore conclude that the *overwithholding effect* observed in the experiment is likely driven by the *anchoring effect*, although in reality this effect could be amplified by myopic behavior.

The results of Experiment 1 also show that the additional retroactive savings option at tax time eliminates the negative overwithholding effect on retirement savings under immediate taxation (H2a) but not under deferred taxation (H2b). There are two possible explanations why the additional information received from the tax refund at the time of the second savings decision does not affect the *overwithholding effect* under deferred taxation. (1) Under deferred taxation, most participants may already correctly anticipate the overwithheld taxes even without the prominent information at tax time. As a result, there is no significant *anchoring effect*, leaving only the *motivation effect*, which is not affected by the additional savings option. (2) Alternatively, in contrast to immediate taxation, the prominent information at tax time may not reduce the *anchoring effect*. This could be due to the fact that under deferred taxation individuals have to process more complex information and therefore focus primarily on the tax savings resulting from their retirement contributions. We will investigate these possibilities further in Experiment 2 to provide more clarity.

Next, we find that an additional savings option increases savings regardless of the withholding conditions (H3). One could argue that the additional retroactive savings option simply shifts savings from regular savings to tax return savings. Indeed, we find some evidence that the additional savings option reduces the regular savings rate.[22] However, what matters is that the overall effect of the additional savings option on savings is always positive. This finding is important as it could provide policymakers with an opportunity to create a significant incentive to save more with little effort and cost. The proposed underlying theory behind this effect is that participants are implicitly reminded by the additional savings option that saving for retirement is important.[23] Thus, Experiment 3 is designed to provide evidence regarding this rationale.

In addition to our hypothesized results, we emphasize the notable difference in savings outcomes between immediate and deferred taxation across all conditions (see simple effects (11) to (14) in Panel B of Table 4). With regular savings decisions and accurate withholding, effective savings are

[22] This effect is significant in half of the *Add Savings Option* treatments according to untabulated ANCOVAs.

[23] In an earlier version of this paper, we considered an alternative explanation. The observed increase in savings with an additional savings option could be attributed to impulsive behavior, which aligns with the dual-process theory (Kahneman, 2003, 2011). However, further analyses ruled out impulsiveness (see Appendix S4.3).

lower under deferred taxation than immediate taxation.[24] This is in contrast to Bohr et al. (2023), but in line with Blaufus and Milde (2021), Tschinkl et al. (2021), Bachmann et al. (2023) and Blaufus et al. (2025). Our results add to this research by showing that overwithholding has a greater negative effect on savings under immediate than under deferred taxation; however, the savings gap remains.

4 | EXPERIMENT 2: UNDERSTANDING SAVINGS BEHAVIOR

4.1 | Experimental design

4.1.1 | Procedure and treatments

With Experiment 2, we examine whether the observed savings behavior under overwithholding can be explained by the proposed *anchoring effect* and *motivation effect*. This experiment was preregistered before data collection at Open Science Framework, osf.io/839en/. We repeated four treatments from Experiment 1 using a 2 × 2 between-participant design, in which we varied the accuracy of withholding (*Accurate Withholding* vs. *Overwithholding*) and the tax treatment (*Immediate* vs. *Deferred*) without providing an additional option to save at tax time. The experimental procedure is the same as that described for Experiment 1, with one important difference: the life-cycle had only one savings and one retirement period. This approach enabled us to ask participants about their savings behavior immediately after the savings decision. This design choice has the advantages that (1) the collected process measures were not influenced by the payoff information that participants received after each period in Experiment 1, and (2) subsequent savings decisions cannot be biased by asking participants about their savings behavior immediately after the first savings decision, as would have been the case if we had collected the process measures directly in Experiment 1.

4.1.2 | Participants and data

We recruited participants for this experiment through the survey platform Bilendi & respondi. A total of 420 individuals participated. On average, participants received a total compensation of €3.88 (SD 1.01). The median time required to complete the experiment and questionnaire was 20

[24] In addition, we find that participants under immediate taxation do not make significantly different savings decisions compared to a setting without taxation, supporting the assumption that it is the deferred tax system that leads to tax misperceptions and thus lower savings (see Appendix S4.4).

minutes, resulting in a median hourly wage of €11.64. All participants were 18 years of age or older and native German speakers. An average of 104 (SD 3.0) participants were randomly assigned to each treatment condition. The majority of participants were male (51.2%), and the mean age of participants was 43.1 years (SD 10.3). Descriptive statistics on the average socio-demographic characteristics of the participants are presented in Table 1 (Columns 3 and 4).

4.2 | Variable measurement

The dependent variable in this experiment was again the *Effective Savings Rate* with the difference that there is only one savings period (see Equation 1). We used the same controls in the multivariate analyses as described in Section 3.2.2. In addition to the treatment variables already explained in Section 3.1.2, the explanatory dummy variable *Anchoring* indicated whether a participant considered take-home pay an important factor in their savings decision while simultaneously deeming the overwithholding refund as relatively unimportant. To capture this information, participants were asked, "What information was most important to you in making your savings decision? (multiple answers possible)". The response options under [immediate] deferred taxation were gross income, withholding tax, take-home pay, [non]deductibility of savings contributions, [tax exemption] taxation of income from savings, and, in the case of overwithholding, tax refund due to overwithholding. Where possible, participants were given the corresponding values in ECU in the response options. To measure participants' motivation to save under deferred taxation, we asked participants how much the tax refund resulting from tax-privileged savings motivated them to save more, on a scale ranging from 1 (*not motivated at all*) to 9 (*very strongly motivated*). *Motivation* is a dummy variable equal to one if the participant selected an eight or nine (median split), and zero otherwise.

4.3 | Results

As a first step, we investigate whether Experiment 2 replicates the findings from Experiment 1. Panel A of Table 5 provides a descriptive overview of the dependent variables across all treatment conditions. We again find that savings decrease significantly in the presence of overwithholding, both under immediate taxation from 40.3% to 29.0% (M_{Diff} = 11.3, p <0.001; Cohen's d =0.641)

and under deferred taxation from 30.2% to 24.7% (M_{Diff} = 5.5, p = 0.009; Cohen's d = 0.363). The interaction term of the ANCOVA in Panel B together with the simple effects in Panel C again show that the *overwithholding effect* is less pronounced under deferred taxation.

Next, we investigate the extent to which the reduction in savings is due to the proposed *anchoring effect*. This effect would cause participants to anchor on their current take-home pay and then not adjust sufficiently upward to account for the expected overwithholding refund, resulting in less savings. Using data from the two overwithholding treatments, we find that 53.5% of participants anchor to their take-home pay in the case of overwithholding without considering the overwithholding refund (= *Anchoring*), suggesting that this group does not adequately adjust for the overwithholding refund. The comparison of effective savings rates between these two groups shows that participants in the anchoring group saved less (25.2%) than those in the other group (28.6%). The results of an untabulated ANCOVA, using the *Effective Savings Rate* as the dependent variable and *Anchoring* as the independent variable, show that the difference is significant (p = 0.063). This supports our hypothesis that lower savings rates under overwithholding are, at least in part, driven by the *anchoring effect* (H1a).

However, the *anchoring effect* is expected to be less pronounced under deferred taxation than under immediate taxation (H1b). This is because deferred taxation allows individuals to actively increase their tax refund through additional tax-deductible savings. Consequently, taxpayers should be more inclined to consider the tax consequences on their tax returns when making savings decisions. The means in Panel A of Table 5 show, at first glance, that more participants anchor in the case of immediate taxation (62.9%) than in the case of deferred taxation (44.5%). To test our rationale, we run a mediation analysis to examine how the effect of the tax system on savings is mediated by the anchoring effect. We use the *Effective Savings Rate* as the dependent variable (linear outcome model), the treatment *Deferred* as the independent variable, and the *Anchoring* as the mediator (probit mediator model).

Figure 2A shows that under deferred taxation, the probability of being affected by the *anchoring effect* decreases (path from *Deferred* to *Anchoring*). Since this effect has a negative impact on

savings, we identify a significant positive indirect effect of deferred taxation on savings. This suggests that the *anchoring effect* is smaller under deferred taxation than under immediate taxation. The figure also shows a significant direct negative effect of deferred taxation on effective savings rates, which is consistent with our discussion of the savings gap between immediate and deferred taxation in Section 3.4.

At the end of the analysis of the *anchoring effect*, it is worth examining the 46.5% of participants who did not anchor on their take-home pay (i.e., they do not consider take-home pay as an important factor in their savings decision, while simultaneously considering the overwithholding refund as relatively unimportant). Of these, only 13.0% primarily considered their take-home pay. In addition, 36.0% took the refund of the withholding tax into account when making their savings decisions, with significantly more participants doing so in the case of deferred taxation (Chi^2-test, $p = 0.031$), which is consistent with our results. It is also interesting to note what both groups (anchoring vs. non-anchoring) considered most important in their savings decisions. In the anchoring group, preliminary net income (as defined by us) was considered the most important factor, while in the non-anchoring group the participants emphasized the tax-favorable structure of the tax system. Specifically, 66.7% of participants in the immediate taxation group considered the tax-free status of withdrawals to be the most important factor, while 63.9% of those in the deferred taxation group focused on the tax-free status of contributions. This highlights the strong importance of tax treatment in shaping savings decisions, further underscoring the importance of understanding how different tax systems influence behavior.

Next, we examine how the *motivation effect* under deferred taxation influences savings behavior. The means in Panel A of Table 5 show that under deferred taxation, the tax refund in the case of overwithholding was less motivating for participants to save (31.8%) compared to accurate withholding (55.9%). Consistent with this, our next mediation analysis in Figure 2B shows that under deferred taxation, the motivation to save (*motivation effect*) was significantly lower in the case of overwithholding than in the case of accurate withholding (path from *Overwithholding* to *Motivation*), which means that reduced motivation leads to significantly lower savings. Thus, we find

a negative mediating effect of motivation to save on effective savings, conditional on the presence of overwithholding. In our experiment, this leads to 1.4 percentage points lower savings in the case of overwithholding than in the case of accurate withholding.

4.4 | Discussion

We show that the lower savings under overwithholding are partly due to an *anchoring effect* that is less pronounced under deferred taxation. We further confirm the difference in anchoring between immediate and deferred taxation by looking at the responses to questions about the savings decision. We asked participants to indicate the extent to which they agreed with various statements. We find that when participants are faced with overwithholding under deferred taxation, they are more attentive to the tax consequences of their savings decision (M_{Diff} = 0.86 on a 9-point Likert scale; p = 0.003; Cohen's d = 0.418), less likely to neglect taxes in their savings decision (M_{Diff} = 0.62 on a 9-point Likert scale; p = 0.044; Cohen's d = 0.276), and more likely to consider the withholding refund during the income phase (M_{Diff} = 16.0%-points; p = 0.002; Cohen's d = 0.436) than are those under immediate taxation.

With deferred taxation, we also find a significant *motivation effect* (i.e., that overwithholding lowers the motivation to save) as there is already a tax refund in the overwithholding case, which in turn reduces the incentive to receive a higher tax refund with additional tax-privileged savings contributions. This supports the assumption that tax refunds are perceived as gains and are valued as such with a concave utility function, meaning that increasing an existing refund by $100 is valued less than receiving only a refund of $100.

5 | EXPERIMENT 3: THE IMPACT OF SAVINGS OPTION DESIGN ON SAVINGS

5.1 | Experimental design

5.1.1 | Procedure and treatments

Our previous findings on the additional savings option at tax time suggest that this option acts as a nudge, increasing one's motivation to save more for retirement. To explore this suggestion, we conducted a third experiment manipulating the perceived importance of saving for retirement (savings

norm). This experiment was preregistered before data collection at Open Science Framework, osf.io/6r5qd/.

The structure and procedure of the experiment were the same as in Experiment 1. The results of Experiment 1 showed that the additional savings option at tax time significantly increases savings across both tax treatments and withholding conditions (H3). Thus, in Experiment 3, it was deemed sufficient to conduct only treatments without overwithholding and only one tax system (i.e., deferred taxation). In the treatments, only the design of the retroactive savings option at tax time and thus the perceived importance of saving were varied. In the baseline treatment (*Baseline*), as in Experiment 1, there was a field on the tax return where a savings amount could be entered (see Figure S2.11 in Appendix S2). To manipulate the perceived importance of saving for retirement, we created three new treatments. First, in the *Costs* treatment, participants had to fill out an additional form to save more, thus reducing the strength of the savings norm by introducing additional costs. For this purpose, the product number of the savings plan, the additional savings contribution, and the period had to be entered (see Figures S2.15 and S2.16 in Appendix S2).[25] Second, in the *Aggregate* treatment, the transparency of the option was reduced; there was no separate field for additional savings provided on the tax return. Instead, only one field was provided where both previously made and additional savings had to be entered together, as is the case in the United States when using Form 1040 (see Figure S2.17 in Appendix S2).[26] Third, in the *Checkbox* treatment, the default was set to not making any additional savings. Participants had to click a checkbox on the tax return for the additional savings field to appear (see Figure S2.18 in Appendix S2). We expected these choice architecture interventions to reduce the perceived importance of saving, enabling us to examine whether the savings norm mediates the effect of the additional savings option.

[25] Due to the additional form, participants took an average of 2.4 times longer (37 seconds) to complete their tax return with the additional savings decision than without the additional savings decision.

[26] Participants were asked to rate their agreement with the statement: "The additional savings option on the tax return was clearly presented," on a scale ranging from 1 (*strongly disagree*) to 9 (*strongly agree*). Participants in the *Baseline* treatment reported that the additional savings decision was very clearly presented, whereas those in the *Aggregate* treatment perceived it as significantly less clear ($M_{Diff} = 1.4$; $p < 0.001$; Cohen's $d = 0.637$).

5.1.2 | Participants and data

We recruited participants for this experiment through the survey platform Bilendi & respondi. A total of 409 individuals participated. On average, participants received a total compensation of €6.05 (SD 0.91). The median time required to complete the experiment and questionnaire was 34 minutes, resulting in a median hourly wage of €10.68. All participants were 18 years of age or older and native German speakers. An average of 102 (SD 1.3) participants were randomly selected for each treatment. The majority of participants were male (61.1%), and the mean age of participants was 49.1 years (SD 12.3). Descriptive statistics on the average socio-demographic characteristics of the participants are presented in Table 1 (Columns 5 and 6).

5.2 | Variable measurement

The dependent variable in this experiment was again the *Effective Savings Rate* (see Section 3.2.1), and we used the same controls as in the multivariate analyses described in Section 3.2.2. We used the treatment variables *Baseline*, *Aggregate*, *Checkbox*, and *Costs*, as described in Section 5.1.1, as independent variables. In addition, we assessed the perceived importance of saving for retirement (*Perceived Savings Norm*) by including a question in the post-experimental questionnaire asking participants to indicate their level of agreement with the statement, "The additional savings option on the tax return has made me feel that it is important to save more," on a scale ranging from 1 (*strongly disagree*) to 9 (*strongly agree*).

5.3 | Results

The effective savings rates of the corresponding treatments are shown in Panel A of Table 6. However, before we begin the actual analysis, we investigate whether different collection periods influence the results between Experiments 1 and 3. To this end, we compare the effective savings rates of the *Baseline* treatment (32.7%) with the exactly identical treatment from Experiment 1, with accurate withholding under deferred taxation (32.8%). Despite the varying collection periods, we find no difference in savings behavior between the two treatments (M_{Diff} = 0.05, p = 0.976, Cohen's d = 0.004).

Next, mediation analyses are used to investigate how the variation of the additional savings option at tax time affects the perceived importance of saving for retirement (*Perceived Savings Norm*) and savings. Figure 3 displays the results of these analyses for the three different designs. First, we observe that all three designs lead to a significant decrease in the perceived savings norm compared to the *Baseline* treatment (paths from *Treatment* to *Perceived Savings Norm*).

The perceived savings norm has a significantly positive effect on the effective savings rate (paths from *Perceived Savings Norm* to *Effective Savings Rate*), allowing us to identify a significant negative mediating effect of the perceived savings norm on savings behavior in all three treatments. We do not find a direct effect of the different designs on savings behavior (paths from *Treatment* to *Effective Savings Rate*). Thus, a significant negative total effect is attributed exclusively to the mediating effect of the perceived savings norm. However, this is only the case for the *Aggregate* and *Checkbox* treatments. For the *Costs* treatment, the total effect is not significant, with a p-value of 0.202. Nevertheless, we observe that due to the additional costs incurred by completing the extra form, only 67.3% of participants chose to save at least once in the savings product, compared to more than 96% in the *Baseline* treatment. In the *Aggregate* and *Checkbox* treatments, even fewer participants opted to save at least once additionally on their tax return, at 24.7% and 52.0% respectively.

Finally, a question remains regarding to what extent the design of the additional savings option actually leads to higher savings compared to the setting with only a single, regular savings decision. To address this question, we compare the savings rates from Experiment 3 with the savings rate of the *Deferred* treatment from Experiment 1, with only one savings decision (*Regular Saving*) and accurate withholding (*Accurate Withholding*). The results of the ANCOVA analysis in Table 6 show that the *Checkbox* and *Aggregate* treatments increase the effective savings rate only slightly compared to scenarios with a single regular savings decision, and this marginal increase is not statistically significant. In contrast, the *Costs* treatment, despite eliciting a lower perceived savings norm, results in higher savings compared to scenarios with only a regular savings decision.

In summary, Experiment 3 provides support for the assumption that the additional savings option affects the perceived importance of saving for retirement which can be manipulated by changing the

design of the nudge. If the nudge is not designed properly, it will lose its effect, and the effect of the additional savings option will be limited to correcting the *overwithholding effect*.

5.4 | Discussion

Our third experiment shows that even small changes in the design of an additional savings option can significantly impact savings behavior, an important practical implication. For example, even minimal costs led to a 30% reduction in the use of the additional savings option. In practice, one approach could be for tax authorities to deposit additional contributions directly into the savings product to reduce taxpayers' cost. Thus far, in some countries it is only possible that the pension provider pays tax refunds (e.g., United Kingdom) or matching contributions (e.g., Germany) directly into a savings product. In addition, the salience of the additional savings option plays an important role. We find that savings are significantly higher and the savings option is used approximately four times more often when there is a separate field for additional savings on the tax return (such as in Canada) than when additional savings contributions have to be entered aggregated with previously made contributions, as is common in the United States, for example. Furthermore, changing the default also has a significant effect on savings behavior. In an otherwise identical tax return, requiring a click on a checkbox to display the additional savings option does not lead to a significant increase in savings compared to the case with no additional savings option. Thus, simple measures such as properly placing the additional savings option at tax time can significantly increase savings.

6 | CONCLUSION

More than 70% of all individual income tax returns filed with the IRS result in a refund due to overpayment (IRS, 2021). While overwithholding increases tax compliance (e.g., Chang and Schultz Jr, 1990; Jackson and Hatfield, 2005; Vossler et al., 2021) and provides emotional benefits to taxpayers (Bobek et al., 2007), this study highlights an important disadvantage of overwithholding. Using incentivized online experiments, we provide causal evidence that overwithholding reduces retirement savings. We show that this is because individuals tend to anchor on their take-home pay when deciding how much to save, and overwithholding reduces their take-home pay. Even though

individuals receive regular feedback on their tax refund over time, allowing them to learn and adjust their savings decisions, the *anchoring effect* weakens but remains present in the end. Moreover, we demonstrate that overwithholding reduces the motivation to save under deferred taxation. This is consistent with prospect theory, assuming that individuals view their tax refunds as gains, which they therefore value using a concave value function, implying that the value of an increase in the tax refund due to retirement savings is lower when there is already an overwithholding tax refund.

Furthermore, this study shows that the introduction of an additional option to save retroactively at tax time is sufficient to eliminate the negative effect of overwithholding on savings under immediate taxation, because at tax time taxpayers have accurate information about their actual after-tax income and can adjust their savings to reflect their true preferences. However, a negative effect of overwithholding remains under deferred taxation due to the reduced motivation to save. Moreover, in practice, overwithholding may also create a liquidity constraint, where individuals reduce their retirement savings because of a lack of available funds. This outcome would exacerbate the negative effect of overwithholding, providing a further argument for the importance of an additional retroactive savings option at tax time.

In addition to the positive effect on savings due to providing accurate information on taxes at tax time, we provide evidence that the additional option to save retroactively further increases saving by acting as a nudge that increases the perceived importance of saving for retirement. This implies that the design of the nudge has important implications for increasing saving. We find that the additional option to save is effective at increasing savings when it is presented transparently and when additional savings can be made at low cost. Thus, introducing a retroactive savings option at tax time is an attractive opportunity to encourage retirement savings. For countries such as the United States and Canada, where such an option already exists, our study thus reveals an unintended consequence of this provision, as the primary purpose of introducing this retroactive savings option was simply to ensure that taxpayers knew their final tax results for the year in question, allowing them to determine their eligibility for various tax-privileged retirement plans.

Finally, this study demonstrates that while the tax savings gap between immediate and deferred taxation reported in previous research is moderated by overwithholding and the an additional savings option, immediate taxation consistently results in greater effective savings than deferred taxation, regardless of either overwithholding or the presence of an additional savings option.

Regarding the effect sizes in this study, we find small to medium effects of overwithholding and the additional savings option with Cohen's d ranging between 0.25 and 0.65, which reflects the typical effect size across categories of choice architecture intervention techniques reported in prior research (Mertens et al., 2022). Moreover, the effect size of the additional savings option is similar to that achievable by providing detailed numerical retirement tax information as measured by Blaufus and Milde (2021). However, saving at tax time is an easier and less costly way to promote retirement savings. Finally, we find even larger effects in our analyses of the savings gap between immediate and deferred taxation, with Cohen's d ranging from 0.30 to 0.80.

One interesting area for future research is whether taxpayers should be allowed to make additional retroactive savings at tax time (as assumed in the current study) or simply additional savings effective in the year the savings are contributed to the plan. Our study shows no significant difference regarding the *nudge effect* between immediate and deferred taxation, suggesting that it might not matter whether there are retroactive or prospective savings options. Moreover, a prospective savings option may be easier to implement. However, to definitively answer this question, one has to consider that real-world tax-privileged retirement plans usually have a limitation or cap on the amount that can be saved for retirement and only after having all information about actual income and taxes (i.e., at tax time) can taxpayers thus decide whether they can make additional tax-privileged savings contributions. This favors a retroactive savings option. Moreover, in the case of underwithholding, which is not examined in this study, the retroactive option may have an additional advantage as loss-averse taxpayers may be incentivized to make additional savings to reduce their tax liability at tax time (Cuccia et al., 2022).

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FIGURES

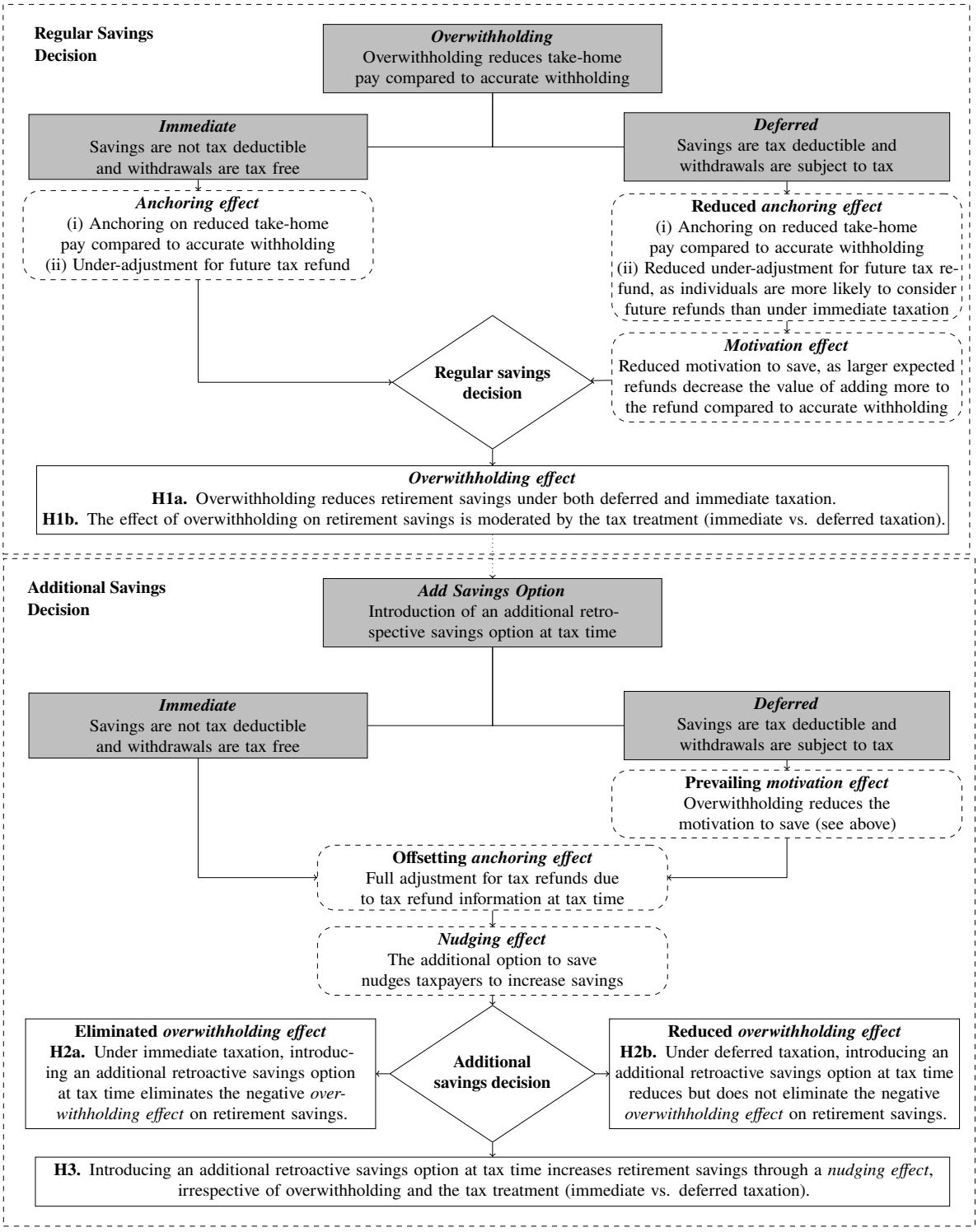

FIGURE 1 Theoretical framework

Note: This figure illustrates the theoretical framework, showing how savings decisions (represented by diamonds) are influenced by behavioral processes (dashed boxes) triggered by the treatments in the gray boxes (*Overwithholding*, *Immediate*, *Deferred*, and *Add Savings Option*). These processes ultimately affect the outcome of the savings decisions (standard boxes).

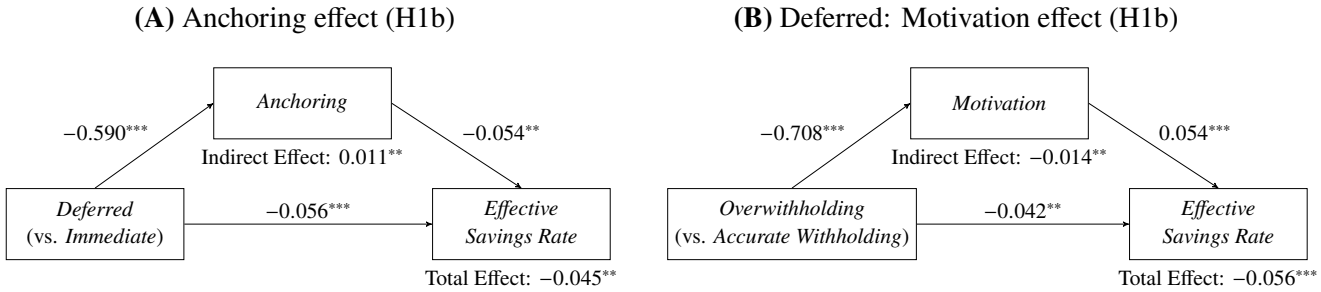

FIGURE 2 Experiment 2: Anchoring and motivation effect

Note: This figure shows two mediation analyses with control variables, through which we show the effects of a treatment (*Deferred* or *Overwithholding*) on *Effective Savings Rate*, with *Anchoring* or *Motivation* as the mediating channels. The analysis in Figure (A) includes the two *Overwithholding* treatments and in Figure (B) the two *Deferred* treatments. The *Effective Savings Rate* determines the average proportion of after-tax income that a participant effectively saves for retirement across all periods of the income phase (see Section 3.2.1). *Anchoring* indicates whether a participant considered take-home pay an important factor in their savings decision while simultaneously deeming the overwithholding refund as relatively unimportant. *Motivation* reflects the responses to the question of how much the tax refund resulting from tax-preferred saving motivated participants to save more (median split). We define our control variables *Male*, *Age*, *Income*, *Married*, *Tax Knowledge*, *Propensity to Save*, *Cognitive Ability*, *Tax Aversion*, *Non-risk-averse*, *Loss Aversion*, and *Preference for Prepayment* in Section 3.2.2. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

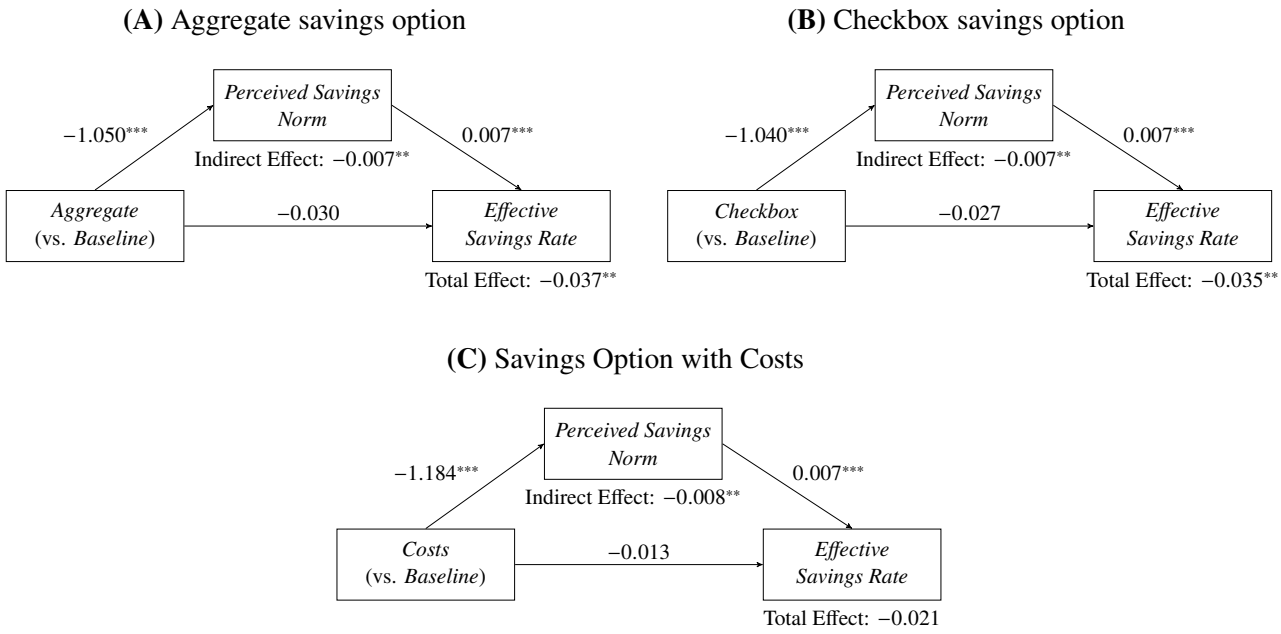

FIGURE 3 Experiment 3: Mediation analyses

Note: These figures illustrate the results of the mediation analysis with control variables, through which we demonstrate the direct, indirect, and total effects of our treatments (*Aggregate*, *Checkbox*, and *Costs*) on the *Effective Savings Rate* compared to the *Baseline* treatment, employing the *Perceived Savings Norm* as the mediating channel. The *Effective Savings Rate* determines the average proportion of after-tax income that a participant effectively saves for retirement across all periods of the income phase (see Section 3.2.1). In the *Baseline* treatment there is a field on the tax return for the additional savings, which in the *Checkbox* treatment becomes visible only after a checkbox is clicked. In the *Costs* treatment, participants have to fill out an additional form in order to make additional savings at tax time. In the *Aggregate* treatment, participants enter both savings contributions already made and additional savings in a single field. The treatment variables are dummy variables that take a value of one if the observation belongs to the respective tax treatment. We define our control variables *Male*, *Age*, *Income*, *Married*, *Tax Knowledge*, *Propensity to Save*, *Cognitive Ability*, *Tax Aversion*, *Non-risk-averse*, *Loss Aversion*, and *Preference for Prepayment* in Section 3.2.2. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

TABLES

TABLE 1 Descriptive statistics

	(1)	(2)	(3)	(4)	(5)	(6)
	Experiment 1		Experiment 2		Experiment 3	
Variables	Mean	SD	Mean	SD	Mean	SD
Male	0.53	0.50	0.51	0.50	0.61	0.49
Age 18-35	0.51	0.50	0.27	0.44	0.19	0.39
Age 36-50	0.22	0.42	0.45	0.50	0.27	0.44
Age 51+	0.26	0.44	0.29	0.45	0.54	0.50
Income €0-1,500	0.42	0.49	0.09	0.29	0.23	0.42
Income €1,501-3,000	0.41	0.49	0.40	0.49	0.43	0.50
Income €3,001+	0.17	0.38	0.51	0.50	0.33	0.47
Married	0.37	0.48	0.61	0.49	0.53	0.50
Tax Knowledge	0.24	0.43	0.41	0.49	0.32	0.47
Propensity to Save	0.32	0.47	0.42	0.49	0.38	0.49
Cognitive Ability	0.35	0.48	0.32	0.47	0.35	0.48
Tax Aversion	0.46	0.50	0.41	0.49	0.49	0.50
Non-risk-averse	0.14	0.35	0.14	0.34	0.10	0.29
Loss Aversion	0.42	0.49	0.30	0.46	0.30	0.46
Preference for Prepayment	0.83	0.37	0.78	0.41	0.84	0.37
Observations	819		420		409	

Note: We define all listed variables in Section 3.2.2.

TABLE 2 Results of Experiment 1: Descriptive statistics

			Tax System		
			Immediate	***Deferred***	**Overall**
Regular Saving	*Accurate Withholding*	*n*	110	104	214
		Mean	0.352	0.279	0.317
		SD	0.132	0.113	0.128
	Overwithholding	*n*	106	99	205
		Mean	0.292	0.250	0.272
		SD	0.118	0.105	0.114
Add Savings Option	*Accurate Withholding*	*n*	102	101	203
		Mean	0.386	0.327	0.357
		SD	0.136	0.134	0.138
	Overwithholding	*n*	98	99	197
		Mean	0.388	0.296	0.342
		SD	0.118	0.107	0.121
	Overall	*n*	416	403	819
		Mean	0.353	0.288	0.321
		SD	0.132	0.118	0.129

Note: This table presents descriptive statistics for *Effective Savings Rate*. The *Effective Savings Rate* determines the average proportion of after-tax income that a participant effectively saves for retirement across all periods of the income phase (see Section 3.2.1). The effective savings rates for the *Add Savings Option* treatments are composed as follows: *Immediate Accurate Withholding*: regular savings: 0.316 + additional savings at tax time: 0.070; *Deferred Accurate Withholding*: 0.264 + 0.063; *Immediate Overwithholding*: 0.264 + 0.124; *Deferred Overwithholding*: 0.224 + 0.072.

TABLE 3 Results of Experiment 1: *Regular Saving* (H1a, H1b)

Panel A: ANCOVA results

	Sum of squares	df	Mean square	F-statistic	p-value
Model	1.032	16	0.065	4.91	<0.001
Overwithholding	0.223	1	0.223	16.97	<0.001
Deferred	0.362	1	0.362	27.52	<0.001
Overwithholding × *Deferred*	0.040	1	0.040	3.06	0.081
Residual	5.288	402	0.013		

Panel B: Comparisons of marginal means

	Contrast	df	F-statistic	p-value
Effect of *Overwithholding* **within** ...				
(1) *Immediate*	0.289 - 0.356 = -0.067	1	17.66	<0.001
(2) *Deferred*	0.250 - 0.277 = -0.027	1	2.76	0.097
Effect of *Deferred* **within** ...				
(3) *Accurate Withholding*	0.277 - 0.356 = -0.079	1	24.64	<0.001
(4) *Overwithholding*	0.250 - 0.289 = -0.039	1	6.01	0.015

Note: This table presents the results of Experiment 1, addressing our first set of hypotheses (H1a and H1b). The table illustrates the 2 × 2 between-participants design, which manipulates two factors: taxation of savings (*Immediate* vs. *Deferred*) and the accuracy of withholding (*Accurate Withholding* vs. *Overwithholding*). The dependent variable is *Effective Savings Rate*, which measures the average proportion of after-tax income that a participant effectively saves for retirement over all periods of the income phase (see Section 3.2.1). Panel A reports ANCOVA results with controls *Male*, *Age*, *Income*, *Married*, *Tax Knowledge*, *Propensity to Save*, *Cognitive Ability*, *Tax Aversion*, *Non-risk-averse*, *Loss Aversion*, and *Preference for Prepayment*, which are defined in in Section 3.2.2. Panel B presents comparisons of marginal means.

TABLE 4 Results of Experiment 1: *Regular Saving* & *Add Savings Option* (H2a, H2b, H3)

Panel A: ANCOVA results

	Sum of squares	df	Mean square	F-statistic	p-value
Model	2.363	20	0.118	8.33	<0.001
Overwithholding	0.193	1	0.193	13.61	<0.001
Deferred	0.875	1	0.875	61.69	<0.001
Overwithholding × *Deferred*	0.000	1	0.000	0.00	1.000
Add Savings Option	0.682	1	0.682	48.11	<0.001
Overwithholding × *Add Savings Option*	0.044	1	0.044	3.13	0.077
Deferred × *Add Savings Option*	0.010	1	0.010	0.71	0.399
Overwithholding × *Deferred* × *Add Savings Option*	0.110	2	0.055	3.89	0.021
Residual	11.316	798	0.014		

Panel B: Comparisons of marginal means

	Contrast	df	F-statistic	p-value
Effect of *Overwithholding* **within** *Add Savings Option* and ...				
(1) *Immediate*	0.388 - 0.386 = 0.002	1	0.01	0.916
(2) *Deferred*	0.297 - 0.331 = -0.034	1	4.03	0.045
Effect of *Overwithholding* × *Add Savings Option* **within** ...				
(3) *Immediate*	(0.388 - 0.386) - (0.289 - 0.353) = 0.066	1	7.72	0.006
(4) *Deferred*	(0.297 - 0.331) - (0.249 - 0.277) = -0.006	1	0.06	0.800
Effect of *Add Savings Option* **within** *Accurate Withholding* and ...				
(5) *Immediate*	0.386 - 0.354 = 0.032	1	3.83	0.051
(6) *Deferred*	0.331 - 0.277 = 0.054	1	10.34	0.001
Effect of *Add Savings Option* **within** *Overwithholding* and ...				
(7) *Immediate*	0.388 - 0.290 = 0.098	1	34.05	<0.001
(8) *Deferred*	0.297 - 0.249 = 0.048	1	7.98	0.005
Effect of *Deferred* × *Add Savings Option* **within** ...				
(9) *Accurate Withholding*	(0.331 - 0.277) - (0.386 - 0.354) = 0.022	1	0.85	0.358
(10) *Overwithholding*	(0.297 - 0.249) - (0.388 - 0.290) = -0.050	1	4.39	0.037
Effect of *Deferred* **within** *Accurate Withholding* and ...				
(11) *Regular Saving*	0.277 - 0.354 = -0.077	1	21.84	<0.001
(12) *Add Savings Option*	0.331 - 0.386 = -0.055	1	10.66	0.001
Effect of *Deferred* **within** *Overwithholding* and ...				
(13) *Regular Saving*	0.249 - 0.290 = -0.041	1	6.03	0.014
(14) *Add Savings Option*	0.297 - 0.388 = -0.091	1	28.41	<0.001

Note: This table presents the results of Experiment 1, addressing our second set of hypotheses (H2a and H2b) and H3. The table illustrates the 2 × 2 × 2 between-participants design, which manipulates three factors: taxation of savings (*Immediate* vs. *Deferred*), the accuracy of withholding (*Accurate Withholding* vs. *Overwithholding*), and the number of savings decisions (only a single savings decision in the income phase (*Regular Saving*) vs. two savings decisions, one in the income phase and an additional one at tax time (*Add Savings Option*)). The dependent variable is *Effective Savings Rate*, which measures the average proportion of after-tax income that a participant effectively saves for retirement over all periods of the income phase (see Section 3.2.1). Panel A reports ANCOVA results with controls *Male*, *Age*, *Income*, *Married*, *Tax Knowledge*, *Propensity to Save*, *Cognitive Ability*, *Tax Aversion*, *Non-risk-averse*, *Loss Aversion*, and *Preference for Prepayment*, which are defined in in Section 3.2.2. Panel B presents comparisons of marginal means.

TABLE 5 Results of Experiment 2

Panel A: Descriptive statistics			**Tax System**		
			Immediate	***Deferred***	**Overall**
Effective Savings Rate	*Accurate Withholding*	*n*	103	102	205
		Mean	0.403	0.302	0.353
		SD	0.188	0.169	0.185
	Overwithholding	*n*	105	110	215
		Mean	0.290	0.247	0.357
		SD	0.167	0.134	0.138
	Overall	*n*	208	212	420
		Mean	0.346	0.273	0.309
		SD	0.186	0.154	0.174
Anchoring	*Overwithholding*	Mean	0.629	0.445	0.535
		SD	0.486	0.499	0.500
Motivation	*Accurate Withholding*	Mean		0.559	
		SD		0.499	
	Overwithholding	Mean		0.318	
		SD		0.468	
	Overall	Mean		0.434	
		SD		0.497	

Panel B: ANCOVA results					
	Sum of squares	**df**	**Mean square**	**F-statistic**	**p-value**
Model	1.907	16	0.119	4.444	<0.001
Overwithholding	0.709	1	0.709	26.446	<0.001
Deferred	0.560	1	0.560	20.873	<0.001
Overwithholding × *Deferred*	0.098	1	0.098	3.636	0.057
Residual	10.808	403	0.027		

Panel C: Comparisons of marginal means				
	Contrast	**df**	**F-statistic**	**p-value**
Effect of *Overwithholding* **within** ...				
(1) *Immediate*	0.290 - 0.404 = -0.114	1	24.40	<0.001
(2) *Deferred*	0.247 - 0.299 = -0.052	1	5.36	0.021
Effect of *Deferred* **within** ...				
(3) *Accurate Withholding*	0.299 - 0.403 = -0.104	1	20.54	<0.001
(4) *Overwithholding*	0.247 - 0.290 = -0.043	1	3.58	0.059

Note: This table presents the results of Experiment 2. The table illustrates the 2 × 2 between-participants design, which manipulates two factors: taxation of savings (*Immediate* vs. *Deferred*) and the accuracy of withholding (*Accurate Withholding* vs. *Overwithholding*). Panel A presents descriptive statistics of the dependent variables. The *Effective Savings Rate* determines the average proportion of after-tax income that a participant effectively saves for retirement across all periods of the income phase (see Section 3.2.1). *Anchoring Effect* indicates whether a participant considered take-home pay an important factor in their savings decision while simultaneously deeming the overwithholding refund as relatively unimportant. The *Motivation Effect* is measured by participants' responses to the question: "To what extent did the tax refund from tax-privileged savings motivate you to save more?" Responses were given on a scale from 1 (not motivated at all) to 9 (very strongly motivated). Panel B reports ANCOVA results with controls *Male*, *Age*, *Income*, *Married*, *Tax Knowledge*, *Propensity to Save*, *Cognitive Ability*, *Tax Aversion*, *Non-risk-averse*, *Loss Aversion*, and *Preference for Prepayment*, which are defined in in Section 3.2.2. Panel C presents comparisons of marginal means.

TABLE 6 Results of Experiment 3: Savings option design

Panel A: Descriptive statistics (*Effective Savings Rate*)

	Savings Option Design				
	Baseline	***Checkbox***	***Aggregate***	***Costs***	**Overall**
n	102	102	101	104	409
Mean	0.294	0.263	0.267	0.283	0.277
SD	0.137	0.149	0.145	0.119	0.138

Panel B: ANCOVA results

	Sum of squares	**df**	**Mean square**	**F-statistic**	**p-value**
Model	0.577	17	0.034	2.239	0.003
Regular Saving (Experiment 1)	——————————- Base ——————————				
Baseline	0.171	1	0.171	11.245	<0.001
Checkbox	0.032	1	0.032	2.130	0.145
Aggregate	0.029	1	0.029	1.905	0.168
Costs	0.072	1	0.072	4.775	0.029
Residual	7.509	495	0.015		

Note: The table shows descriptive statistics and ANCOVA results for Experiment 3. The dependent variable is *Effective Savings Rate*, which measures the average proportion of after-tax income that a participant effectively saves for retirement over all periods of the income phase (see Section 3.2.1). The *Regular Saving* treatment comes from Experiment 1 in the case of *Accurate Withholding*, with a mean *Effective Savings Rate* of 0.279 (see Table 2). In the *Baseline* treatment there is a field on the tax return for the additional savings, which in the *Checkbox* treatment becomes visible only after a checkbox is clicked. In the *Costs* treatment, participants have to fill out an additional form in order to make additional savings at tax time. In the *Aggregate* treatment, participants enter both savings contributions already made and additional savings in a single field. The treatment variables are dummy variables that take a value of one if the observation belongs to the respective tax treatment. We define our control variables *Male*, *Age*, *Income*, *Married*, *Tax Knowledge*, *Propensity to Save*, *Cognitive Ability*, *Tax Aversion*, *Non-risk-averse*, *Loss Aversion*, and *Preference for Prepayment* in Section 3.2.2.The effective savings rates for the treatments are composed as follows: *Baseline*: regular savings: 0.261 + savings at tax time: 0.067; *Checkbox*: 0.278 + 0.017; *Aggregate*: 0.271 + 0.020; *Costs*: 0.272 + 0.038.