Tax-Rate Biases in Tax-Planning Decisions: Experimental Evidence

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Abstract

Contrary to standard economic theory, recent empirical findings suggest that firms do not always engage in economically optimal tax planning. We conduct a laboratory experiment and find robust evidence that decision biases offer a behavioral explanation for suboptimal tax planning. When facing time pressure in an intra-group cross-border financing decision, subjects apply heuristics based on the salience of statutory tax rates. This stirs decision makers to underestimate the effects of tax-base changes and causes economically suboptimal decisions. We find that tax-planning behavior is largely unaffected by subjects' work experience or education in accounting, taxation, and/or finance. However, we observe an overconfidence bias in subjects with work experience. In line with the theory of rational inattention, an increasing tax-burden difference between two tax-planning strategies weakly mitigates the use of heuristics. Taken together, our findings suggest that tax-information salience drives tax-planning decisions. This effect might cause decision biases and contribute to the undersheltering puzzle.

I. INTRODUCTION

This paper investigates behavioral aspects of corporate tax planning. We explore whether tax-information salience serves as a heuristic in the decision-making process that leads to decision biases. Moreover, we examine whether time constraints, personal experience, and rational inattention affect the use of heuristics. Prior research building on the work of Simon (1955) and Tversky and Kahneman (1974, 1981) indicates that decisions, if based on simplifying decision strategies (i.e. heuristics), could result in economically suboptimal outcomes. Chetty, Looney, and Kroft (2009), for instance, find that tax-information salience is a key driver of individual taxpayer behavior. Powers, Seidman, and Stomberg (2015) examine corporate decisions and show that statutory tax rates serve as a heuristic that reduces information-processing costs. Along the same lines, Graham, Hanlon, Shevlin, and Shroff (2015) find that managers base financial decisions on salient information such as the average tax rate, rather than on less accessible but more accurate information (i.e. the marginal tax rate). Firms in their sample experience an estimated average financial loss of $10 million due to poorly designed capital structures and $25 million caused by suboptimal acquisitions.

Tax-planning decisions have substantial consequences for firms. Dyreng, Hanlon, and Maydew (2008), for instance, provide evidence that firms' effective tax rates (ETRs) differ considerably and a quarter of the firms in their sample persistently pay taxes in excess of the statutory U.S. corporate tax rate. In accounting research, the term "undersheltering puzzle" was coined for this phenomenon (Gallemore, Maydew, and Thornock 2014, Hanlon and Heitzman 2010, Desai and Dharmapala 2006, Weisbach 2002). As the causes of the undersheltering puzzle are yet not entirely clear (Hanlon and Heitzman 2010), we examine whether and under which conditions heuristics lead to biases in tax-planning decisions that result in economically suboptimal decisions. Because economically suboptimal tax planning impairs a firm's competitiveness, investment and growth (Donohoe, Lisowsky, and Mayberry

2015), a more profound understanding of tax-planning decisions is required. Examining the behavioral dimension of tax planning explains tax-burden differences and heterogeneity in ETRs not exclusively based on economic arguments.

Standard economic theory assumes that agents take economically optimal decisions and incorporate all relevant information. When deciding on whether to implement a tax-planning strategy, decision makers balance costs and benefits in order to maximize shareholder wealth (Scholes, Wolfson, Erickson, Hanlon, Maydew, and Shevlin 2015). An economically optimal tax-planning decision depends on tax-rate and tax-base effects (Huizinga, Laeven, and Nicodeme 2008, Hines and Rice, 1994). Building on the insights developed in the above literatures, we study whether differences in the salience of tax-rate and tax-base effects guide decision-making. Since the economic effects of tax rates are more salient, we hypothesize that decision makers consider tax-rate effects more strongly than tax-base effects, i.e. tax-rate salience drives decision-making. Moreover, we conjecture that this effect increases with time constraints. Personal experience such as relevant work experience and education, on the other hand, should mitigate the effect of tax-rate salience. In line with the theory of rational inattention (Abeler and Jaeger 2015), we expect a similar effect for increasing tax-burden differences between tax-planning strategies.

We take an experimental approach to study the effects of tax-rate and tax-base changes on decision-making for two reasons. First, an experiment allows us to isolate causal effects. Second, an experiment allows us to quantify the importance of specific sources of information in tax-planning decisions. We therefore design an intra-group, cross-border financing scenario and vary statutory tax rates and tax bases. On this basis, we ask subjects to indicate the tax-minimizing tax-planning strategy (i.e. equity or debt capital for a foreign subsidiary).[1] We model tax-rate effects via differences in statutory tax rates (i.e. the tax-rate

[1] In our experiment, a tax-minimizing decision automatically implies an economically optimal outcome since the tax-planning strategies do not differ in non-tax costs or benefits. Thus, we use both terms interchangeably in our

differential) between the financed subsidiary and the financing parent company, and tax-base effects via the subsidiary's tax loss carry-forward. Moreover, we introduce time constraints to alter the decision environment, account for personal experience such as relevant work experience or education, and vary the tax-burden difference between equity and debt financing. Our sample comprises experienced students from a public business university in Austria who have a sound background in business administration, business law, and/or economics.

We find robust evidence that tax-information salience leads to suboptimal tax-planning decisions. Specifically, decision makers use tax rates as a heuristic and underestimate the economic consequences of tax-base effects. While we do not observe systematic decision biases in situations without time constraints, time pressure significantly aggravates systematically biased decision-making. Under time constraints, decision-making is largely unaffected by subjects' personal experience, i.e. work experience or education, in accounting, taxation, and/or finance. Subjects with relevant work experience, however, indicate high confidence in having identified the tax-minimizing strategy, yet they perform relatively poorly. This indicates an overconfidence bias in these subjects. Finally, we find that an increasing tax-burden difference between two tax-planning strategies weakly mitigates the decision bias.

In exploring the behavioral dimension of tax-planning decisions, our study adds to the understanding of corporate tax planning and its economic effects (e.g., Hanlon and Heitzman 2010, Dyreng et al. 2008). First, we contribute to current research on the processing of tax-related information (e.g., Eberhartinger and Fellner-Röhling 2016, Graham et al. 2015,

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paper. We acknowledge that tax-minimizing behavior in reality does not necessarily imply economically optimal results. For instance firms differ in their financial reporting costs of tax planning (e.g., Frank, Lynch, and Rego 2009, Badertscher, Philips, Pinco, and Rego 2009), regulatory costs of tax planning (e.g., Mills, Nutter, and Schwab 2013), or reputational costs of tax planning (e.g., Gallemore et al. 2014) which implies different levels of economically optimal tax planning across firms. We neglect these aspects in our experimental setting to isolate the causal effect of tax-rate and tax-base effects on decision-making.

Powers et al. 2015, Blaufus, Bob, Hundsdoerfer, Kiesewetter, and Weimann 2013). Identifying tax-rate salience as a heuristic and a potential source of decision biases increases the understanding of heterogeneity in ETRs and the undersheltering puzzle. Prior research has shown that characteristics of tax executives affect corporate tax-planning behavior (Dyreng, Hanlon, and Maydew 2010). Complementing this finding, our results indicate that characteristics of tax-planning decisions could also affect tax outcomes. At the same time, we observe that experienced decision makers rely on their knowledge rather than seeking new information. This underlines the importance of effective internal monitoring of corporate tax-planning decisions. Second, we experimentally test the theory of rational inattention (Abeler and Jaeger 2015). Our findings suggest that the propensity to take a biased decision depends to some extent on the tax effects of a tax-planning strategy, indicating that the tendency to take biased decisions might be higher in situations with seemingly minor economic consequences. Third, our study is among the first to analyze tax-planning decisions in an experimental setting. This approach enables researchers in accounting to examine causal effects in corporate tax-planning decisions and to assess settings in which archival data is not available.

The remainder of this paper proceeds as follows: Section II outlines a model for tax planning through intra-group financing under the assumption of optimal decision-making, and develops our hypotheses. Section III describes the experimental design, with results presented in section IV. Section V discusses the main implications of our findings and potential limitations.

II. THEORETICAL BACKGROUND

Tax-Planning through Intra-Group Financing

Corporate tax planning is economically optimal if it increases shareholder wealth. Widely adopted tax-planning strategies exploit discretion in setting intra-group transfer prices

for intermediate inputs (Beer and Loeprick 2015, Klassen and LaPlante 2012), special-tax regimes (Dyreng, Lindsey, and Thornock 2013, Dyreng and Lindsey 2009), and financial instruments such as hybrids (Johannesen 2014), derivatives (Donohoe 2015), and insurance contracts (Brown 2011). In addition, income shifting through intra-group debt financing is widespread (Heckemeyer and Overesch 2013) as internal capital markets enable firms to exploit tax-rate differentials (Desai, Foley, and Hines 2004) and to shift income via interest payments to low-tax jurisdictions (Buettner and Wamser 2013). Thus, low-taxed group members of multinationals finance their high-taxed counterparts with intra-group debt (Overesch and Wamser 2014, Buettner, Overesch, Schreiber, and Wamser 2009, Huizinga et al. 2008).

Aside from statutory tax rates that determine tax-rate differentials, several tax-system features affect the tax base of a firm and thus the choice of an optimal tax-planning strategy. An example of a tax-base effect is the possibility to carry tax losses forward. This may reduce a firm's periodic tax base and turn a high-taxed entity into a low-taxed one. As a result, income shifting via interest payments on intra-group debt and a tax loss carry-forward may conflict with each other, as the financed group member does not benefit from the interest deduction if it does not pay any taxes due to a tax loss carry-forward. These interest payments are, at the same time, subject to taxation at the financing group member, which induces double taxation.

In the following, we derive tax-planning preferences of a multinational for intra-group equity or debt assuming economically optimal decision-making. We consider a parent company A with its wholly owned foreign subsidiary B. The firms earn π_A and π_B which denote taxable income of *A* and *B* before deducting interest payments on intra-group debt and a tax loss carry-forward. The tax base after deducting interest payments and a tax loss carry-forward is taxable at the statutory tax rates τ_A and τ_B, respectively. A may finance B via intra-

group equity or debt. A is risk neutral and has no preference for either form of financing. If A chooses equity financing, dividends are neither tax deductible for B nor taxable at A.[2] If B is financed via debt, interest payments I are tax deductible at B and taxed at A. In a one-period setting, A selects the tax-planning strategy yielding the smallest group tax burden.[3]

First, the group tax burden for equity financing T_E in a given period amounts to

$$T_E = \pi_a \tau_a + (\pi_b - L_b)\, \tau_b, \tag{1}$$

where L_b denotes the amount of tax loss carry-forward available for B which is equal to or less than π_b. As a result, π_b is sufficiently large to offset an existing tax loss carry-forward. This implies that $L_b \leq \pi_b$ has to hold. Any unused tax loss carry-forward, however, will be forfeited in later periods.

Second, the group tax burden for debt financing T_D in a given period amounts to

$$T_D = (\pi_a + I)\, \tau_a + (\pi_b - I - \theta L_b)\, \tau_b, \tag{2}$$

where I indicates interest payments on intra-group debt ($I > 0$) which are tax deductible at B and taxable at A. θ denotes the fraction of L_b which can be offset against taxable income after deducting I. As we assume that country B does not offer a tax refund in case of a loss, the deductible fraction of a L_b is limited to the tax base, which implies

$$\theta = \begin{cases} 1, & L_b \leq (\pi_b - I), \\ \frac{\pi_b - I}{L_b}, & L_b > (\pi_b - I). \end{cases} \tag{3}$$

A selects the form of intra-group financing which yields the lowest group tax burden, thus

$$min\{T_E, T_D\}. \tag{4}$$

[2] This approach resembles a territorial tax system for foreign income earned by parent company A. This system is the prevailing standard for most jurisdictions. The current tax treatment of foreign earnings in the U.S. follows a worldwide tax system where foreign income is taxable and a tax credit is available for foreign taxes paid.

[3] Given our interest in the trade-off between the tax-rate differential and the tax loss carry-forward, we assume that $\pi_a \geq 0$; $\pi_b \geq L_b$; $I_b \geq 0$; and $\pi_b \geq I_b$ where any unused tax loss carry-forward will be forfeited. Moreover, we disregard agency costs, information asymmetries, and tax planning costs.

It follows for the group tax burden to be a function of both the statutory tax rates and the tax loss carry-forward. These factors determine tax-planning preferences for intra-group equity or debt financing.

We first consider the case where $\theta = 1$. The income of B after deducting I exceeds the available tax loss carry-forward. In this case, A prefers intra-group debt over equity if

$$\pi_a \, \tau_a + (\pi_b - L_b) \, \tau_b > \, (\pi_a + I) \, \tau_a + (\pi_b - I - L_b) \, \tau_b. \tag{5}$$

All else being equal, the relation holds if $\tau_a < \, \tau_b$. Substituting τ_b for $\tau_a + d$ where d denotes the difference in statutory tax rates between B and A (i.e. the tax-rate differential: $d = \tau_b - \tau_a$) and changing the order of preferences yields a tax-planning preference for intra-group debt if

$$Id > 0 \tag{6}$$

If the income of B after deducting I exceeds its tax loss carry-forward, debt financing is preferable in the case of a positive tax-rate differential. For a negative tax-rate differential, equity financing is the dominant tax-planning strategy. If $d = 0$, A is indifferent between both forms of financing. Hence, tax-planning preferences do not depend on the amount of tax loss carry-forward.

Second, we consider $\theta = \frac{\pi_b - I}{L_b}$ where the tax loss carry-forward exceeds the income of B after the deduction of I. The benefit of intra-group equity or debt financing again depends on d. It follows from (5) that A prefers debt over equity if

$$(\pi_b - \, L_b)(\tau_a + d) - I \, \tau_a > 0. \tag{7}$$

The definition of θ implies that $I > \, \pi_b - L_b$ holds. Equation (7) does not hold if the tax-rate differential is negative $(d < 0)$ or zero $(d = 0)$. If a tax loss carry-forward exceeds the income of B after deducting I (i.e. $L_b > (\pi_b - I)$), A prefers intra-group equity over debt if its statutory tax rate equals or exceeds the subsidiary's statutory tax rate. If the tax-rate

differential is positive ($d > 0$), the tax-planning preference depends on the size of the tax loss carry-forward and the positive tax-rate differential.

Table 1 summarizes the dominant tax-minimizing strategies derived from Equations (6) and (7). In general, the sign of the tax-rate differential determines the tax-minimizing strategy in a variety of scenarios. However, if a tax loss carry-forward exceeds a subsidiary's taxable income after deducting interest payments and coincides with a positive tax-rate differential, a trade-off between the tax-rate differential and the tax loss carry-forward appears. To take an economically optimal tax-planning decision, decision makers have to consider tax-rate and tax-base effects and balance the gain from income shifting via intra-group debt financing against the tax effects of foregoing a tax loss carry-forward. If decision makers receive incentives for economically optimal tax planning, we expect them to resolve this conflict and minimize the group tax burden.

INSERT TABLE 1 HERE

Hypothesis Development

Empirical evidence suggests that firms differ in tax-planning behavior and a significant proportion of firms appear not to minimize their tax burden (Dyreng et al. 2008). While firms use tax-planning strategies to reduce their ETRs, the extent of tax planning tends to fall short of theoretical predictions given the vast spectrum of opportunities to save on taxes (Hanlon and Heitzman 2010).[4] Against this background, we know surprisingly little about the behavioral dimension of tax-planning decisions.

Although legal or economic factors explain parts of heterogeneity in tax-burden differences and ETRs, certain behavioral patterns could trigger suboptimal decisions in tax contexts (Graham et al. 2015). This argument is in line with research in behavioral economics and economic psychology, which finds systematic biases in economic decision-making where

[4] A meta-study by Feld, Heckemeyer, and Overesch (2013), for instance, finds that a 10 percentage point change in statutory tax rates induces only a 3 percentage point reaction in the debt ratio of a firm.

decision outcomes are less optimal than theoretically assumed (see Kirchler (2007) for a review). Building on early work by Simon (1955) and discussing the effects of individuals' limited knowledge and ability in decision-making, Tversky and Kahneman (1974) identify cognitive principles that guide decision-making in complex situations. As it is often difficult to assess the economic consequences of a decision, individuals seek simplifying decision strategies known as heuristics. These decision strategies affect the way information is processed (Gigerenzer and Gaissmaier 2011) and reduce the cognitive load of a problem, as they alleviate the complexity of a task (Kahneman 2003, Tversky and Kahneman 1974). In contrast to extensive decision strategies, however, heuristics often do not yield economically optimal choices but could imply biases.

The literature discusses several types of heuristics (see Kahneman 2003).[5] For taxation, McCaffery and Baron (2003) observe systematic decision biases in a series of experiments and find that tax-information salience is a key heuristic. When presented with tax-related information, decision makers use information that appears to be salient as a primary heuristic, while the remaining (yet relevant) information is widely neglected. Similarly, Chetty et al. (2009) show that variation in tax-information salience causes optimization errors, and the salience rather than the magnitude of taxes tends to affect individuals' choices. Fochmann and Weimann (2013) find that high tax salience reduces tax misperception. This is in line with studies that find effects of the visibility of tax rates on financial decision-making. For instance, Rupert and Wright (1998) show that highly visible tax rate schedules positively affect decision performance. While these studies focus on the behavior of individual taxpayers, two recent papers provide initial evidence that corporate tax-planning decisions could be more systematically biased than theoretically expected.[6] Graham

[5] For instance, decision makers often estimate the outcome of a decision based on some initial value (i.e. the anchor) that is adjusted to derive a solution. As they fail to adjust sufficiently, "different starting points yield different estimates" and decisions are biased towards the anchor (Tversky and Kahneman 1974, p. 1128).
[6] Some scholars argue that corporate decision-making is economically optimal. In this respect, DellaVigna (2009) posits that firms have measures at hand to increase the optimality of their decisions. These include, for

et al. (2015) empirically show that capital structuring and acquisition decisions could be economically suboptimal, as executives overestimate the importance of salient information when evaluating the economic consequences of taxes. Along the same lines, Powers et al. (2015) find that investors use the U.S. statutory tax rate as a heuristic to reduce information-processing costs.

With regard to tax-rate and tax-base effects, previous research suggests that decision makers consider tax-rate effects more carefully than tax-base effects when evaluating the economic consequences of tax-planning decisions (e.g., Buettner and Ruf 2007, Sørensen 1992). Statutory tax rates are highly salient, i.e. they are easily available and decision makers know their economic effects very well (Graham et al. 2015). Tax-base effects, on the other hand, are more complex and their economic effects are less straightforward (Blaufus et al. 2013). Based on these arguments, we conjecture that tax-rate salience drives the choice between equity and debt financing, as the economic effect of statutory tax rates on the group tax burden is intuitive and easy to compute. A simplified decision strategy based on tax-rate salience, however, potentially induces a decision bias if tax-base changes do not receive adequate attention and decision makers underestimate their economic effects. Based on these arguments, we hypothesize the following:

H1: *If (1) a tax-rate differential and (2) a tax loss carry-forward determine the tax effects of a tax-planning decision, the decision is biased towards the tax-rate effect.*

As heuristics accelerate decision processes, decision makers use heuristics not only in complex situations, but also when resources for decision-making are limited. Extensive decision-making, on the other hand, requires time and cognitive effort, but leads to more

instance, external consultants or feedback from the capital market. Others acknowledge that corporate decision-making could be biased if no feedback is provided to the decision maker (Camerer and Melmendier 2007). Given the complexity of tax planning, the specificity of information required to take tax-planning decisions, and the possibility to obscure relevant information in the financial statements (Balakrishnan, Blouin, and Guay 2011), the probability of identifying economically suboptimal tax-planning decisions tends to be relatively low in reality.

accurate decisions (Kahneman 2011, 2003). Previous research in psychology found that scarcity of resources, such as time constraints, stimulates the use of heuristics.[7] Specifically, decision quality follows an inverted U-shaped curve. Decision quality increases under moderate time constraints and decreases as time constraints become more onerous (Dror, Busemeyer, and Basola 1999, Payne, Bettman, and Johnson 1988, Rothstein 1986). Several studies in auditing research confirm the negative effects of time constraints on decision quality (e.g., Low and Tan 2011, Braun 2000, Choo 1995, Ponemon 1992). Thus, we conjecture that time constraints in tax-planning decisions increase the probability of applying heuristics based on tax-rate salience and posit the following:

H2: Time constraints increase decision bias in tax-planning decisions.

In addition to time constraints, personal experience also tends to affect tax-planning decisions. In a simple tax-planning scenario with perfect information, we expect subjects with work experience in accounting, taxation, and/or finance, and advanced graduate students in these fields to perform better and to rely less on heuristics than subjects without relevant personal experience. Therefore, we hypothesize the following:

H3: Work experience or education in accounting, taxation, and/or finance mitigates decision bias in tax-planning decisions.

Finally, we investigate whether the use of heuristics depends on the financial consequences of a tax-planning strategy, i.e. the resulting tax burden. In certain settings, tax effects of tax-planning strategies are large and therefore obvious. Thus, decision makers may not use heuristics as frequently as they do in decisions with less clear outcomes. This is in line with the theory of rational inattention, which suggests that decision makers consider less salient information if ignoring the information is costly (Abeler and Jaeger 2015). For our

[7] We examine time constraints as a theoretical concept that stimulates the use of heuristics (Kahneman 2011, 2003). In a corporate tax-planning setting, time constraints could result from limited resources (e.g., budgetary constraints, incomplete information, lacking expertise, etc.) which reduces the likelihood of using extensive decision strategies and of taking an economically optimal tax-planning decision.

setting, this theory predicts that the probability of taking optimal decisions is conditional on the tax-burden difference between the two tax-planning strategies (i.e. equity or debt financing). If, for instance, equity yields a significantly lower tax burden than debt, we expect a higher likelihood of choosing equity. If, however, the tax effects of equity or debt differ only marginally, we expect fewer optimal decisions. In other words: the more obvious the benefits of a tax-planning strategy, the less heuristics are used in decision-making. Based on these arguments, we conjecture the following:

H4: *An increase in the tax-burden difference between tax-planning strategies mitigates decision bias in tax-planning decisions.*

Figure 1 summarizes our hypotheses and depicts the theoretical framework of our experiment.

INSERT FIGURE 1 HERE

III. RESEARCH DESIGN

Experimental Setup

An economic experiment enables us to isolate behavioral responses to changes in statutory tax rates (i.e. the tax-rate differential) and the tax base (i.e. the tax loss carry-forward). Specifically, we systematically vary tax rates and tax loss carry-forwards and assess subjects' tax-planning decisions. We run a computer-based experiment programmed in Z-Tree (Fischbacher 2007) with three stages: (i) a questionnaire (ii) instructions for a tax-planning game and (iii) a set of 16 tax-planning decisions.[8]

We simulate decision-making under time constraints by randomly assigning 60 percent of our subjects to a treatment with limited decision time (*time-pressure treatment*). Before conducting the experiment, we run pre-tests with 18 junior faculty members and track the decision time. On average, pre-test participants require 90 seconds to take one tax-

[8] A copy of the experimental instrument is available on request. Our subjects granted approval to publish anonymized results of our study.

planning decision. Following Low and Tan (2011), to induce time pressure, we restrict the time to 45 seconds per decision and inform participants about the time limitation before the first tax-planning task. The time-pressure treatment aims at triggering rapid decision-making and exploring an adaption of the decision strategy. Specifically, we intend to induce intuitive, fast decisions as opposed to reason-based, slow and effortful choices (Kahneman 2003). We do not compel our subjects to provide a decision within the given time frame. The remaining subjects do not face time constraints (*no-time-pressure treatment*). Taken together, this experimental setup yields a factorial design with between and within subject variation.

Experimental Procedure

Questionnaire

We initiate our study with a questionnaire on subjects' personal background, their work experience and education in accounting, taxation, and/or finance. We also ask eight questions to identify personal attitudes towards debt financing. The questionnaire concludes with a test that measures reflexivity in decision-making (*cognitive reflection test*: see Frederick 2005).[9]

Instructions

In the second part, we introduce our subjects to a tax-planning game, which entails 16 tax-planning decisions. The scenario follows the model laid out in Section II and presents a multinational that operates in two countries. While the parent company is located in country A, the subsidiary operates in country B. Subjects take the position of the multinational's CFO and are in charge of tax planning through intra-group financing provided by the parent company to the subsidiary. Financing arrangements can take the form of intra-group equity or debt. We instruct subjects to choose the form of financing, which minimizes the total group tax burden in a one-period setting.

[9] As we conduct our study in German, we apply a translated version of the cognitive reflection test provided by Piazolo (2007).

After providing some background on taxes and financing decisions, we outline a simple tax system which comprises three dimensions: (i) the statutory tax rates τ_a, τ_b, (ii) the subsidiary's tax loss carry-forward L_b, and (iii) an asymmetric tax treatment of interest payments I and dividends. As we are interested in the trade-off between a positive tax-rate differential and a tax loss carry-forward determined under Equation (7), τ_a is strictly smaller than τ_b. The subsidiary in country B reports a tax loss carry-forward L_b which can be offset against its taxable income. Any unused L_b will be forfeited in later periods. Equity and debt financing receive an asymmetric tax treatment where dividends are tax-exempt in country A, while debt financing triggers interest payments that are tax deductible at the subsidiary and taxable at the parent company. We also outline a simple economic environment where the parent company does not report any income besides interest or dividend payments received from the subsidiary. The subsidiary earns a constant profit of ECU 4,000,000[10] and fully distributes after-tax profits as dividends. Moreover, the financed amount (ECU 50,000,000) and interest payments (ECU 3,000,000) do not vary.

We apply three safeguards to ensure that subjects understand the experimental task. First, we present a table summarizing all the information and depicting how to compute the group tax burden, conditional on the form of intra-group financing. On this basis, we present two model calculations which comprise all relevant factors, i.e. the financed amount, interest payments, the taxable profit of the subsidiary, statutory tax rates, the tax loss carry-forward at the subsidiary, and the group tax burden which results from equity or debt financing. While one model calculation yields equity as the tax-minimizing strategy, the other implies debt financing. We also explain the tax effects of both strategies in written form. The third and final safeguard involves three questions (*check questions*) which cover the three tax-system dimensions: (i) the effects of the tax-rate differential, (ii) the effects of a tax loss carry-

[10] ECU ("Electronic Currency Unit") is an abbreviation for a fictitious currency we introduce in the experimental testing.

forward and (iii) the effects of asymmetric taxation of dividends and interest payments. To ensure that only subjects who fully understand the general mechanism are included in the primary analysis, we exclude those who did not correctly answer the *check questions*.

Tax-Planning Game

The main part of our experiment consists of a tax-planning game with 16 decisions. Each subject faces these 16 decisions in random order. Subjects may refer back to the general information and the model calculations provided in the table and described in the previous section. We provide a calculator, paper, and a pencil. We inform subjects at the end of the experiment whether they took tax-minimizing decisions (i.e. economically optimal decisions). During the experiment, subjects do not receive any feedback.

Based on the trade-off determined under Equation (7), we systematically vary the tax-minimizing solution by changing (i) the statutory tax rates and (ii) the subsidiary's tax loss carry-forward.[11] We keep the remaining parameters constant, which enables us to determine the decision relevance of the tax-rate effect (i.e. the tax-rate differential) and the tax-base effect (i.e. the tax loss carry-forward). Figure 2 provides a schematic overview of our experimental setting. Each group of tax-planning tasks comprises four of the 16 individual decisions (*items*). In the *BASELINE* item group, debt financing is the tax-minimizing strategy. We then systematically vary the tax base (*CHANGE_TLCF*) and the tax rate (*CHANGE_TD*) so that equity financing yields the tax-minimizing strategy. For a fourth group of tax-planning decisions (*SYMMETRY*) we alter the tax base and the tax rates so that debt financing remains the tax-minimizing strategy.

INSERT FIGURE 2 HERE

[11] We are aware that, in contrast to statutory tax rates, time effects alter the value of tax loss carry-forwards. While statutory tax-rate differentials require long-term tax planning, tax loss carry-forwards are usually limited in time. We restrict the tax-planning game to a one-period setting to rule out time effects affect decision-making.

Table 2, Panel A presents the tax parameters for the 16 items and Panel B for the four item groups. Eight items (items 5-8 and 13-16) yield equity as the tax-minimizing strategy. Debt financing is the tax-minimizing strategy for the remaining items (items 1-4 and 9-12). We design eight item pairs whereby the tax-burden difference between equity and debt financing is constant for each pair. For items 1 and 9, for instance, debt financing reduces the group tax burden by ECU 200,000 as compared to equity. Vice versa, equity financing yields a ECU 200,000 smaller group tax burden for items 8 and 16. We vary the tax-burden difference such that one strategy is clearly preferable for some items and less pronounced for others. Items 1, 8, 9, and 16, for example, result in a tax advantage of ECU 200,000 (*DELTA_200000*) for the tax-minimizing strategy, while we reduce the difference to roughly ECU 1,280[12] (*DELTA_1280*) for items 4, 5, 12, and 13. Items 3, 6, 11, and 14 yield a difference of ECU 25,000 (*DELTA_25000*) and items 2, 7, 10, and 15 a difference of ECU 60,000 (*DELTA_60000*).

As our paper aims to identify unequal responses to tax-rate and tax-base effects, three item groups are particularly relevant. Debt capital is the tax-minimizing strategy in the *BASELINE* item group (items 1-4). While the tax-rate differential is constant within this group, the subsidiary's tax loss carry-forward increases from item 1 to item 4, while the tax advantage of debt diminishes.

Equity is the tax-minimizing strategy in the *CHANGE_TLCF* item group (items 5-8) where the tax-rate differential is identical to *BASELINE*, while the subsidiary's tax loss carry-forward increases. Therefore, the tax advantage of equity financing increases from item 5 to item 8. We posit under H1 that subjects are biased towards the tax-rate effect (i.e. the tax-rate differential). Thus, they choose debt instead of tax-minimizing equity and we expect a smaller proportion of tax-minimizing decisions for *CHANGE_TLCF* than for *BASELINE* items.

[12] Due to rounding difficulties in obtaining readable statutory tax rates, tax-burden differences implied by equity or debt financing do not completely match for items 4, 5, 12, and 13 (i.e. *DELTA_1280*). The tax-burden differences match for the remaining item groups (*DELTA_25000*, *DELTA_60000*, and *DELTA_200000*).

CHANGE_TD comprises items 13-16 where equity financing is the tax-minimizing strategy. While the tax-rate differential is constant at a low level in this group, the tax loss carry-forward decreases from item 13 to item 16. For every item in this group, the tax-burden difference between equity and debt financing is identical to one item of the *CHANGE_TLCF* group so that, for instance, equity yields the same tax advantage for items 14 and 6 (see Panel A of Table 2). Again, we expect a smaller proportion of tax-minimizing decisions in the *CHANGE_TD* item group than in *BASELINE*, as the tax-rate differential suggests debt financing while equity financing yields the tax-minimizing strategy.

Debt capital is the tax-minimizing strategy in the *SYMMETRY* item group (items 9-12). While the tax-rate differential is constant at a high level, the tax loss carry-forward decreases from item 9 to item 12. In such a case, we do not expect a smaller proportion of optimal decisions than in *BASELINE*, as the tax-rate differential indicates debt financing, which is the tax-minimizing strategy. We create the *SYMMETRY* item group so that eight items yield debt and eight items yield equity financing as the tax-minimizing strategy.

INSERT TABLE 2 HERE

Dependent Variable and Remuneration

We ask our subjects to indicate the tax-minimizing form of intra-group financing. Thus, they face 16 binary choices between equity and debt financing. In our analysis, we use the variable *TAX-MINIMIZING* and code every decision zero or one. *TAX-MINIMIZING* takes the value of one if a subject took an economically optimal decision for a certain item while zero indicates an economically suboptimal decision.

We provide monetary incentives for participation (Croson 2005) and pay subjects based on their performance in the tax-planning game. Subjects receive a show-up fee of €6.00 and we reward tax-minimizing decisions with €0.50 each. We do not remunerate decisions that fail to minimize the tax burden. For 16 decisions, this schedule yields an expected payoff

of €10.00 and a maximum of €14.00 per person.[13] After every decision, we ask our subjects to indicate their confidence of having identified the tax-minimizing strategy (scale from 0-8).

Sample

Our sample comprises experienced students from a public business university in Austria with a sound background in business administration, business law, and/or economics. We invite all active students to participate via email, and personally recruit graduate students in accounting, taxation, and/or finance. These students have professional experience and a sound understanding of the topic. We conduct the experiment in the computer laboratory of the university in January 2015 and test 185 subjects in 11 sessions. Observations of 44 subjects are excluded from the primary analysis, as 40 did not pass the *check questions* and another 4 did not provide decisions for any of the 16 items. As we do not require a full set of 16 decisions per subject, we include subjects who did not provide a decision on every item in our primary sample.[14] These missing observations relate to the time-pressure treatment where we do not force our subjects to take a decision within the given time frame. If a subject does not take a decision within 45 seconds, we count the item as unsolved and present the next item. However, by not taking a decision, subjects forego the opportunity to receive remuneration for that item.[15] The final sample consists of 141 subjects and 2,024 decisions. Table 3 provides an overview of the sample selection on subject level (Panel A) and item level (Panel B).

INSERT TABLE 3 HERE

Table 4 presents demographic data per treatment. 53.9 percent of the subjects in the final sample are female and the average age is 25.1 years. The time-pressure treatment

[13] As a binary choice implies a 50% chance to randomly select the economically optimal strategy, we expect a payoff of €10 if subjects guess throughout the experiment.
[14] As a robustness check, we limit our sample to subjects who provided decisions on all 16 items. The results presented in section IV do not differ qualitatively from our primary analysis.
[15] We do not observe a systematic pattern of missing observations across items ($X^2 = 0.932$, df = 15, $p > 0.999$). Thus, missing observations are randomly distributed and not driven by the perceived difficulty of certain items.

contains somewhat more subjects with education in accounting, taxation, and/or finance. Other than that, the random assignment of subjects to the two treatments did not result in significant differences between the two treatment groups. On average, a session without time pressure lasts one hour, and a time pressure session 45 minutes. Accordingly, the average payoff in the time-pressure treatment (€10.76) amounts to about 75 percent of the payoff in the no-time-pressure treatment (€12.82). We do not allow subjects to leave the laboratory nor do we provide feedback until the last subject has completed the experiment.

INSERT TABLE 4 HERE

IV. RESULTS

Descriptive Statistics

We first provide descriptive statistics for the tax-planning game. Table 5 presents the distribution of the mean proportion of tax-minimizing decisions per subject (*TAX-MINIMIZING)* for the full sample, the time-pressure treatment, and the no-time-pressure treatment.[16] Overall, 18.4 percent of our subjects select the tax-minimizing strategy for all items, while the mean proportion of tax-minimizing decisions amounts to 68.8 percent per subject. Untabulated t-tests indicate significant differences from the optimum of 100 percent tax-minimizing decisions per subject ($t = -16.04$, $p < 0.01$) and from the average of 50 percent tax-minimizing decisions that we would expect if subjects were to have guessed throughout ($t = 9.68$, $p < 0.01$).[17] Table 5 also shows that almost 40 percent of the subjects in the no-time-pressure treatment consistently take tax-minimizing decisions whereas only 5 percent do so

[16] We provide a definition of variables in Appendix.

[17] The mean proportion of 58.0 percent tax-minimizing decisions per subject (SD = 0.19) in the time-pressure treatment is also significantly smaller than the optimum ($t = -19.93$, $p < 0.01$). This result holds for the no-time-pressure treatment, where roughly 40 percent of our subjects provide a full set of tax-minimizing decisions. In this group, the mean proportion of 83.9 percent tax-minimizing decisions per subject (SD = 0.20) is significantly smaller than the optimum of 100 percent ($t = -6.35$, $p < 0.01$). Equally, the mean of *TAX-MINIMIZING* per subject is significantly larger than 50 percent for the time-pressure treatment ($t = 3.79$, $p < 0.01$) and the no-time-pressure treatment ($t = 13.34$, $p < 0.01$).

under time pressure. Overall, these results imply that subjects do not always take tax-minimizing decisions and that time pressure negatively affects decision-making.

INSERT TABLE 5 HERE

Under H1, we conjecture that biases in tax-planning decisions are not random, but a result of heuristics based on tax-rate salience. We examine this hypothesis by clustering the 16 items into our four item groups. Table 6, Panel A presents the mean of *TAX-MINIMIZING* per item group. For the full sample and in line with H1, we observe the largest proportion of tax-minimizing decisions in the *BASELINE* item group, while the proportion is significantly smaller for *CHANGE_TLCF* and *CHANGE_TD* items. We find a similar pattern for the time-pressure treatment where *CHANGE_TLCF* and *CHANGE_TD* items yield a significantly smaller proportion of tax-minimizing decisions. In the no-time-pressure treatment, however, the mean of *TAX-MINIMIZING* does not differ between item groups.

Panel B presents the mean of *TAX-MINIMIZING* per item. As expected and consistent with H1, we find the smallest proportion of tax minimizing decisions for items 5-8 (*CHANGE_TLCF*) and items 13-16 (*CHANGE_TD*) in the time-pressure treatment. Results for these items in the no-time-pressure treatment are less systematic. Generally, the mean of *TAX-MINIMIZING* is smaller in the time-pressure treatment than in the no-time-pressure treatment. This result holds for all four item groups in Panel A and for 12 out of 16 items in Panel B.

INSERT TABLE 6 HERE

Tax-Rate Salience and Biases in Tax-Planning Decisions

To examine H1 and the effect of tax-rate salience on decision-making in a multivariate setting, we estimate the following logistic regression for decision *i* of subject *j*:

$$ln\frac{P_{TAX\_MINIMIZING}}{1-P_{TAX\_MINIMIZING}}_{i,j} = \alpha + \beta_2 CHANGE\_TLCF + \beta_3 CHANGE\_TD + \beta_4 SYMMETRY + \beta_5 TREATMENT + \beta \sum X_j + \varepsilon, \quad (8)$$

where $P_{TAX\_MINIMIZING_{i,j}} = \frac{e^{(\alpha+\beta_2 CHANGE\_TLCF+\beta_3 CHANGE\_TD+\beta_4 SYMMETRY+\beta_5 TREATMENT+\beta\sum X_j+\varepsilon)}}{1+e^{(\alpha+\beta_2 CHANGE\_TLCF+\beta_3 CHANGE\_TD+\beta_4 SYMMETRY+\beta_5 TREATMENT+\beta\sum X_j+\varepsilon)}}$ denotes the probability that subject *j* takes a tax-minimizing decision in item *i*.

TAX-MINIMIZING is an indicator variable taking the value of one if subject *j* takes a tax-minimizing decision in item *i*, and zero otherwise (i.e. the decision is not tax minimizing). *CHANGE_TCLF*, *CHANGE_TD*, and *SYMMETRY* are indicator variables taking the value of one if the decision belongs to the respective item group, and zero otherwise. α captures the probability of taking a tax-minimizing decision in the *BASELINE* item group. The coefficients for the indicator variables denote the incremental change in the probability of taking a tax-minimizing decision due to a variation in the item group. In line with H1, we expect negative coefficients for β_2 and β_3. *TREATMENT* is an indicator variable taking the value of one for subjects in the time-pressure treatment, and zero otherwise. Vector X_j includes control variables that capture subject *j*'s personal characteristics (i.e. *MALE, AGE, WORK_EXP*, *EDUCATION*, and *CRT*).

Table 7 presents regression results. In column 1, we find that the probability of taking a tax-minimizing decision is significantly lower for *CHANGE_TLCF* (by 14.80 percent) and for *CHANGE_TD* (by 10.90 percent) items than for *BASELINE* items.[18] In line with H1, decision-making in the tax-planning game responds more strongly to changes in tax rates. The tax-rate differential points in the direction of debt financing for *CHANGE_TCLF* and *CHANGE_TD* items, while the size of the tax loss carry-forward causes equity financing to be tax beneficial. This unequal response to tax-rate and tax-base effects indicates a decision bias. As expected, we do not observe significant effects when comparing *BASELINE* to *SYMMETRY* items. Moreover, we do not find an effect of *MALE, AGE, WORK_EXP*, *EDUCATION* and *CRT* on the probability of taking a tax-minimizing decision. These results support H1: Tax-rate salience drives decision-making in the tax-planning game.

[18] We derive these effects by calculating Average Marginal Effects for each independent variable in our logistic regression model while holding the remaining independent variables at their means (untabulated).

Time Constraints and Biases in Tax-Planning Decisions

Under H2, we conjecture that time constraints aggravate the decision bias, as they urge decision makers to rely on heuristics more strongly. Table 7, column 1 indicates that *TREATMENT* significantly reduces the probability of taking a tax-minimizing decision (by 25.3 percent), which suggests that time pressure has a negative effect on decision quality. To investigate the impact of time pressure on the decision bias, we re-estimate Equation (8) for each treatment. Results in columns 2 and 3 support H2. The decision bias exclusively occurs in the time-pressure treatment, where a decision from the *CHANGE_TLCF* item group significantly reduces the probability of taking a tax-minimizing decision as compared to *BASELINE* (by 26.6 percent). The coefficient for *CHANGE_TD* is also significantly negative, which indicates that subjects systematically underestimate tax-base effects. Without time pressure, neither changes in the tax loss carry-forward (*CHANGE_TLCF*) nor changes in the tax-rate differential (*CHANGE_TD*) affect the probability of taking a tax-minimizing decision (column 3).

In an additional test, we retain the full sample and interact the item group variables with *TREATMENT*. In column 4, the interactions *CHANGE_TCLF*TREATMENT* and *CHANGE_TD*TREATMENT* are negative and significant, which is consistent with the previous results. Taken together, our results support H1 and H2: Tax-planning decisions are more strongly biased towards the salient tax-rate differential if decision makers face time pressure.

INSERT TABLE 7 HERE

Personal Experience and Biases in Tax-Planning Decisions

We conjecture under H3 that personal experience of the decision maker mitigates the decision bias. To investigate this hypothesis, we examine the personal characteristics of our subjects and define personal experience as (i) relevant work experience in accounting,

taxation, and/or finance or (ii) education in a specialized graduate program. To achieve a more nuanced analysis, we divide work experience into moderate work experience (less than six months, *MOD_WORK_EXP*) and advanced work experience (more than six months, *ADV_WORK_EXP*). 25.5 percent of our subjects have moderate work experience and 21.3 percent have advanced work experience. 27.0 percent of our subjects study in a specialized graduate program with a focus on accounting, taxation, and/or finance (*EDUCATION*).

Univariate results in Table 8 provide little support for H3. In Panel A, the mean of *TAX-MINIMIZING* for *CHANGE_TLCF* and *CHANGE_TD* items for the full sample does not differ between subjects with moderate or advanced work experience and subjects without work experience. Surprisingly, however, subjects without work experience take significantly more tax-minimizing decisions in the *CHANGE TLCF* item group when facing time pressure. Differences for *CHANGE_TD* items, on the other hand, are not significant. Without time pressure, advanced work experience leads to a somewhat larger proportion of tax-minimizing decisions for *CHANGE_TD* items.

In Panel B, we find that subjects with relevant education exhibit a larger proportion of tax minimizing decisions for *CHANGE_TLCF* and *CHANGE_TD* items in the no-time pressure treatment. We find no effect of education for the full sample or the time-pressure treatment. Taken together, these findings indicate that education increases decision quality in the absence of time pressure, while work experience reduces the proportion of tax-minimizing decisions for *CHANGE_TLCF* items under time pressure.

However, when contrasting the relation between work experience, the self-stated degree of confidence in ones' decisions (*CONF*), and the mean of *TAX-MINIMIZING* in Table 8, we find some evidence for an overconfidence bias in subjects with work experience. Under time pressure and for *CHANGE_TLCF* items, these subjects exhibit a significantly smaller mean of *TAX-MINIMIZING* while indicating a higher confidence in their decisions

than subjects without personal experience. Such a pattern suggests that decision makers with work experience tend to overestimate their abilities, which reinforces the decision bias under time pressure. Subjects with *EDUCATION,* however, do not exhibit such a behavior.

INSERT TABLE 8 HERE

To investigate the effect of personal experience on the decision bias in a multivariate setting, we modify Equation (8) as follows:

$$ln\frac{P_{TAX\_MINIMIZING}}{1-P_{TAX\_MINIMIZING}}_{i,j} = \alpha + \beta_2 CHANGE\_TLCF + \beta_3 CHANGE\_TD + \beta_4 SYMMETRY + \beta_5 CHANGE\_TLCF * \sum EXPERIENCE_j + \beta_6 CHANGE\_TD * \sum EXPERIENCE_j + \beta_7 SYMMETRY * \sum EXPERIENCE_j + \beta_8 TREATMENT + \beta \sum X_j + \varepsilon, \quad (9)$$

$EXPERIENCE_j$ captures personal experience and includes indicator variables for *MOD_WORK_EXP*, *ADV_WORK_EXP*, and *EDUCATION*. α denotes the probability of taking a tax-minimizing decision in the *BASLINE* item group for subject *j* without personal experience. β_5, β_6, and β_7 capture the incremental effect of *CHANGE_TLCF*, *CHANGE_TD* and *SYMMTRY* items, conditional on personal experience. In line with H3, we expect a positive coefficient for β_5 and β_6 in all specifications. *TREATMENT* and the remaining control variables are consistent with Equation (8).

Table 9 presents regression results. We present information for the full sample in columns 1 and 4, the time-pressure treatment in columns 2 and 5, and the no-time-pressure treatment in columns 3 and 6. In line with the mixed inferences above, the coefficient estimates for the interaction terms (e.g., *CHANGE_TLCF*MOD_WORK_EXP*) reveal that work experience and education do not imply a higher probability of taking a tax-minimizing decision in *CHANGE_TLCF* and *CHANGE_TD* item groups. The only significant positive effect of *ADV_WORK_EXP* on the probability of taking a tax-minimizing decision concerns the *CHANGE_TLCF* item group in the no-time-pressure treatment (column 3).

In column 2, we find that under time pressure moderate work experience reinforces the decision bias for *CHANGE_TLCF* and *CHANGE_TD* items, which is contrary to H3 but in line with our univariate evidence. Our results show a reduction in the probability of taking a tax-minimizing decision for *CHANGE_TLCF* (by 22.0 percent) and *CHANGE_TD* (by 19.4 percent) items. Thus, for decision makers with a moderate level of work experience, the probability of taking a tax-minimizing decision in these item groups decreases significantly, while the effect is not significant for decision makers with advanced work experience. Taken together, these results provide little support for H3: Personal experience does not generally mitigate the decision bias in tax-planning decisions. In fact, experienced subjects apply heuristics to a similar extent as inexperienced subjects while subjects with moderate work experience rely on heuristics even more strongly.

INSERT TABLE 9 HERE

Rational Inattention and Biases in Tax-Planning Decisions

We conjecture under H4 that an increase in the tax-burden difference between tax-planning strategies mitigates decision bias. To test our final hypothesis, we evaluate the effect of tax-burden differences and modify Equation (8) as follows:

$$ln\frac{P_{TAX_{MINIMIZING}}}{1-P_{TAX_{MINIMIING}}}{}_{i,j} = \alpha + \beta_2 DELTA\_25000 + \beta_3 DELTA\_60000 + \beta_4 DELTA\_200000 + \beta_5 TREATMENT + \beta \sum X_j + \varepsilon, \quad (10)$$

We estimate Equation (10) separately for *CHANGE_TLCF* and *CHANGE_TD* items. *DELTA_25000*, *DELTA_60000*, and *DELTA_200000* are indicator variables taking the value of one if the decision belongs to the respective item group, and zero otherwise. α captures the probability of taking a tax-minimizing decision for the item with the smallest tax-burden difference (*DELTA_1280)* in the *CHANGE_TLCF* and the *CHANGE_TD* item group, respectively. Coefficients β_2, β_3, and β_4 indicate the incremental change in the probability of taking a tax-minimizing decision due to an increase in the tax-burden difference. In line

with H4, we expect that an increase in the tax-burden difference mitigates the decision bias and predict positive coefficients for β_2, β_3, and β_4. *TREATMENT* and vector X_j are consistent with Equation (8).

Table 10 presents regression results. Columns 1-3 include observations for *CHANGE_TLCF* and columns 4-6 for *CHANGE_TD* items, respectively. We present information for the full sample in columns 1 and 4, the time-pressure treatment in columns 2 and 5, and the no-time-pressure treatment in columns 3 and 6. In columns 1-3, coefficient estimates for the indicator variables indicate that within the *CHANGE_TLCF* item group, *DELTA_200000* items significantly increase the probability of taking a tax-minimizing decision as compared to *DELTA_1280* items. Thus, an increasing tax-burden difference weakly mitigates the decision bias in the full sample and the time-pressure treatment. In contrast to the general decision bias, this finding also holds for the no-time-pressure treatment. In columns 4-6, we find do not find a mitigating effect within *CHANGE_TD* items. The remaining results are consistent with our previous analysis. *TREATMENT* significantly reduces the general probability of taking a tax-minimizing decision for both item groups. Overall, our results provide some support for H4: An increase in the tax-burden difference between tax-planning strategies weakly mitigates the decision bias.

INSERT TABLE 10 HERE

Supplemental Analyses

To provide evidence of the robustness of our main findings and to rule out alternative explanations, we conduct additional tests and report the results in Table 11. Specifically, we rerun Equation (8) on a modified sample. As a first step, we eliminate all subjects who did not correctly answer the *check questions* and did not provide decisions for all 16 items. This step reduces our sample to 79 subjects. In column 1, *CHANGE_TD* is not significant, while the coefficient for *CHANGE_TCLF* remains significantly negative.

In a second step, we drop the requirement of correct *check questions* which extends the initial sample to any observation, irrespective of whether a subject correctly answered the *check questions*. This step yields a sample of 181 subjects. In column 2, we obtain significant negative coefficients for *CHANGE_TLCF* and *CHANGE_TD*. These tests corroborate our main finding that subjects tend to apply heuristics based on tax-rate salience. The decision bias induced by a large tax-rate differential is independent of the sampling procedure.

Interestingly, *CRT*, which captures the outcome of the cognitive reflection test, yields a positive and significant coefficient in column 2. As the coefficient is insignificant in the primary analysis (column 1 in Table 7), subjects with a low degree of reflexivity in decision-making seemingly failed the *check questions*. This result increases our confidence that we excluded subjects who did not comprehend the experimental task from the primary analysis, and that the decision bias does not emerge from a lack of understanding.

Finally, we test whether the distribution underlying our regression models could affect our results and replace the logistic regression under Equation (8) with a probit model.[19] In column 3, we obtain results that are consistent with those of our primary analysis.

INSERT TABLE 11 HERE

Personal Attitude towards Debt Financing

We investigate whether personal attitudes towards debt financing could drive our results and explain the significant proportion of debt choices in *CHANGE_TLCF* and *CHANGE_TD* items (untabulated). Based on eight questions presented in the questionnaire (scale from 0-8), where four concern the debtor side and four the lender side of debt financing, we construct two measures to proxy for these attitudes. Both scales comprise four questions, where higher values indicate a higher propensity towards debt financing. We estimate an OLS regression with the proportion of debt choices per subject as a dependent

[19] Both models apply a maximum likelihood method to estimate coefficients. Logit models assume a logistic distribution (logit-transformation) while probit models assume a normal distribution (probit-transformation).

variable and the debt-attitudes scales and the controls from Equation (8) as independent variables.[20] Our results suggest no significant effect of either the debtor side ($p = 0.93$) or the lender side scale ($p = 0.50$) on the debt choices. Thus, we are confident that personal attitudes towards debt financing do not affect our results and debt preferences do not drive our subjects' decisions.

V. DISCUSSION

This paper examines behavioral aspects of corporate tax planning. We find that tax-rate salience drives tax-planning decisions. Under time constraints, decision makers use salient statutory tax rates as a heuristic and therefore underestimate the economic effects of tax-base changes. This decision bias is largely unaffected by subjects' work experience or education in accounting, taxation, and/or finance. While subjects with relevant work experience indicate high confidence in having identified the tax-minimizing tax-planning strategy, they perform relatively poorly. Finally, we find some evidence for rational inattention in tax-planning decisions, i.e. an increasing tax-burden difference between two tax-planning strategies weakly mitigates the decision bias.

In exploring the behavioral dimension of corporate tax planning, our results offer several implications. First, our findings suggest that tax-planning decisions could be less economically optimal than generally assumed, as decision makers overestimate the economic effects of statutory tax rates. Several real-world tax systems offer optional tax-rate reductions for particular types of income, which come at the cost of limited deduction opportunities. For instance, firms may choose to be taxed on sales rather than on profits. Due to tax-rate salience, decision makers could underestimate the economic consequences of foregone deduction opportunities and take economically suboptimal decisions. This finding complements recent research by Graham et al. (2015), who analyze the relevance of different

[20] A Wilcoxon-Mann-Whitney test suggests that the debtor side scale ($z = 0.289$, $p = 0.773$) and the lender side scale ($z = –0.157$, $p = 0.875$) to not significantly differ between experimental treatments.

types of tax rates for corporate decision-making. Firms that rely on salient average tax rates rather than on more accurate marginal tax rates experience substantial financial losses. Taken together, these results indicate that tax-rate salience could lead to economically suboptimal decisions and contribute to heterogeneity in ETRs and the undersheltering puzzle (Dyreng et al. 2008, Hanlon and Heitzman 2010).

Second, our results indicate that characteristics of the decision environment shape corporate tax-planning decisions. This adds to the finding of Dyreng et al. (2010) who observe that personal characteristics of executives affect a firm's tax-planning strategy (Dyreng et al. 2010) and underlines the importance of effective monitoring strategies for corporate tax-planning decisions. Internal monitoring of tax executives should therefore account for the specific characteristics of a tax-planning decision. This is particularly relevant as non-disclosure of tax-planning strategies in financial statements impedes external monitoring (Camerer and Malmendier 2007). The same applies to tax audits, which might reveal overly aggressive tax-planning strategies but not economically suboptimal decisions.

Third, our findings suggest that scarcity of resources, such as time constraints, aggravates the use of heuristics. If an executive who is neither familiar with the decision framework evaluated by the tax department nor receives sufficient internal information takes a tax-planning decision (Gallemore and Labro 2015), the propensity to apply heuristics increases. Time constraints could induce an overrepresentation of salient information in tax-planning decisions and thus have negative effects on firms' competitiveness, investment and growth (Donohoe et al. 2015). As we find only weak support for rational inattention, decision biases seem not to depend entirely on the tax effects of a tax-planning strategy (Abeler and Jaeger 2015). This indicates that also tax-planning decisions with apparently obvious economic consequences require scrutiny.

Fourth, our results offer a behavioral explanation for evidence that corporate tax revenues in industrialized countries have increased in response to recent tax-rate cutting and base broadening actions (Carone, Schmidt, and Nicodeme 2007). Our findings suggest that, particularly in complex situations (Rupert, Single, and Wright 2003), corporate taxpayers could have underestimated effects of tax-base broadening (e.g., limitations for the use of tax loss carry-forward) and insufficiently adapted their tax-planning strategies. This seems plausible as the public debate on taxation focuses more strongly on tax-rate than on tax-base changes, which contributes to tax-rate salience.

Fifth, our experiment is one of the first studies to examine causal effects in corporate tax-planning decisions. As archival data on corporate decision-making is not always available to accounting researchers, laboratory experiments offer several avenues for future research. Potential future studies, for instance, may examine the effects of external advisors and varying degrees of expertise, reputational risk, or compensation on corporate tax-planning decisions.

The validity of findings from laboratory experiments is sometimes questioned. With regard to our study, tax executives and advanced business students could differ in the way they approach tax-planning decisions. Although we do not exclusively investigate tax professionals, a significant proportion of our subjects have work experience or relevant education in the fields of accounting, taxation, and/or finance. Inexperienced subjects do not exhibit systematically different behavioral patterns to those of experienced subjects. This increases our confidence in the validity of our findings. Moreover, several studies argue that laboratory experiments are externally valid, if they are designed appropriately and contain clear instructions (e.g., Bloomquist 2009), because subjects experience real emotions, perceive their behavior as relevant, and face economic consequences for their decisions (Falk and Heckman 2009). For tax experiments, Alm, Bloomquist, and McKee (2015) find that decision-making in laboratory settings corresponds to decisions in naturally occurring

situations and that students and non-students respond similarly to experimental treatments. Likewise, student decision-making does not systematically deviate from that of professionals in accounting and management (Depositario, Nayga, Wu, and Laude 2009, Liyanarachchi 2007, Remus 1996, Ashton and Kramer 1980) if, as in our case, the integrative complexity of an experimental task is low (Elliot, Hodge, Kennedy, and Pronk 2007).

Although laboratory experiments offer valuable insights into the behavioral dimension of tax-planning decisions, we are unable to model all aspects of decision-making. In practice, several factors affect tax-planning decisions, including external consultants, liquidity aspects, risk considerations, managerial incentives, and accounting consequences. Given our interest in the causal effect of tax-rate and tax-base changes, we do not address these dimensions. Nonetheless, we fully acknowledge their relevance.

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APPENDIX – VARIABLES

Dependent Variable	
TAX_MINIMIZING; TM	Indicator variable taking the value of one if subject *j* takes a tax-minimizing decision in item *i*, and zero otherwise (i.e. the decision is not tax minimizing).
Confidence Variable	
CONF	Self-stated degree of confidence in having identified the tax-minimizing form of intra-group financing for item *i* (scale: 0-8).
Treatment Variable	
TREATMENT	Indicator variable taking the value of one if subject *j* was allocated to the time-pressure treatment, and zero otherwise (i.e. subject *j* was allocated to the no-time-pressure treatment).
Item-Group Variables	
BASELINE	Indicator variable taking the value of one if item *i* belongs to the *BASELINE* item group (items 1-4), and zero otherwise.
CHANGE_TLCF	Indicator variable taking the value of one if item *i* belongs to the *CHANGE_TLCF* item group (items 5-8), and zero otherwise.
CHANGE_TD	Indicator variable taking the value of one if item *i* belongs to the *CHANGE_TD* item group (items 13-16), and zero otherwise.
SYMMETRY	Indicator variable taking the value of one if item *i* belongs to the *SYMMETRY* item group (items 9-12), and zero otherwise.
DELTA_1280	Indicator variable taking the value of one if item *i* belongs to the *DELTA_1280* item group (items 4, 5, 12, and 13), and zero otherwise.
DELTA_25000	Indicator variable taking the value of one if item *i* belongs to the *DELTA_25000* item group (items 3, 6, 11, and 14), and zero otherwise.
DELTA_60000	Indicator variable taking the value of one if item *i* belongs to the *DELTA_60000* item group (items 2, 7, 10, and 15), and zero otherwise.
DELTA_200000	Indicator variable taking the value of one if item *i* belongs to the *DELTA_200000* item group (items 1, 8, 9, and 16), and zero otherwise.

Personal Experience Variables

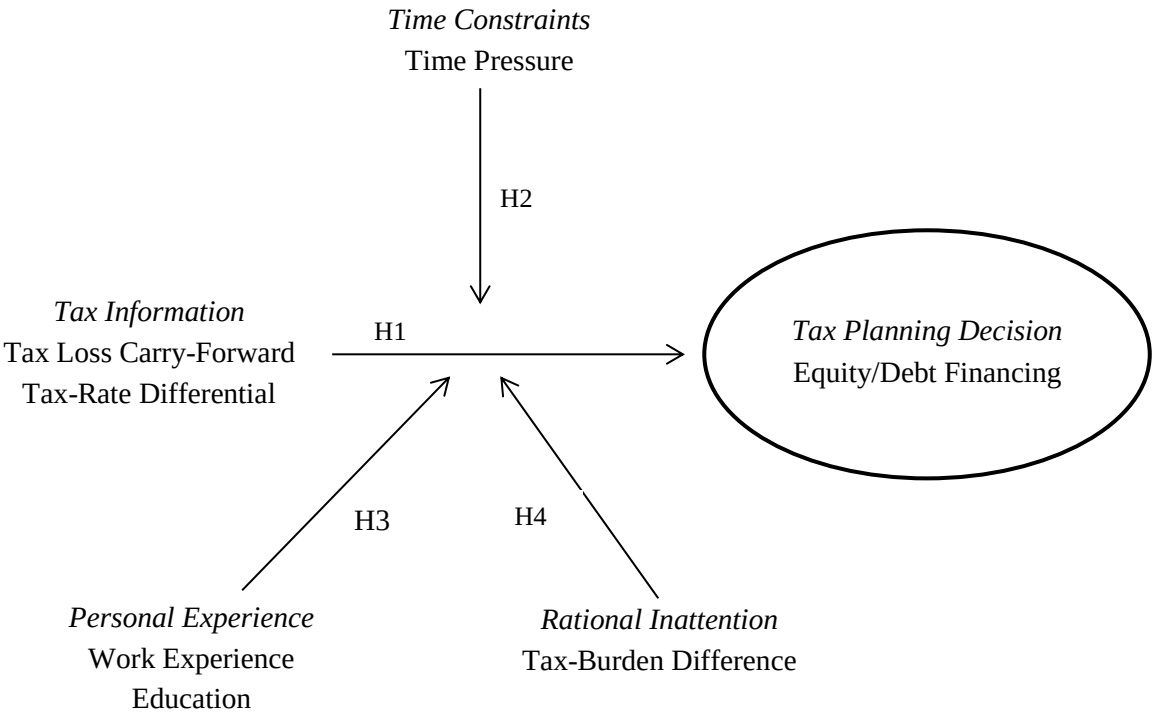
WORK_EXP	Indicator variable taking the value of one if subject *j* has at least one month of work experience in the area of accounting, taxation, and/or finance, and zero otherwise (i.e. *NO_WORK_EXP*).
MOD_WORK_EXP	Indicator variable taking the value of one if subject *j* has less than six months of work experience in the area of accounting, taxation, and/or finance, and zero otherwise.
ADV_WORK_EXP	Indicator variable taking the value of one if subject *j* has more than six months of work experience in the area of accounting, taxation, and/or finance, and zero otherwise.
EDUCATION	Indicator variable taking the value of one if subject *j* is studying in a program with a specific focus on accounting, taxation, and/or finance, and zero otherwise (i.e. *NO_EDUCATION*).

Additional Control Variables

MALE	Indicator variable taking the value of one if subject *j* is male, and zero otherwise.
AGE	Discrete variable for the age of subject *j*.
CRT	Indicator variable taking the value of one if subject *j* has correctly answered all three questions of the cognitive reflection test based on Frederick (2005), and zero otherwise.

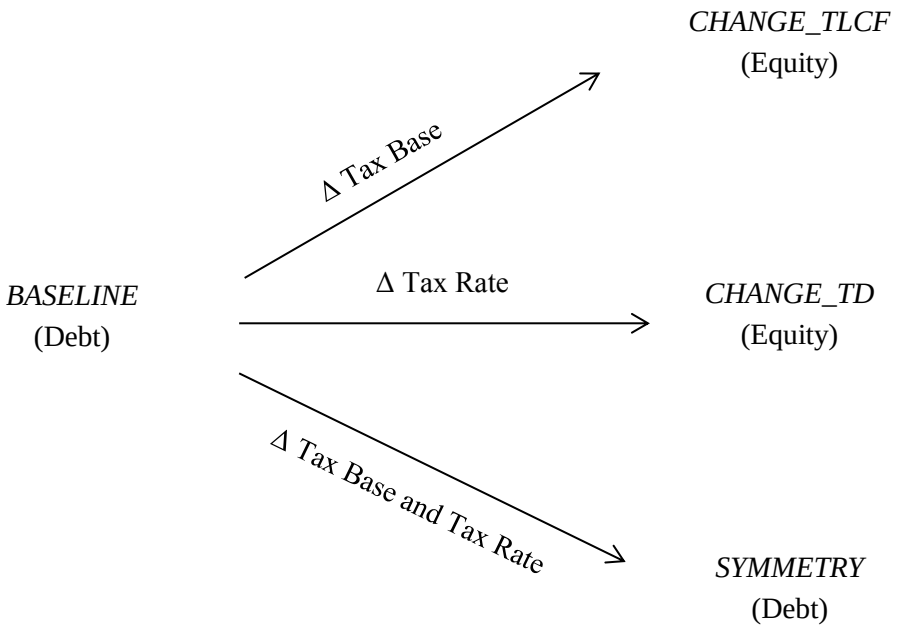
FIGURES AND TABLES

FIGURE 1: Theoretical Framework



Note: This figure presents the theoretical framework and summarizes our hypotheses. Under H1, we conjecture that subjects overestimate the economic effects of the salient tax-rate differential, which leads to a bias in tax-planning decisions. H2 examines the effect of time constraints which we expect to increase the decision bias. H3 concerns the effect of personal experience and H4 the effect of the tax-burden difference on the decision bias. We hypothesize that work experience, education, and an increasing tax burden difference mitigate the decision bias induced by tax-rate salience. We model tax planning by a series of choices between equity and debt financing.

FIGURE 2: Experimental Design



Note: This figure presents a schematic overview on the experimental design. *BASELINE*, *CHANGE_TLCF*, *CHANGE_TD*, and *SYMMETRY* are item groups each including four of our 16 tax-planning tasks (items). Relative to *BASELINE*, we systematically change the tax base (*CHANGE_TCLF*) and the tax rates (*CHANGE_TD*) so that equity financing is the tax-minimizing strategy for these item groups. A simultaneous change in the tax base and the tax rates (*SYMMETRY*) does not alter the tax-minimizing strategy. We indicate the tax-minimizing strategy for each item group in parentheses.

TABLE 1: Tax-Minimizing Strategy for Intra-Group Financing

Tax Loss Carry-Forward	Factor θ	Tax-Rate Differential	Tax-Minimizing Strategy
$L_b \leq (\pi_b - I)$	1	d < 0	Equity
$L_b \leq (\pi_b - I)$	1	d = 0	Indifference
$L_b \leq (\pi_b - I)$	1	d > 0	Debt
$L_b > (\pi_b - I)$	$(\pi_b - I)/L_b$	d ≤ 0	Equity
$L_b > (\pi_b - I)$	$(\pi_b - I)/L_b$	d > 0	Conditional on d and L_b

Note: This table presents the dominant strategy for tax planning through intra-group financing (i.e. equity or debt financing). π_b describes the income of the subsidiary before deducting interest payments on intra-group debt and a tax loss carry-forward. I captures interest payments on intra-group debt provided by the parent company. L_b denotes the subsidiary's tax loss carry-forward. θ denotes the fraction of the subsidiary's tax loss carry-forward which can be offset against taxable profits after the deduction of interest payments I. d refers to the tax-rate differential (i.e. the difference in statutory tax rates) between the subsidiary and the parent company.

TABLE 2: Information on 16 Items and Four Item Groups

PANEL A: Tax Parameters for the 16 Items

Item	1
Tax rate: subsidiary	0.500
Tax rate: parent	0.200
Tax loss carry-forward	2,400,000
Δ Group tax burden from equity	+200,000

Item	2
Tax rate: subsidiary	0.500
Tax rate: parent	0.200
Tax loss carry-forward	2,680,000
Δ Group tax burden from equity	+60,000

Item	3
Tax rate: subsidiary	0.500
Tax rate: parent	0.200
Tax loss carry-forward	2,750,000
Δ Group tax burden from equity	+25,000

Item	4
Tax rate: subsidiary	0.500
Tax rate: parent	0.200
Tax loss carry-forward	2,797,430
Δ Group tax burden from equity	+1,285

Item	5
Tax rate: subsidiary	0.500
Tax rate: parent	0.200
Tax loss carry-forward	2,802,570
Δ Group tax burden from equity	-1,285

Item	6
Tax rate: subsidiary	0.500
Tax rate: parent	0.200
Tax loss carry-forward	2,850,000
Δ Group tax burden from equity	-25.000

Item	7
Tax rate: subsidiary	0.500
Tax rate: parent	0.200
Tax loss carry-forward	2,920,000
Δ Group tax burden from equity	-60,000

Item	8
Tax rate: subsidiary	0.500
Tax rate: parent	0.200
Tax loss carry-forward	3,200,000
Δ Group tax burden from equity	-200.000

Item	9
Tax rate: subsidiary	0.388
Tax rate: parent	0.037
Tax loss carry-forward	3,200,000
Δ Group tax burden from equity	+200,000

Item	10
Tax rate: subsidiary	0.518
Tax rate: parent	0.166
Tax loss carry-forward	2,920,000
Δ Group tax burden from equity	+60,000

Item	11
Tax rate: subsidiary	0.556
Tax rate: parent	0.205
Tax loss carry-forward	2,850,000
Δ Group tax burden from equity	+25,000

Item	12
Tax rate: subsidiary	0.584
Tax rate: parent	0.233
Tax loss carry-forward	2,802,570
Δ Group tax burden from equity	+1,260

Item	13
Tax rate: subsidiary	0.201
Tax rate: parent	0.081
Tax loss carry-forward	2,797,430
Δ Group tax burden from equity	-1,283

Item	14
Tax rate: subsidiary	0.220
Tax rate: parent	0.100
Tax loss carry-forward	2,750,000
Δ Group tax burden from equity	-25,000

Item	15
Tax rate: subsidiary	0.250
Tax rate: parent	0.130
Tax loss carry-forward	2,680,000
Δ Group tax burden from equity	-60,000

Item	16
Tax rate: subsidiary	0.400
Tax rate: parent	0.280
Tax loss carry-forward	2,400,000
Δ Group tax burden from equity	-200,000

PANEL B: Tax Parameters for the Four Item Groups

Item Groups	*BASELINE*	*CHANGE_TLCF*	*CHANGE_TD*	*SYMMETRY*
Items	1, 2, 3, 4	5, 6, 7, 8	13, 14, 15, 16	9, 10, 11, 12
Tax loss carry-forward	Increasing	increasing	decreasing	decreasing
Tax-rate differential	High	high	low	high
Tax-minimizing strategy	Debt	equity	equity	debt

Item Groups	*DELTA_1280*	*DELTA_25000*	*DELTA_60000*	*DELTA_200000*
Items	4, 5, 12, 13	3, 6, 11, 14	2, 7, 10, 15	1, 8, 9, 16
Tax-burden difference between tax-minimizing and suboptimal strategy	ECU 1,280	ECU 25,000	ECU 60,000	ECU 200,000

Note: This table presents the 16 items used in the experimental testing (Panel A) and the four item groups including these 16 items (Panel B). We also present the main properties of these item groups. Items 1-4 belong to *BASELINE*, items 5-8 to *CHANGE_TLCF*, items 9-12 to *SYMMETRY*, and items 13-16 to *CHANGE_TD*. *Items* corresponds with the item numbers in Panel A.

TABLE 3: Sample Selection

PANEL A: Sample Selection (Subject Level)

Treatment	Full Sample	No Time Pressure	Time Pressure
Observations: Initial Sample	185	77	108
Check Questions Failed	-40	-18	-22
No Decisions Taken	-4	0	-4
Observations: Final Sample	**141**	**59**	**82**

PANEL B: Sample Selection (Item Level)

Treatment	Full Sample	No Time Pressure	Time Pressure
Observations: Initial Decisions	2,960	1,232	1,728
Check Questions Failed	-640	-288	-352
Missing Observations	-296	-3	-293
Observations: Final Sample	**2,024**	**941**	**1,083**

Note: This table presents the sample selection procedure on subject level (Panel A) and item level (Panel B). We present information for the full sample, the no-time-pressure treatment, and the time-pressure treatment. *Initial Decisions* denotes the hypothetical number of decisions taken if each subjects would have responded to all 16 tax-planning decisions. We exclude tax-planning decisions from the primary analysis if the subject failed to correctly answer the check questions *(Check Questions Failed)*. Additionally, we exclude observations if the subject did not take at least one tax-planning decision *(No Decisions Taken/Missing Observations)* or failed to take certain decisions in the time-pressure treatment *(Missing Observations)*.

TABLE 4: Demographic Data

Treatment	Full Sample	Time Pressure	No Time Pressure	Δ p-Value
MALE	46.10%	42.68%	50.85%	0.337
AGE	25.09	25.15	25.00	0.898
	(5.42)	(5.82)	(4.86)	
EDUCATION	26.95%	32.93%	18.64%	0.059*
WORK_EXP	46.81%	46.34%	47.46%	0.896
CRT	1.44	1.49	1.44	0.799
	(1.20)	(1.22)	(1.18)	

Note: This table presents demographic data for the full sample, the time-pressure treatment, and the no-time-pressure treatment. *MALE* denotes the percentage of male subjects, *AGE* the mean age of subjects, *EDUCATION* the percentage of subjects that study in a program with a specific focus on accounting, taxation, and/or finance. *WORK_EXP* denotes the percentage of subjects that have more than 1 month of work experience in the field of accounting, taxation and/or finance and *CRT* indicates the mean score of the cognitive reflection test (Frederick 2005; scale: 0-3). We provide standard deviations of ordinal and interval variables in parentheses. We apply a Wilcoxon-Mann-Whitney-Test to test for differences between subsamples (i.e. time-pressure and no-time-pressure treatment) for ordinal and interval variables (*AGE*, *CRT*) and a Chi^2-Test for categorical variables (*MALE*, *EDUCATION*, *WORK_EXP*). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed).

TABLE 5: Tax-Minimizing Decisions per Treatment

Treatment	Observations	*TAX-MINIZING*	SD	Min	Max	25th percentile	Median	75th percentile
Full Sample	2,012	0.668	0.000	0.000	0.000	0.000	0.000	0.000
Time Pressure	1,083	0.580	0.191	0.000	1.000	0.500	0.563	0.692
No Time Pressure	941	0.839	0.195	0.313	1.000	0.688	0.688	1.000
Δ		0.259***						
p-Value		< 0.000						

Note: This table presents the distribution of the mean proportion of tax-minimizing decisions *(TAX-MINIMIZING)* per subject aggregated at the treatment level. We calculate *TAX-MINIMIZING* as the number of tax-minimizing decisions relative to the total number of decisions taken per subject and present information for the full sample, the time-pressure treatment, and the no-time-pressure treatment. We apply a two-sample t-test to test for differences (Δ) in means between treatments (i.e. time-pressure and no-time-pressure treatment). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed).

TABLE 6: Tax-Minimizing Decisions per Item Group and Item

PANEL A: Tax-Minimizing Decisions per Item Group

Treatment	Full Sample	Time Pressure	No Time Pressure	Δ	p-Value
Item Group	*TAX-MINIMIZING*	*TAX-MINIMIZING*	*TAX-MINIMIZING*		
BASELINE	0.774	0.715	0.843	0.127***	< 0.000
CHANGE_TLCF	0.624	0.441	0.835	0.394***	< 0.000
Δ	0.150***	0.274***	0.008		
p-Value	< 0.000	< 0.000	0.409		
BASELINE	0.774	0.715	0.843	0.127***	< 0.000
CHANGE_TD	0.667	0.515	0.843	0.328***	< 0.000
Δ	0.107***	0.201***	0.000		
p-Value	< 0.000	< 0.000	0.500		
BASELINE	0.774	0.715	0.843	0.127***	< 0.000
SYMMETRY	0.754	0.679	0.838	0.159***	< 0.000
Δ	0.020	0.036	0.004		
p-Value	0.227	0.181	0.450		

PANEL B: Tax-Minimizing Decisions per Item

Treatment	Full Sample	Time Pressure	No Time Pressure	Δ	p-Value
Item	*TAX-MINIMIZING*	*TAX-MINIMIZING*	*TAX-MINIMIZING*		
ITEM 1	0.773	0.739	0.814	0.074	0.156
ITEM 2	0.813	0.723	0.914	0.191***	0.003
ITEM 3	0.767	0.700	0.847	0.147**	0.024
ITEM 4	0.744	0.700	0.797	0.097	0.107
ITEM 5	0.567	0.382	0.780	0.397***	< 0.000
ITEM 6	0.600	0.424	0.797	0.372***	< 0.000
ITEM 7	0.609	0.435	0.814	0.379***	< 0.000
ITEM 8	0.719	0.522	0.949	0.427***	< 0.000
ITEM 9	0.746	0.716	0.780	0.063	0.210
ITEM 10	0.773	0.667	0.898	0.232***	0.001
ITEM 11	0.773	0.739	0.814	0.074	0.160
ITEM 12	0.720	0.583	0.862	0.279***	< 0.000
ITEM 13	0.624	0.493	0.776	0.283***	< 0.001
ITEM 14	0.683	0.493	0.898	0.406***	< 0.000
ITEM 15	0.719	0.594	0.864	0.270***	< 0.000
ITEM 16	0.641	0.478	0.831	0.352**	< 0.000

Note: This table presents the mean proportion of tax-minimizing decisions *(TAX-MINIMIZING)* aggregated at the item-group level (i.e. *BASELINE*, *CHANGE_TLCF*, *CHANGE_TD*, and *SYMMETRY*) in Panel A and the item level in Panel B. We calculate *TAX-MINIMIZING* as the number of tax-minimizing decisions relative to the total number of decisions taken per item group (item) and present information for the full sample, the time-pressure treatment, and the no-time-pressure treatment. The definition of items (item groups) follows Panel A (B) of Table 2. We apply a two-sample t-test to test for differences (Δ) in means between item groups and treatments (i.e. time-pressure and no-time-pressure treatment). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed).

TABLE 7: Regressions Results for H1 and H2

	(1) Coef. (SE)	(2) Coef. (SE)	(3) Coef. (SE)	(4) Coef. (SE)
Variables	*TM*	*TM*	*TM*	*TM*
CHANGE_TLCF	-0.795***	-1.162***	-0.058	-0.057
	(0.216)	(0.271)	(0.354)	(0.342)
CHANGE_TD	-0.585***	-0.862***	-0.003	-0.001
	(0.192)	(0.222)	(0.348)	(0.338)
SYMMETRY	-0.135	-0.173	-0.033	-0.032
	(0.134)	(0.171)	(0.185)	(0.179)
TREATMENT	-1.359***			-0.782***
	(0.202)			(0.299)
*CHANGE_TLCF*TREATMENT*				-1.110**
				(0.436)
*CHANGE_TD*TREATMENT*				-0.865**
				(0.405)
*SYMMETRY*TREATMENT*				-0.147
				(0.248)
MALE	0.260	0.216	0.369	0.264
	(0.160)	(0.148)	(0.399)	(0.162)
AGE	-0.005	0.005	-0.020	-0.004
	(0.012)	(0.011)	(0.017)	(0.012)
EDUCATION	0.296	0.138	1.116*	0.300
	(0.195)	(0.208)	(0.641)	(0.197)
WORK_EXP	0.030	-0.017	0.044	0.029
	(0.187)	(0.196)	(0.386)	(0.188)
CRT	0.235	0.091	0.611	0.237
	(0.187)	(0.182)	(0.547)	(0.189)
Constant	1.939***	0.645**	1.705***	1.536***
	(0.356)	(0.282)	(0.543)	(0.377)
Observations	2,024	1,083	941	2,024
Pseudo R^2	0.089	0.043	0.038	0.096

Note: We estimate the logistic regression specified under Equation (8) and report regression coefficients. Regressions for column 1 and 4 include the full sample, for column 2 the time-pressure treatment, and for column 3 the no-time-pressure treatment. *TM (TAX-MINIMIZING)* is the dependent variable and takes the value of one if subject *j* takes a tax-minimizing decision in item *i*. *CHANGE_TLCF*, *CHANGE_TD*, and *SYMMETRY* are indicator variables taking the value of one if item *i* belongs to the respective item group. *TREATMENT* is an indicator variable taking the value of one for observations from the time-pressure treatment. *MALE* is an indicator variable taking the value of one for male subjects, *AGE* is the age of a subject, *EDUCATION* is an indicator variable taking the value of one for a subject studying in a program with a specific focus on accounting, taxation, and/or finance. *WORK_EXP* is an indicator variable taking the value of one for a subject with more than 1 month of work experience in the field of accounting, taxation and/or finance. *CRT* is an indicator variable taking the value of one for a subject that has correctly solved all three questions of the cognitive reflection test (Frederick 2005). We estimate robust standard errors clustered on a subject-level (provided in parentheses). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed).

TABLE 8: Tax-Minimizing Decisions for *CHANGE_TLCF* and *CHANGE_TD*

PANEL A: Conditional on Work Experience (per Item Group)

Treatment	Full Sample		Time Pressure		No Time Pressure	
CHANGE_TLCF	*TAX-MINIMIZING*	*CONF*	*TAX-MINIMIZING*	*CONF*	*TAX-MINIMIZING*	*CONF*
NO_WORK_EXP	0.621	4.429	0.496	3.448	0.798	5.758
MOD_WORK_EXP	0.556	6.145	0.325	4.886	0.844	7.641
Δ	0.066	-1.716***	0.171**	-1.438**	-0.045	-1.883***
p-Value	0.199	< 0.001	0.033	0.017	0.325	0.002
NO_WORK_EXP	0.621	4.429	0.496	3.448	0.798	5.758
ADV_WORK_EXP	0.561	5.463	0.324	4.686	0.917	6.563
Δ	0.060	-1.033**	0.172**	-1.238**	-0.118	-0.804
p-Value	0.235	0.030	0.040	0.028	0.127	0.155
MOD_WORK_EXP	0.556	6.145	0.325	4.886	0.844	7.641
ADV_WORK_EXP	0.561	5.463	0.324	4.686	0.917	6.563
Δ	-0.006	0.683	0.001	0.200	-0.073	1.078**
p-Value	0.478	0.112	0.497	0.397	0.219	0.012

Treatment	Full Sample		Time Pressure		No Time Pressure	
CHANGE_TD	*TAX-MINIMIZING*	*CONF*	*TAX-MINIMIZING*	*CONF*	*TAX-MINIMIZING*	*CONF*
NO_WORK_EXP	0.623	4.320	0.511	3.236	0.782	5.823
MOD_WORK_EXP	0.616	5.785	0.396	4.325	0.891	7.609
Δ	0.008	-1.465***	0.116	-1.089**	-0.108	-1.787***
p-Value	0.459	0.003	0.105	0.038	0.117	0.003
NO_WORK_EXP	0.623	4.320	0.511	3.236	0.782	5.823
ADV_WORK_EXP	0.683	5.290	0.519	4.623	0.931	6.236
Δ	-0.060	-0.970**	-0.007	-1.386**	-0.148*	-0.414
p-Value	0.208	0.036	0.468	0.011	0.065	0.300
MOD_WORK_EXP	0.616	5.785	0.396	4.325	0.891	7.609
ADV_WORK_EXP	0.683	5.290	0.519	4.623	0.931	6.236
Δ	-0.068	0.494	-0.123	-0.298	-0.040	1.373***
p-Value	0.231	0.203	0.143	0.350	0.292	0.009

(continued on next page)

PANEL B: Conditional on Education (per Item Group)

Treatment	Full Sample		Time Pressure		No Time Pressure	
CHANGE_TLCF	*TAX-MINIMIZING*	*CONF*	*TAX-MINIMIZING*	*CONF*	*TAX-MINIMIZING*	*CONF*
NO_EDUCATION	0.606	4.837	0.435	3.656	0.802	6.167
EDUCATION	0.553	5.812	0.380	4.997	0.977	7.591
Δ	0.053	-0.974**	0.055	-1.341***	-0.175**	-1.424**
p-Value	0.234	0.025	0.251	0.010	0.038	0.022

CHANGE_TD	*TAX-MINIMIZING*	*CONF*	*TAX-MINIMIZING*	*CONF*	*TAX-MINIMIZING*	*CONF*
NO_EDUCATION	0.644	4.726	0.498	3.472	0.811	6.111
EDUCATION	0.607	5.368	0.457	4.454	0.977	7.614
Δ	0.037	-0.642*	0.042	-0.982**	-0.167**	-1.503**
p-Value	0.295	0.092	0.299	0.032	0.033	0.017

Note: This table presents the mean proportion of tax-minimizing decisions *(TAX-MINIMIZING)* aggregated on the item-group level and conditional on work experience (Panel A) and education (Panel B). We display information for the *CHANGE_TLCF* item group and the *CHANGE_TD* item group. We calculate *TAX-MINIMIZING* as the number of tax-minimizing decisions relative to the total number of decisions taken per item group and present information for the full sample, the time-pressure treatment, and the no-time-pressure treatment. The definition of item groups follows Panel B of Table 2. *CONF* is the mean of the self-stated degree of confidence in having identified the tax-minimizing form of intra-group financing for a particular item (scale: 0-8). We calculate the mean of indicated confidence per item group. *NO_WORK_EXP* denotes subjects who do not have work experience in the field of accounting, taxation, and/or finance while *MOD_WORK_EXP* includes subjects who have less than six months of relevant work experience. *ADV_WORK_EXP* involves subjects who have more than six months of relevant work experience. *EDUCATION* includes subjects who study in a graduate program for accounting, taxation, and/or finance, while *NO_EDUCATION* refers to subjects without relevant education. We perform a two-sample t-test to test for differences (Δ) in means between groups. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed).

TABLE 9: Regressions Results for H3

	(1) Coef. (SE)	(2) Coef. (SE)	(3) Coef. (SE)	(4) Coef. (SE)	(5) Coef. (SE)	(6) Coef. (SE)
Variables	*TM*	*TM*	*TM*	*TM*	*TM*	*TM*
CHANGE_TLCF	-0.504*	-0.542	-0.410	-0.782***	-1.128***	-0.206
	(0.263)	(0.333)	(0.415)	(0.248)	(0.332)	(0.353)
CHANGE_TD	-0.492**	-0.471*	-0.511	-0.533**	-0.751***	-0.149
	(0.239)	(0.282)	(0.419)	(0.219)	(0.265)	(0.348)
SYMMETRY	-0.222	-0.251	-0.141	-0.189	-0.259	-0.038
	(0.195)	(0.248)	(0.300)	(0.162)	(0.217)	(0.206)
TREATMENT	-1.368***			-1.360***		
	(0.203)			(0.202)		
*CHANGE_TLCF*MOD_WORK_EXP*	-0.799	-1.893***	0.774			
	(0.572)	(0.710)	(0.835)			
*CHANGE_TLCF*ADV_WORK_EXP*	-0.465	-0.991	0.880			
	(0.552)	(0.694)	(1.023)			
*CHANGE_TD*MOD_WORK_EXP*	-0.449	-1.498***	1.298			
	(0.535)	(0.579)	(0.877)			
*CHANGE_TD*ADV_WORK_EXP*	0.071	-0.313	1.236*			
	(0.435)	(0.515)	(0.675)			
*SYMMETRY*MOD_WORK_EXP*	-0.018	-0.234	0.174			
	(0.281)	(0.390)	(0.363)			
*SYMMETRY*ADV_WORK_EXP*	0.515	0.589	0.356			
	(0.365)	(0.460)	(0.564)			
*CHANGE_TLCF*EDUCATION*				-0.050	-0.113	1.921
				(0.495)	(0.573)	(1.447)
*CHANGE_TD*EDUCATION*				-0.206	-0.369	1.864
				(0.447)	(0.478)	(1.445)
*SYMMETRY*EDUCATION*				0.207	0.273	0.038
				(0.275)	(0.342)	(0.385)
MALE	0.267*	0.234	0.349	0.261	0.218	0.370
	(0.160)	(0.152)	(0.388)	(0.160)	(0.148)	(0.401)
AGE	-0.014	0.001	-0.032	-0.005	0.005	-0.020
	(0.013)	(0.015)	(0.021)	(0.012)	(0.011)	(0.017)
EDUCATION	0.261	0.111	1.036*	0.321	0.208	0.450
	(0.199)	(0.226)	(0.617)	(0.364)	(0.367)	(0.860)
WORK_EXP				0.028	-0.022	0.044
				(0.187)	(0.195)	(0.387)
MOD_WORK_EXP	0.246	0.912**	-0.847			
	(0.429)	(0.464)	(0.631)			
ADV_WORK_EXP	0.277	0.317	0.021			
	(0.389)	(0.462)	(0.590)			
CRT	0.211	0.067	0.707	0.236	0.093	0.613
	(0.190)	(0.186)	(0.594)	(0.187)	(0.183)	(0.550)
Constant	2.088***	0.494	2.281***	1.933***	0.628**	1.783***
	(0.391)	(0.401)	(0.643)	(0.352)	(0.288)	(0.530)
Observations	2,024	1,083	941	2,024	1,083	941
Pseudo R^2	0.095	0.064	0.058	0.089	0.044	0.047

Note: We estimate the logistic regression specified under Equation (9) and report regression coefficients. Regressions for columns 1 and 4 include the full sample, for columns 2 and 5 the time-pressure treatment, and for columns 3 and 6 the no-time-pressure treatment. *TM (TAX-MINIMIZING)* is the dependent variable and takes the value of one if subject *j* takes a tax-minimizing decision in item *i*. *CHANGE_TLCF*, *CHANGE_TD*, and *SYMMETRY* are indicator variables taking the value of one if item *i* belongs to the respective item group. *TREATMENT* is an indicator variable taking the value of one for observations from the time-pressure treatment. *MALE* is an indicator variable taking the value of one for male subjects, *AGE* is the age of a subject, *EDUCATION* is an indicator variable taking the value of one for a subject studying in a program with a specific focus on accounting, taxation, and/or finance. *WORK_EXP* is an indicator variable taking the value of one for a subject with more than 1 month of work experience in the field of accounting, taxation and/or finance. *MOD_WORK_EXP* is an indicator variable taking the value of one for a subject that has between 1 and 6 months of work experience in the field of accounting, taxation and/or finance. *ADV_WORK_EXP* is an indicator variable taking the value of one for a subject that has more than 6 months of work experience in the field of accounting, taxation and/or finance. *CRT* is an indicator variable taking the value of one for a subject that has correctly solved all three questions of the cognitive reflection test (Frederick 2005). We estimate robust standard errors clustered on a subject-level (provided in parentheses). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed).

TABLE 10: Regressions Results for H4

	(1) Coef. (SE)	(2) Coef. (SE)	(3) Coef. (SE)	(4) Coef. (SE)	(5) Coef. (SE)	(6) Coef. (SE)
Variables	*TM*	*TM*	*TM*	*TM*	*TM*	*TM*
TREATMENT	-2.017***			-1.647***		
	(0.325)			(0.301)		
DELTA_25000	0.169	0.205	0.113	0.296	0.017	1.006***
	(0.254)	(0.350)	(0.341)	(0.245)	(0.328)	(0.364)
DELTA_60000	0.223	0.232	0.232	0.503*	0.423	0.662
	(0.218)	(0.313)	(0.232)	(0.275)	(0.340)	(0.460)
DELTA_200000	0.838***	0.623*	1.772***	0.085	-0.063	0.381
	(0.248)	(0.322)	(0.534)	(0.255)	(0.332)	(0.385)
MALE	0.076	0.025	0.171	0.268	0.234	0.330
	(0.309)	(0.316)	(0.758)	(0.259)	(0.273)	(0.605)
AGE	-0.052	-0.030	-0.051	0.008	0.020	0.000
	(0.033)	(0.024)	(0.063)	(0.015)	(0.017)	(0.030)
EDUCATION	0.540	0.603	2.247**	0.183	0.049	2.158**
	(0.336)	(0.435)	(1.115)	(0.298)	(0.405)	(0.985)
WORK_EXP	-0.465	-1.012**	0.285	0.027	-0.339	0.704
	(0.364)	(0.418)	(0.747)	(0.299)	(0.386)	(0.589)
CRT	0.083	-0.261	0.962	0.173	-0.046	0.780
	(0.292)	(0.316)	(0.873)	(0.275)	(0.321)	(0.729)
Constant	2.762***	0.560	1.968	1.046**	-0.496	0.422
	(0.858)	(0.657)	(1.747)	(0.483)	(0.488)	(0.973)
Observations	508	272	236	507	272	235
Pseudo R^2	0.169	0.050	0.141	0.109	0.014	0.106

Note: We estimate the logistic regression specified under Equation (10) and report regression coefficients. Regressions for columns 1 and 4 include the full sample, for columns 2 and 5 the time-pressure treatment, and for columns 3 and 6 the no-time-pressure treatment. Regressions for columns 1-3 include observations from the *CHANGE_TLCF* item group and for columns 4-6 from the *CHANGE_TD* item group. *TM (TAX-MINIMIZING)* is the dependent variable and takes the value of one if subject *j* takes a tax-minimizing decision in item *i*. *TREATMENT* is an indicator variable taking the value of one for observations from the time-pressure treatment. *DELTA_25000*, *DELTA_60000*, and *DELTA_200000* are indicator variables taking the value of one if item *i* belongs to the respective groups. *MALE* is an indicator variable taking the value of one for male subjects, *AGE* is the age of a subject, *EDUCATION* is an indicator variable taking the value of one for a subject studying in a program with a specific focus on accounting, taxation, and/or finance. *WORK_EXP* is an indicator variable taking the value of one for a subject with more than 1 month of work experience in the field of accounting, taxation and/or finance. *CRT* is an indicator variable taking the value of one for a subject that has correctly solved all three questions of the cognitive reflection test (Frederick 2005). We estimate robust standard errors clustered on a subject-level (provided in parentheses). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed).

TABLE 11: Regression Results for Supplemental Analyses

	(1) Coef. (SE)	(2) Coef. (SE)	(3) Coef. (SE)
Variables	*TM*	*TM*	*TM*
CHANGE_TLCF	-0.522*	-0.586***	-0.454***
	(0.307)	(0.185)	(0.126)
CHANGE_TD	-0.276	-0.341**	-0.330***
	(0.301)	(0.161)	(0.113)
SYMMETRY	-0.153	-0.067	-0.076
	(0.187)	(0.116)	(0.076)
TREATMENT	-1.322***	-1.077***	-0.800***
	(0.242)	(0.163)	(0.114)
MALE	0.098	0.318**	0.161*
	(0.268)	(0.133)	(0.097)
AGE	-0.026	-0.001	-0.003
	(0.018)	(0.010)	(0.007)
EDUCATION	0.479	0.161	0.191
	(0.320)	(0.182)	(0.120)
WORK_EXP	0.178	0.091	0.018
	(0.302)	(0.151)	(0.113)
CRT	0.294	0.427***	0.150
	(0.343)	(0.159)	(0.114)
Constant	2.358***	1.380***	1.141***
	(0.560)	(0.310)	(0.210)
Observations	1,264	2,629	2,024
Pseudo R^2	0.089	0.063	0.088

Note: We estimate the logistic regression specified under Equation (8) and report regression coefficients. Regression for column 1 excludes subjects with missing observations. Regression for column 2 includes subjects that did not correctly answer the check questions (see Table 3 for information on the sample selection). The regression model for column 3 is a probit model. *TM (TAX-MINIMIZING)* is the dependent variable and takes the value of one if subject *j* takes a tax-minimizing decision in item *i*. *CHANGE_TLCF*, *CHANGE_TD*, and *SYMMETRY* are indicator variables taking the value of one if item *i* belongs to the respective item group. *TREATMENT* is an indicator variable taking the value of one for observations from the time-pressure treatment. *MALE* is an indicator variable taking the value of one for male subjects, *AGE* is the age of a subject, *EDUCATION* is an indicator variable taking the value of one for a subject studying in a program with a specific focus on accounting, taxation, and/or finance. *WORK_EXP* is an indicator variable taking the value of one for a subject with more than 1 month of work experience in the field of accounting, taxation and/or finance. *CRT* is an indicator variable taking the value of one for a subject that has correctly solved all three questions of the cognitive reflection test (Frederick 2005). We estimate robust standard errors clustered on a subject-level (provided in parentheses). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed).